भाकृअनुप
ICAR

वार्षिक प्रतिवेदन

ANNUAL REPORT 2025

नवोन्मेषी डेरी तकनीकियों के विकास के साथ देश की सेवा में समर्पित

FULFILLING NATION'S DAIRY DREAMS

ndri

Since 1923

भाकृअनुप-राष्ट्रीय डेरी अनुसंधान संस्थान

(मानद् विश्वविद्यालय) करनाल - 132 001 भारत

ICAR-NATIONAL DAIRY RESEARCH INSTITUTE

(Deemed University) Karnal - 132 001 India

VISION

Ensure availability of quality milk and milk products at affordable cost, livelihood security to the producer and profitability to the dairy sector through adoption of appropriate technologies and human resource development.

MISSION

To serve the cause of dairying by developing quality human resource and suitable technologies related to the production, processing and marketing of milk and milk products, and their dissemination for the benefit of dairy industry, farming community and the Nation.

GOAL

Provide R&D support towards generation and dissemination of knowledge towards improved national milch herd for milk production enhancement, greater productivity of dairy industry and management aspects of the dairy profession leading to the social, economic and environmental benefits to the Nation as well as contributing towards manpower development programmes.

MANDATE

- Research in the Areas of Dairy Production, Processing and Marketing.
- Human Resource Development in Dairy Sector.
- Dissemination of Innovative Dairy Technologies.

वार्षिक प्रतिवेदन - 2025
ANNUAL REPORT - 2025

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ICAR-NDRI Annual Report 2025

2025

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पशु जैव प्रौद्योगिकी केन्द्र

MILESTONES

1923 Established as Imperial Institute of Animal Husbandry and Dairying in Bangalore.

1936 Renamed as "Imperial Dairy Institute".

1955 Established as National Dairy Research Institute (NDRI) at Karnal with Southern Regional Station of the Institute at Bangalore

1957 B.Sc. Dairying commenced at NDRI, Karnal.

1961 B.Sc. Dairying bifurcated into two branches, namely B.Sc. (Dairy Technology) and B.Sc. (Dairy Husbandry); M.Sc. Dairying courses commenced at Karnal.

1962 Western Regional Station established at Bombay.

1964 Eastern Regional Station established at Kalyani (W.B.).

1966 Institute brought under the aegis of ICAR.

1975 Operational Research Project initiated.

1976 Department of Human Nutrition and Dietetics established at NDRI, Karnal.

1979 M.Sc., Ph.D. Programme in Dairy Engineering commenced at Karnal.

1980 Karan Swiss cattle breed developed

1982 Karan Fries cattle breed developed

1984 Western Regional Station at Bombay was closed in 1984.

1985 "Farm Advisory Bureau" and "Industrial Consultancy Cell" set up.

NDRI recognized as Centre of Excellence in Animal Biotechnology.

1987 Embryo Biotechnology Centre established.

1989 Institute granted "Deemed to be University" status.

National Library of Dairy Science established.

M.Sc. in Biotechnology started.

1990 Birth of Pratham, first IVF buffalo calf of the world.

1991 20 bedded Hospital Complex set up and made functional.

1994 Institute got recognition as Centre of Advanced Studies in Dairy Technology and Dairy Cattle Breeding.

1995 1st Convocation of ICAR-NDRI was held. Sh. Balram Jhakhar, then Union Minister of Agriculture and Farmers Welfare was Chief Guest

1996 Two-year National Dairy Diploma (NDD) course introduced at Southern Regional Station of NDRI at Bangalore.

ICAR award (1993-94) for outstanding KVK conferred on the KVK located at NDRI.

1997 A state-of-the-art Auditorium having seating capacity of 950.

A commercial Model Dairy Plant with a capacity of over one lakh litres/ day commissioned for providing practical training to the students of NDRI University and to serve as an interface between Institute and Industry.

1998 A Modern Cafeteria with a seating capacity of 150 constructed in front of the Institute Hostels.

1999 Total No. of 9 NATP Projects with financial outlay of 266.25 lakhs initiated.

2000 A Guest House with two suites named as "Kamdhenu" was constructed at SRS, Bangalore.

Website of NDRI was created and launched by the Hon'ble Union Minister for Agriculture on 23rd December 2000.

2001 Foundation stone of the Agricultural Technology Information Centre laid on 1st August, 2001 under NATP project at NDRI, Karnal.

2002 International Students' Hostel equipped with modern facilities and amenities constructed at NDRI, Karnal.

Set up of Feed Quality Control Laboratory to help keep-strict quality check on feeds being fed to bovine livestock.

2003 State-of-the-art milking parlour system introduced in cattle section.

2004 First IVF goat kid born at NDRI.

ATIC centre made functional at NDRI.

2006 New Animal Biotechnology Centre commissioned.

2009 World First Cloned Buffalo Calf and second cloned calf "Garima" produced by hand-guided cloning technique at NDRI.

DST supported Technology Business Incubator (TBI) facility made functional.

New Course Curricula for B.Tech. in Dairy Technology and Masters and Doctoral Programmes introduced.

A new extension programme "Dairy Education at Farmers' Door" started.

2010 8th Convocation of NDRI, Deemed University held in presence of Dr. A. P. J. Abdul Kalam, Former President of India.

2011 M.Sc. in Forage Production Introduced at NDRI, Karnal. NDRI recognized as Centre of Advanced Faculty Training (CAFT) in the Disciplines of Dairy Production and Dairy Processing.

2012 Sahiwal Calf "Holi" through Ovum Pick up (OPU-IVF) technique born on 7th March, 2012.

NRC on Milk Quality and Safety established at NDRI, Karnal.

Business Planning and Development (BPD) Unit established at NDRI, Karnal.

2013 First female calf named 'Mahima' was born to a cloned buffalo on 25th January 2013.

A male cloned buffalo calf named 'Swarn' was born on 18thMarch 2013. Donor somatic cell used was isolated from the seminal plasma of an elite bull.

A Diploma in Dairy Technology started at Southern Regional Station, Bangalore.

2014 NDRI bagged the Sardar Patel Outstanding ICAR Institution Award presented by Hon'ble Prime Minister of India, Sh. Narendra Modi Ji.

NDRI produced a clone of endangered wild buffalo of Chhattisgarh named "Deepasha" on 12th December, 2014. "Farmers' Farm School" started.

A new extension education approach "Farmers' Farm School" was started at NDRI, Karnal.

NDRI got ISO 9001: 2008 certification.

2016 Two service centres established at Lalukheri, Muzzafarnagar (UP) and Piprakothi East Champaran (Bihar).

2017 Additional KVK established at Eastern Campus, Kalyani.

One month Foundation Course for newly admitted students of 2017-18 batch introduced.

Automation of the 'Academic Management System' implemented

ICAR - NDRI ranked first among all Agricultural Universities and four Deemed Universities of ICAR consecutively for five times (2016-2017, 2017-2018, 2018-2019, 2019-2020 and 2020-2021).

2018 A mega world-bank funded Institutional Development Plan (IDP) of National Agricultural Higher Education Project initiated.

National Referral Centre for Milk Quality and Safety (NRCMQS) granted accreditation by National Accreditation Board for Testing and Calibration Laboratories (NABL) as per ISO 17025:2005.

Set up Atal Incubation Centre at Southern Campus of NDRI, Bengaluru.

2019 Three cloned calves produced using donor cells of elite bulls.

2020 Twenty three Faculty members and fifty five students successfully completed their International training in 25 Overseas Universities located in 8 different countries under NAHEP.

National Referral Centre for Milk Quality and Safety (NRCMQS) granted accreditation by National Accreditation Board for Testing and Calibration Laboratories (NABL) as per ISO 17025:2005.

2022 Service Centre of ICAR-NDRI established at Goras, Sheopur, Madhya Pradesh.

Centenary year celebrations of the Institute inaugurated.

2023 Ganga was born on March 16, 2023 and birth weight was 32 Kg.

19th Convocation of the ICAR- National Dairy Research Institute was held in the august presence of Hon'ble President of India Smt. Droupadi Murmu ji.

2024 ICAR-NDRI ranked 2nd as per NIRF under 'Agriculture and Allied Sectors' category by the Ministry of Education, Government of India.

B.Tech. (Dairy Technology) programme started at SRS, Bengaluru.

Started two new UG programme B.Tech. (Biotechnology) and B.Tech. (Food Technology) at NDRI, Karnal.

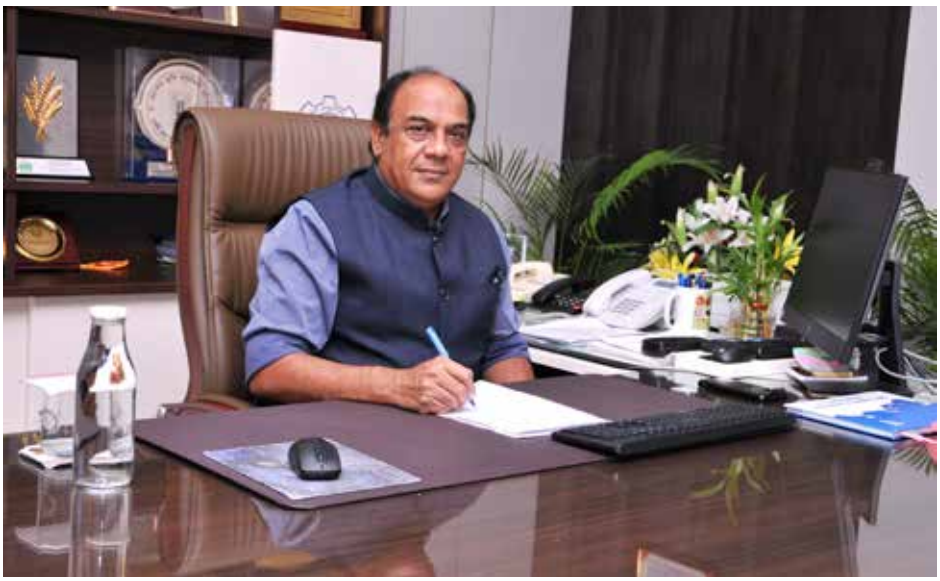
Live birth of buffalo calf with β-lactoglobulin knockout gene using gene edited technology.

2025 Karan-Fries breed (a synthetic breed), is registered and all the genomic aspects of the breed evaluated.

Genomic selection in Sahiwal cattle has been initiated using single-step genomic BLUP methodology for enhancing the productivity.

प्रस्तावना

PREFACE



मुझे भाकृअनुप-राष्ट्रीय डेरी अनुसंधान संस्थान (भाकृअनुप-राडेअनुसं), करनाल की वार्षिक रिपोर्ट 2025 प्रस्तुत करते हुए बहुत खुशी हो रही है। यह रिपोर्ट वर्ष भर में डेयरी अनुसंधान, शिक्षा, विस्तार, प्रौद्योगिकी विकास और नवाचार के क्षेत्र में संस्थान के बड़े योगदान की उपलब्धियों को दर्शाता है। यह प्रभावी डेयरी विकास, पशुओं की उत्पादकता में सुधार, भोजन और पोषण की सुरक्षा मजबूत करने और किसानों की आय बढ़ाने के लिए विज्ञान पर आधारित समाधान को आगे बढ़ाने के हमारे लगातार किए गए प्रयास को दिखाता है। 2024-25 के दौरान कैंपस प्लेसमेंट से कुल 66 छात्र चुने गए। 2024-25 के दौरान स्नातक विद्यार्थी को प्राप्त औसत वेतन ₹7.50 लाख सालाना थी, जबकि स्नातकोत्तर विद्यार्थी को प्राप्त औसत वेतन ₹11.00 लाख थी। इसके अलावा, कृषि अनुसंधान वैज्ञानिक (एआरएस) सेवा के 11 अलग-अलग विषयों में 56 उपलब्ध सीटों में से 31 विद्यार्थी एनडीआरआई के चुने गए, जो अत्यंत प्रशंसनीय है। इस तरह शत-प्रतिशत प्लेसमेंट रिकॉर्ड और निपुण मानव विकास संसाधन के साथ यह संस्थान विद्यार्थियों एवं भर्ती करने वाले एजेंसियों दोनों के लिए एक पसंदीदा संस्थान है।

वर्ष 2025 संस्थान के लिए एक ऐतिहासिक मील का पत्थर साबित हुआ, जब भाकृअनुप-राडेअनुसं ने कर्ण-फ्राइज़ नाम की सिंथेटिक डेयरी मवेशी नस्ल को विकसित किया और साथ ही इसकी जीनोमिक विशेषताओं का सफल मूल्यांकन भी किया गया। एक और बड़ी तरक्की साहीवाल मवेशियों में सिंगल-स्टेप जीनोमिक बेस्ट लीनियर अनबायस्ड प्रेडिक्शन (एसएसजीबीएलयूपी) मेथडोलॉजी का इस्तेमाल करके जीनोमिक सिलेक्शन शुरू करना था, जिससे देसी डेयरी मवेशियों में तेज़ी से आनुवंशिक सुधार और उत्पादकता बढ़ाने का रास्ता प्रसस्त किया। ये उपलब्धियां डेयरी पशुओं के आनुवंशिक सुधार के लिए आधुनिक प्रजनन और जीनोमिक प्रौद्योगिकी का इस्तेमाल करने में संस्थान की नेतृत्व क्षमता को दिखाती हैं। एक और

It gives me immense pleasure to present the Annual Report 2025 of the ICAR-National Dairy Research Institute (ICAR-NDRI), Karnal. The report showcases the accomplishments of Institute's major contributions in the fields of dairy research, education, extension, technology development, and innovation during the year. It reflects our continued commitment to advancing science-driven solutions for sustainable dairy development, improving livestock productivity, ensuring food and nutritional security, and enhancing farmers' livelihoods. Total number of 66 students selected through campus placement during 2024-25. The average salary offered to UG students was ₹7.50 lakh per annum while the average salary for PG students was ₹11.00 lakhs during 2024-25. Beside it, 31 students were selected in 11 different disciplines of Agricultural Research Scientist (ARS) service out of 56 available seats, which is remarkable. As such with 100 percent placement record and excellent human resource generation institute is a favorite destination for both students and recruitment agencies.

The year 2025 marked a historic milestone for the Institute with the registration of the Karan-Fries, a synthetic dairy cattle breed developed by ICAR-NDRI, alongwith the successful evaluation of its genomic characteristics. Another significant advancement was the initiation of genomic selection in Sahiwal cattle using the single-step genomic Best Linear Unbiased Prediction (ssGBLUP) methodology, paving the way for accelerated genetic improvement and enhanced productivity of indigenous dairy cattle. These achievements signify the Institute's leadership in harnessing advanced reproductive and genomic technologies for the genetic improvement of dairy animals. In another milestone, ICAR–NDRI, Karnal has successfully produced a Gir

मील के पत्थर में, भाकृअनुप-राडेअनुसं, करनाल ने एक क्लोन गिर गाय से मिले ऊसाइट्स (डेवलप हो रहे अंडे) से ओवम पिक-अप और इन-विट्रो फर्टिलाइजेशन (ओपीयू-आईवीएफ) का इस्तेमाल करके सफलतापूर्वक एक गिर बछड़ा पैदा किया गया। जो देश में अपनी तरह की पहली उपलब्धि है। यह मील का पत्थर बेहतरीन देसी नस्लों को तेज़ी से बढ़ाने के लिए एडवांस्ड रिप्रोडक्टिव प्रौद्योगिकी को जोड़ने की ज़बरदस्त क्षमता को दिखाता है। साहीवाल सरोगेट से पैदा हुआ गिर बछड़ा, सिर्फ़ 39 महीनों में एक बेहतरीन डोनर गाय से पैदा हुई दूसरी पीढ़ी है, जिससे 46-50 महीने के आम ब्रीडिंग गैप में काफ़ी कमी आई है।

संस्थान बाहरी अनुदान पाने में भी सफल रहा है और 31.12.2025 तक, भाकृअनुप-राडेअनुसं, करनाल में ₹9882.64 लाख के फाइनेंशियल लेआउट वाले 81 बाहरी स्रोतों से वित्तपोषित परियोजना चल रहे हैं। वर्ष 2025 में, संस्थान ने पशु पोषण के क्षेत्र में कॉर्नेल विश्वविद्यालय (यूएसए) के साथ मिलकर काम करना भी शुरू किया है।

संस्थान राष्ट्रीय स्तर पर अपनी शैक्षणिक उत्कृष्टता बनाए हुए है। भाकृअनुप-राडेअनुसं को भारत सरकार के शिक्षा मंत्रालय द्वारा कृषि एवं संबंधित क्षेत्र श्रेणी के तहत राष्ट्रीय संस्थागत रैंकिंग ढांचा (एनआईआरएफ) में लगातार वर्ष 2023-24 और 2024-25 के लिए दूसरा स्थान मिला है।

कई ऐसी प्रौद्योगिकी बनाई गई जिनका विज्ञान, उद्योग और समाज के लिए बहुत महत्व है। इनमें डेयरी उत्पादकता और दूध की गुणवत्ता सुधारने के लिए औषधीय पशु आहार, त्वरित तैयार होने वाला छाछ पाउडर, घी के बचे हुए हिस्से पर बना फैट स्प्रेड, गायों और भैंसों में प्रेग्नेंसी का जल्दी पता लगाने के लिए लेटरल फ्लो इम्यूनोएसे (एलएफआईए) और छेना पोडो और चीज़ पूरी मिक्स जैसे वैल्यू-एडेड पारंपरिक डेयरी उत्पाद शामिल हैं। ये इनोवेशन दिखाते हैं कि संस्थान सस्ती, किसान केंद्रित और उद्योग पर आधारित प्रौद्योगिकी बनाने के लिए दृढ़ संकल्पित है।

संस्थान ने प्रौद्योगिकी स्थानांतरण और बौद्धिक संपदा विकास के ज़रिए नवाचार को बढ़ावा देने में भी काफ़ी तरक्की की है। रिपोर्टिंग वर्ष के दौरान, 11 प्रौद्योगिकियाँ विकसित की गई, जिससे डेयरी इंडस्ट्रीज़ को लाइसेंसिंग के ज़रिए ₹40.97 लाख मिले। इसके अतिरिक्त, संस्थान ने 14 पेटेंट दायर किए तथा 8 कॉपीराइट प्राप्त किए। यह उपलब्धि संस्थान के अनुसंधान की व्यावहारिक उपयोगिता, नवाचार को बढ़ावा देने तथा बौद्धिक संपदा के संरक्षण एवं उसके व्यापक प्रसार के प्रति उसकी प्रतिबद्धता का प्रमाण है।

अनुसंधान को किसान समुदाय से जोड़ने में विस्तार और प्रशिक्षण एवं विकास कार्यक्रमो ने अहम भूमिका निभाई। 2025 के दौरान, संस्थान ने 355 विस्तार कार्यक्रम आयोजित किए, जिससे देश भर में 1.22 लाख से ज़्यादा डेयरी हितधारकों को फ़ायदा हुआ। डेयरी मेला–2025 में लगभग 40,000 लोगों ने भाग लेकर अब तक की सर्वाधिक उपस्थिति दर्ज कराई। यह मेला संस्थान द्वारा विकसित प्रौद्योगिकियों

calf using ovum pick-up and *in-vitro* fertilization (OPU-IVF) from oocytes (developing eggs) retrieved from a cloned Gir cow marking the first achievement of its kind in the country. This milestone demonstrates the powerful potential of integrating advanced reproductive technologies to rapidly multiply elite indigenous breeds. The Gir calf, born to a Sahiwal surrogate, represents the second generation from an elite donor cow within just 39 months, significantly reducing the conventional breeding interval of 46–50 months.

Institute is also successful in obtaining external grants and as on 31.12.2025, the 81 externally funded projects having financial layout of Amount ₹9882.64 lakhs are in progress at ICAR-NDRI, Karnal. In the year, 2025, Institute has also initiated a collaboration with Cornell University (USA) in the area of animal nutrition.

The Institute continues to maintain its academic excellence at the national level. ICAR-NDRI secured ranked second in the National Institutional Ranking Framework (NIRF) under the Agriculture and Allied Sectors category by the Ministry of Education, Government of India, for the consecutive years 2023-24 and 2024-25.

Several technologies with significant scientific, industrial, and societal relevance were developed, including a polyherbal feed supplement for improving dairy productivity and milk quality, instant buttermilk powder, a ghee residue-based fat spread, a lateral flow immunoassay (LFIA) for early pregnancy diagnosis in cows and buffaloes, and value-added traditional dairy products such as Chhana Podo and Cheese Puri Mix. These innovations demonstrate the Institute's commitment to developing affordable, farmer centric, and industry oriented technologies.

The Institute also made substantial progress in promoting innovation through technology transfer and intellectual property generation. During the reporting year, Technologies developed 11, generating ₹40.97 lakh through licensing to dairy industries. In addition, the Institute filed 14 patents and secured 8 copyrights filed 7 copyrights reflecting the strong translational impact of its research and its emphasis on protecting and disseminating intellectual assets.

Extension and capacity-building activities continued to play a pivotal role in connecting research with the farming community. During 2025, the Institute organized 355 extension programmes, benefiting over 1.22 lakh dairy stakeholders across the country. The Dairy Mela–2025 attracted a record participation of nearly 40,000 visitors, serving as an effective platform for showcasing the Institute's technologies and facilitating interaction among farmers, entrepreneurs, researchers, students, and industry stakeholders. Focused interventions under the Tribal Sub-Plan (TSP),

के प्रदर्शन तथा किसानों, उद्यमियों, शोधकर्ताओं, विद्यार्थियों और डेयरी उद्योग से जुड़े हितधारकों के बीच संवाद और सहयोग को बढ़ावा देने के लिए एक प्रभावी मंच साबित हुआ। जनजातीय उप योजना (टीएसपी), उत्तर पूर्व के पहाड़ी (एनईएच), और अनुसूचित जनजाति उप योजना(एससीएसपी) के तहत खास इंटरवेंशन्स ने डेयरी-बेस्ड एंटरप्राइजेज़ के ज़रिए रोज़ी-रोटी के मौकों को और मज़बूत किया और पिछड़े समुदायों के जीवन स्तर कों ऊंचा बढ़ाने मे मदद की।

इस रिपोर्ट में बताई गई उपलब्धियां हमारी संकाय, वैज्ञानिक, तकनीकी स्टाफ, छात्र, प्रशासनिक स्टाफ और सपोर्टिंग एजेंसियों की पक्की लगन, वैज्ञानिक उत्कृष्टता और मिलकर किए गए प्रयासों का नतीजा हैं। मैं अपने सभी हितधारकों, सहयोगी, आर्थिक अनुदान देने वाली संस्थाएँ उद्योग क्षेत्र के सहयोगियों को उनके लगातार सपोर्ट और संस्थान में भरोसे के लिए दिल से शुक्रिया अदा करता हूं।

जैसे-जैसे हम आगे बढ़ रहे हैं, भाकृअनुप-राडेअनुसं डेयरी विज्ञान और प्रौद्योगिकी में दुनिया भर में पहचाने जाने वाले बेहतरीन केंद्र के तौर पर उभरने के अपने विज़न के प्रति प्रतिबद्ध है। अनुसंधान में उत्कृष्ट, अच्छी गुणवत्ता की शिक्षा, असरदार विस्तार और असरदार प्रौद्योगिकी वर्गीकरण के ज़रिए, यह संस्थान भारत के डेयरी क्षेत्र को मज़बूत करने और परियोजना आधारित बजटिंग के साथ-साथ प्रौद्योगिकी रेडीनेस स्तर (टीआरएल) संस्थान के आर एडं डी कार्य को लागू करके व्यावसायिक सुरक्षा और किसानों की खुशहाली बढ़ाने के राष्ट्रीय लक्ष्यों को पूरा करने में योगदान देता रहेगा।

मुझे विश्वास है कि यह प्रकाशन शोधकर्ताओं, शिक्षकों, नीति-निर्माताओं, विद्यार्थियों, विकास एजेंसियों, डेयरी उद्योग तथा डेयरी क्षेत्र के विकास और आधुनिकीकरण से जुड़े सभी हितधारकों के लिए ज्ञानवर्धक एवं उपयोगी जानकारी का एक महत्वपूर्ण स्रोत सिद्ध होगा।

(धीर सिंह)
निदेशक, आईसीएआर-एनडीआरआई

North Eastern Hill (NEH), and Scheduled Caste Sub-Plan (SCSP) further strengthened livelihood opportunities through dairy-based enterprises and contributed to the socio-economic empowerment of marginalized communities.

The accomplishments presented in this report are the outcome of the unwavering dedication, scientific excellence, and collaborative efforts of our faculty, scientists, technical staff, students, administrative personnel, and supporting agencies. I express my sincere appreciation to all our stakeholders, collaborators, funding agencies, and industry partners for their continued support and confidence in the Institute.

As we move forward, ICAR-NDRI remains steadfast in its vision of emerging as a globally recognized centre of excellence in dairy science and technology. Through excellence in research, quality education, impactful extension, and effective technology commercialization, the Institute will continue to contribute towards strengthening India's dairy sector and realizing the national goals of sustainable agriculture, nutritional security, and enhanced farmer prosperity through implementation of project based budgeting along with Technology Readiness Level (TRL) in R & D programmes of the institute.

I sincerely hope that this publication would serve as a valuable source of information for researchers, academicians, policymakers, students, development agencies, dairy industries, and all stakeholders engaged in the growth and transformation of the dairy sector.

(Dheer Singh)
Director, ICAR-NDRI


21वाँ दीक्षाँत समारोह
मंगलवार, 22 अप्रैल, 2025
भाकृअनुप–राष्ट्रीय डेरी अनुसंधान संस्थान, करनाल

कार्यकारी सारांश

भाकृअनुप-राष्ट्रीय डेरी अनुसंधान संस्थान, करनाल देश का एक प्रमुख अनुसंधान संगठन है। देश में डेयरी विकास कार्यक्रमों को अनुसंधान एवं विकास (आर एंड डी) तथा मानव संसाधन विकास (एचआरडी) के माध्यम से सहयोग प्रदान करता है। 1923 में बैंगलोर में स्थापित इस संस्थान का मुख्यालय 1955 में करनाल में मौजूदा जगह पर लाया गया। इसके दो क्षेत्रीय केंद्र हैं - एक बेंगलुरु में और दूसरा कल्याणी में - जो संबंधित क्षेत्रों की कृषि-जलवायु स्थितियों के अनुसार मदद प्रदान करते हैं। भाकृअनुप-एनडीआरआई को 1989 से अपने शैक्षणिक कार्यक्रमों को चलाने के लिए 'डीम्ड यूनिवर्सिटी' का दर्जा प्राप्त है। यह संस्थान 2016-17 से 2021-22 तक लगातार पांच बार भारत के सभी कृषि विश्वविद्यालयों (जिनमें 4 डीम्ड यूनिवर्सिटी भी शामिल हैं) में पहले स्थान पर रहा है। साल 2023-24 और 2024-25 में, भाकृअनुप-एनडीआरआई ने भारत सरकार के उच्च शिक्षा मंत्रालय के 'राष्ट्रीय संस्थागत रैंकिंग फ्रेमवर्क' (एनआरआईएफ) की 'कृषि और संबंधित श्रेणी' में दूसरी रैंक हासिल की है।

संगठनात्मक संरचना

डीम्ड यूनिवर्सिटी सिस्टम और ICAR की नीतियों के अनुसार, संस्थान का प्रबंधन विभिन्न नीति/निर्णय लेने वाली संस्थाओं द्वारा किया जाता है, जैसे कि बोर्ड ऑफ मैनेजमेंट, रिसर्च एडवाइजरी कमेटी, एकेडमिक काउंसिल, एग्जीक्यूटिव काउंसिल और एक्सटेंशन काउंसिल। निदेशक मुख्य कार्यकारी अधिकारी (CEO) होते हैं और अनुसंधान, शैक्षणिक और विस्तार कार्यों के प्रबंधन में संयुक्त निदेशकों द्वारा उनकी सहायता की जाती है। संस्थान में R&D गतिविधियों के तीन मुख्य क्षेत्र हैं: i) डेरी उत्पादन, ii) डेरी प्रसंस्करण और iii) डेरी विस्तार/प्रबंधन। सभी R&D गतिविधियों का प्रबंधन तेरह अनुसंधान प्रभागों/अनुभागों के माध्यम से किया जाता है, जैसे: पशु आनुवंशिकी और प्रजनन, पशुधन उत्पादन और प्रबंधन, पशु पोषण, चारा अनुसंधान और प्रबंधन, पशु शरीर विज्ञान, पशु जैव रसायन, पशु जैव प्रौद्योगिकी, डेरी प्रौद्योगिकी, डेरी इंजीनियरिंग, डेरी रसायन विज्ञान, डेरी सूक्ष्म जीव विज्ञान, डेरी विस्तार और डेरी अर्थशास्त्र, सांख्यिकी और प्रबंधन। संस्थान के पास कृषि प्रौद्योगिकी सूचना केंद्र (ATIC), कृषि विज्ञान केंद्र और डेरी प्रशिक्षण केंद्र, कृत्रिम प्रजनन अनुसंधान केंद्र, पिपराकोठी, पूर्वी चंपारण, मोतिहारी, बिहार में कृषि और डेरी विकास केंद्र और मुजफ्फरनगर, U.P. के लालूखेड़ी में मॉडल डेरी केंद्र भी हैं। संस्थान के बुनियादी ढांचे में केंद्रीय सुविधाएं शामिल हैं जैसे कि पशुधन अनुसंधान केंद्र, चारा अनुसंधान और प्रबंधन केंद्र, कृत्रिम प्रजनन अनुसंधान केंद्र, पशु स्वास्थ्य परिसर, छोटे जानवरों का घर, मॉडल डेरी संयंत्र, प्रौद्योगिकी व्यवसाय इनक्यूबेटर, कृषि-व्यवसाय इनक्यूबेशन केंद्र, दूध की गुणवत्ता और सुरक्षा के लिए राष्ट्रीय रेफरल प्रयोगशाला (NRCMQS), NDRI-केंद्रीय इंस्ट्रूमेंटेशन

EXECUTIVE SUMMARY

ICAR-National Dairy Research Institute, Karnal is a premier research organization of the nation dedicated to provide Research and Development (R&D) and Human Resource Development (HRD) support towards dairy development programmes in the country. Established in 1923 at Bangalore, the headquarters of the Institute was moved to the present location at Karnal in 1955. It has two regional stations, one at Bengaluru and the other at Kalyani for providing region-specific support suited to their agro-climatic conditions. ICAR-NDRI has the distinction of being a Deemed University for implementing its academic programmes since 1989. The Institute has been ranked first among all Agricultural Universities of India including 4 Deemed Universities, consecutively for the five times in the year 2016-17, 2017-18, 2018-19, 2019-20, 2020-21, 2021-22. In the year 2023-24 and 2024-25, ICAR-NDRI has secured the second rank in the National Institutional Ranking Framework (NIRF) in 'Agriculture and Allied Category" of the Union Ministry of Higher Education, Govt. of India.

ORGANISATIONAL STRUCTURE

In consonance with the administrative pattern of the Deemed University System and ICAR policies, the Institute is managed through various policy/ decision making bodies, viz. Board of Management, Research Advisory Committee, Academic Council, Executive Council and Extension Council. The Director is the Chief Executive Officer assisted by the Joint Directors for managing research, academic and extension functions. The Institute has three major areas of R & D activities viz. i) Dairy Production, ii) Dairy Processing and iii) Dairy Extension/ Management. All the R & D activities are managed through thirteen Research Divisions/ Sections, namely, Animal Genetics & Breeding, Livestock Production and Management, Animal Nutrition, Forage Research and Management, Animal Physiology, Animal Biochemistry, Animal Biotechnology, Dairy Technology, Dairy Engineering, Dairy

सुविधा (NCIF), प्रायोगिक डेरी संयंत्र, परामर्श इकाई, पुस्तकालय और राष्ट्रीय जैव-सूचना विज्ञान केंद्र, कंप्यूटर केंद्र, एस्टेट अनुभाग और रखरखाव इंजीनियरिंग अनुभाग। प्रशासनिक कार्य जैसे खरीद, स्टोर और सुरक्षा संयुक्त निदेशक (प्रशासन और वरिष्ठ रजिस्ट्रार) के प्रशासनिक नियंत्रण में हैं, जबकि वित्त प्रभाग नियंत्रक (वित्त) के प्रशासनिक नियंत्रण में है। 31 दिसंबर, 2025 तक संस्थान में कुल 559 कर्मचारी कार्यरत हैं। इनमें 138 वैज्ञानिक, 143 तकनीशियन, 99 प्रशासनिक स्टाफ तथा 179 कुशल सहायक (Skilled Supporting Staff) शामिल हैं।

बजट आवंटन

साल 2025-26 के दौरान संस्थान का वास्तविक खर्च 29164.37 लाख रुपये था और इसी साल के लिए मंज़ूर किया गया बजट 29164.16 लाख रुपये था। इन आंकड़ों में रीजनल कैंपस को मज़बूत करने के लिए किया गया खर्च भी शामिल है।

अनुसंधान

प्रयोगशाला से खेत तक (प्रसार गतिविधियाँ)

- वर्ष 2025 के दौरान, संस्थान ने कुल 355 विस्तार गतिविधियाँ आयोजित कीं, जिनसे 1,22,398 डेयरी हितधारकों को लाभ मिला। इन गतिविधियों में 37 पशु स्वास्थ्य शिविर, 31 किसानों की संगोष्ठियाँ, 123 जागरूकता कार्यक्रम, 153 प्रशिक्षण कार्यक्रम, 08 कौशल विकास कार्यक्रम, 01 राष्ट्रीय डेयरी मेला, 5494 TSP किसानों के बीच इनपुट वितरण, TSP के तहत 1908 किसानों के लिए प्रशिक्षण और इनपुट वितरण, NEH के तहत 1214 किसानों के लिए प्रशिक्षण और इनपुट वितरण और SCSP प्रमुख कार्यक्रमों के तहत 15,828 किसानों के लिए प्रशिक्षण और इनपुट वितरण शामिल थे।
- भारत के लिए एक डेयरी विकास सूचकांक विकसित किया गया, जिसके तहत इसके ढांचे और प्रमुख निर्धारकों को स्थापित किया गया।
- दक्षिण एशिया में छह प्रमुख पशुधन प्रजातियों—गाय, भैंस, भेड़, बकरी, सूअर और मुर्गीपालन—के लिए जलवायु जोखिमों और व्यवहार्य अनुकूलन विकल्पों को मैप करने के लिए एक ई-एटलस (e-Atlas) विकसित किया गया। यह एटलस 0.05° × 0.05° के स्थानिक रिज़ॉल्यूशन पर दो ग्रीनहाउस गैस उत्सर्जन परिदृश्यों (SSP2-4.5 और SSP5-8.5) के तहत आधारभूत (2000 के दशक), 2050 और 2080 के दशक के लिए अनुमान प्रदान करता है, जो जलवायु-अनुकूल पशुधन योजना के लिए एक निर्णय-समर्थन उपकरण के रूप में कार्य करता है।
- उष्णकटिबंधीय परिस्थितियों में डेयरी गायों और भैंसों के लिए पारंपरिक तापमान आर्द्रता सूचकांक (THI) की तुलना में व्यापक

Chemistry, Dairy Microbiology, Dairy Extension and Dairy Economics, Statistics & Management. The Institute also has an Agricultural Technology Information Centre (ATIC), Krishi Vigyan Kendra & Dairy Training Centre, Artificial Breeding Research Centre, Krishi &Dairy Vikas Kendra at KVK, Piprakothi, East Champaran, Motihari, Bihar and Model Dairy Centre at Lalukheri in Muzzafarnagar, U.P. The Institute has infrastructure consisting of central facilities such as Livestock Research Centre, Forage Research & Management Centre, Artificial Breeding Research Centre, Animal Health Complex, Small Animal House, Model Dairy Plant, Technology Business Incubator, Agri-business Incubation Centre, National Referral Laboratory for Milk Quality & Safety (NRCMQS), NDRI-Central Instrumentation Facility (NCIF), Experimental Dairy Plant, Consultancy Unit, Library and National Bio-informatic Centre, Computer Centre, Estate Section and Maintenance Engineering Section. The administrative functions viz. purchase, stores and security are under the administrative control of the Joint Director (Admn. & Sr. Registrar), whereas finance Division is under the Administrative Control of Comptroller (Finance). As on December 31, 2025, the Institute presently has strength of 138 scientists, 143 technicians, 99 administrative staff and 179 skilled supporting staff.

BUDGET OUTLAY

The financial outlays of the Institute in terms of actual expenditure during the year 2025-26 was **₹29164.37** lakhs and budget sanctioned for the year 2025-26 was **₹29164.16** lakhs. These figures also include the financial outlays for the strengthening of Regional Campuses.

Research

Lab to Land (Extension Activities)

- During the year 2025, the Institute conducted a total of 355 extension activities benefiting 1,22,398 dairy stakeholders. These activities included 37 animal health camps, 31 kisan sanghosthies, 123 awareness programmes, 153 training programmes, 08 skill development

जलवायु सूचकांक को अधिक विश्वसनीय थर्मल स्ट्रेस (तापीय तनाव) संकेतक के रूप में पहचाना गया।

- मुजफ्फरनगर, उत्तर प्रदेश में स्थित भाकृअनुप- राष्ट्रीय डेरी अनुसंधान संस्थान किसान सेवा केंद्र ने कृषि उत्पादकता में उल्लेखनीय सुधार किया, जिससे लाभार्थी डेयरी किसानों के दूध उत्पादन में 34.3% की वृद्धि दर्ज की गई।

डेरी उत्पादन

- करण-फ्रीज़ का पंजीकरण: भाकृअनुप- राष्ट्रीय डेरी अनुसंधान संस्थान द्वारा विकसित करण-फ्रीज़ (एक सिंथेटिक नस्ल) को भारत सरकार द्वारा आधिकारिक रूप से पंजीकृत किया गया है और इसके सभी जीनोमिक पहलुओं का मूल्यांकन पूरा कर लिया गया है।
- क्लोन से बछड़े का जन्म: क्लोन की गई गाय 'गंगा' से OPU-IVF तकनीक द्वारा बछिया 'श्रावणी' का सफल जन्म सुनिश्चित किया गया।
- जीन एडिटिंग अनुसंधान: भैंस के बछड़ों में मृत्यु दर से संबंधित 'MSTN' जीन नॉकआउट के मांसपेशियों और सीरम मानकों का विश्लेषण किया गया। साथ ही, CRISPR-Cas9 तकनीक का उपयोग करके संशोधित CD18-जीन वाले भैंस के क्लोन भ्रूण तैयार किए गए।
- स्टेम सेल और प्रोटीन: मवेशियों में इंड्यूस्ड प्लुरिपोटेंट स्टेम सेल (iPS) सफलतापूर्वक स्थापित किए गए। इसके अलावा, शुक्राणु की कार्यक्षमता बढ़ाने के लिए ई. कोलाई (E. coli) में पुनः संयोजक भैंस 'बीटा-डिफेंसिन 126' प्रोटीन का उत्पादन किया गया।
- प्रजनन तकनीक: मवेशियों में X-क्रोमोसोम वाले शुक्राणुओं के संवर्धन के लिए एप्टामर और लिगैंड-आधारित तकनीकें स्थापित की गईं, जिससे मादा भ्रूण के उत्पादन में सुधार हुआ है।
- AI आधारित उपकरण: भैंस और गाय के ब्लास्टोसिस्ट (Blastocysts) की गुणवत्ता के आकलन के लिए एक AI-आधारित पूर्वानुमान टूल विकसित किया गया।
- आरएनए (RNA) विश्लेषण: साहिवाल गायों के दूध की दैहिक कोशिकाओं (Milk Somatic Cells) से अलग-अलग तरह से व्यक्त होने वाले 'लॉन्ग नॉन-कोडिंग आरएनए' (lncRNAs) और 'एमआरएनए' (mRNAs) की पहचान और उनका लक्षण वर्णन किया गया। यह शोध गायों के स्वास्थ्य और दूध उत्पादन की आनुवंशिक समझ के लिए महत्वपूर्ण है।
- एप्टामर-आधारित शुक्राणु संवर्धन: गोवंश में एप्टामर (Aptamer) तकनीक का उपयोग करके 'X' गुणसूत्र (Chromosome) वाले शुक्राणुओं को अलग करने या उन्हें समृद्ध करने की विधि स्थापित की गई।
- मादा भ्रूण उत्पादन: लिगैंड-आधारित तकनीक द्वारा 'X' गुणसूत्र वाले शुक्राणुओं के संवर्धन से इन-विट्रो फर्टिलाइजेशन (IVF) के माध्यम से मादा भ्रूण के उत्पादन में उल्लेखनीय सुधार हुआ है।

programmes, 01 national dairy mela, input distribution among 5494 TSP farmers, trainings and input distribution among 1908 farmers under TSP, trainings and input distribution among 1214 farmers under NEH and trainings and input distribution among 15828 farmers under SCSP flagship programmes.

- A Dairy Development Index for India was developed, establishing its framework and key determinants.
- An e-Atlas was developed to map climate risks and feasible adaptation options for six major livestock species viz. cattle, buffalo, sheep, goat, pig, and poultry in South Asia. The Atlas provides projections for baseline (2000s), 2050s, and 2080s under two greenhouse gas emission scenarios (SSP2-4.5 and SSP5-8.5) at a spatial resolution of 0.05° × 0.05°, serving as a decision-support tool for climate-resilient livestock planning.
- The Comprehensive Climate Index (CCI) was identified as a more reliable thermal stress indicator than the conventional Temperature Humidity Index (THI) for dairy cattle and buffaloes under tropical conditions.
- The ICAR-NDRI Kisan Sewa Kendra in Muzaffarnagar, Uttar Pradesh, significantly improved farm productivity, recording a 34.3% increase in milk production among beneficiary dairy farmers.

Dairy Production

- ICAR-NDRI developed breed viz., Karan-Fries breed (a synthetic breed) has been registered by the Government of India and all the genomic aspects of the breed have been evaluated.
- Birth of Shravani, OPU-IVF calf produced from the cloned cow, GANGA was achieved.
- Molecular and cellular analyses of muscle and serum parameters were measured in MSTN gene knockout buffalo calf related to mortality. Buffalo cloned embryos were produced with modified CD18-gene using CRISPR-Cas9 biallelic knock-in approach.

यह तकनीक भविष्य में केवल बछिया के जन्म को प्राथमिकता देने में सहायक होगी।

- ट्रांसजीन कैसेट का निर्माण: नॉक-इन (Knock-in) अध्ययन के लिए मानव लाइसोजाइम जीन (Human Lysozyme Gene) ले जाने वाला एक 'ट्रांसजीन कैसेट' डिजाइन किया गया। इसका उद्देश्य पशुओं के दूध के औषधीय गुणों या रोगाणुरोधी क्षमता को बढ़ाना है।
- एंटीवायरल प्रतिक्रिया: कुछ विशिष्ट आरएनए मोटिफ्स (RNA motifs) की पहचान की गई है जो शरीर में वायरस से लड़ने वाली (एंटीवायरल) प्रतिक्रिया को उत्तेजित करते हैं।
- प्रतिरक्षा प्रणाली का अध्ययन: आरएनए सेंसर के प्रति एपिथेलियल (सतह वाली) और गैर-एपिथेलियल कोशिकाओं की प्रतिरक्षा प्रतिक्रियाओं को स्थापित किया गया, जिससे यह समझने में मदद मिली कि पशुओं का शरीर संक्रमण से कैसे लड़ता है।
- साहिवाल गायों का जीनोमिक चयन: साहिवाल मवेशियों की उत्पादकता बढ़ाने के लिए 'सिंगल-स्टेप जीनोमिक BLUP' कार्यप्रणाली का उपयोग करके जीनोमिक चयन की प्रक्रिया को सफलतापूर्वक लागू किया गया।
- तनाव और दूध उत्पादन का तुलनात्मक अध्ययन: साहिवाल और करण-फ्राइज़ नस्लों में दूध की मात्रा, गुणवत्ता और 'मैमरी स्ट्रेस बायोमार्कर' की तुलना विभिन्न मौसमों और THI (तापमान-आर्द्रता सूचकांक) के आधार पर की गई। पाया गया कि गर्म और उमस भरे मौसम में करण-फ्राइज़ की प्रतिरक्षा प्रणाली अधिक प्रभावित होती है। यहाँ तक कि गर्मी सहने वाली साहिवाल गायों में भी THI > 79 होने पर तनाव देखा गया, जिसकी पुष्टि बढ़े हुए कोर्टिसोल और HSP90 के स्तर से हुई।
- गर्मी से बचाव के उपाय: 84 मुर्रा भैंसों पर सात अलग-अलग प्रणालियों के माध्यम से गर्मी कम करने के परीक्षण किए गए। इनमें 'शावर' सबसे प्रभावी पाया गया, उसके बाद तालाब और फिर मिस्ट+फैन का स्थान रहा।
- दूध की गुणवत्ता पर प्रभाव: उच्च-SCC (सोमैटिक सेल काउंट) वाले दूध को कम-SCC वाले दूध के साथ मिलाने पर SNF (वसा रहित ठोस), खनिज और विशिष्ट गुरुत्व में कमी आई, जबकि विद्युत चालकता और एंजाइमों में वृद्धि हुई। इससे दूध की गुणवत्ता तेजी से खराब होती है, उसका शेल्फ-लाइफ कम हो जाता है, स्वाद बिगड़ जाता है और इससे बनने वाले दही की बनावट) भी खराब हो जाती है।
- व्यापक जलवायु सूचकांक (CCI): तापमान, आर्द्रता, हवा की गति और विकिरण को सम्मिलित करने वाला व्यापक जलवायु सूचकांक (CCI), डेयरी पशुओं की शारीरिक प्रतिक्रियाओं को समझने में THI (तापमान-आर्द्रता सूचकांक) की तुलना में अधिक सटीक पाया गया, क्योंकि THI में हवा और विकिरण पर ध्यान नहीं दिया जाता है।

- Induced pluripotent stem cells (iPS) were successfully established in cattle. Recombinant buffalo beta-defensin 126 (BuBD126) protein produced in *Escherichia coli* with enhanced sperm function.
- Aptamer-based X chromosome-bearing sperm enrichment was established in bovine. Ligand-based enrichment of X chromosome-bearing spermatozoa improved the production of female embryos using *in-vitro* fertilization.
- An AI-based prediction tool was developed for the assessment of buffalo and cattle blastocysts quality.
- Identified and characterized differentially expressed long non-coding RNA (lncRNAs) and mRNAs from milk somatic cells in Sahiwal cows.
- Aptamer-based X chromosome-bearing sperm enrichment was established in bovine.
- Ligand-based enrichment of X chromosome-bearing spermatozoa improved the production of female embryos using in-vitro fertilization.
- A transgene cassette carrying human lysozyme gene was designed for knockin study.
- RNA motifs were identified as stimulant of antiviral response. Immune responses of epithelial and non-epithelial cells against RNA sensors were established.
- Immune responses of epithelial and non-epithelial cells against RNA sensors were established.
- Genomic selection in Sahiwal cattle has been implemented by using single-step genomic BLUP methodology for enhancing the productivity.
- Compared milk yield, quality, and mammary stress biomarkers in Sahiwal and Karan Fries across seasons and THI. KF showed greater immune disruption in hot-humid conditions. Even heat-tolerant Sahiwal showed stress when THI >79, indicated by elevated cortisol and HSP90.

- घग्गर के मैदानों में परीक्षण: भाकृअनुप- राष्ट्रीय डेरी अनुसंधान संस्थान करनाल द्वारा घग्गर के मैदानी इलाकों में किए गए परीक्षणों से पता चला कि 'एनायनिक मिश्रण' के उपयोग से गर्मियों में भैंसों के प्रजनन, दूध उत्पादन और समग्र स्वास्थ्य में सुधार हुआ।
- निरंतर रूमेन बायोरिएक्टर : मीथेन के आकलन और चारे के मूल्यांकन के लिए पशु के पेट (रूमेन) जैसी स्थितियों को कृत्रिम रूप से बनाने हेतु एक नया 'कंटीन्यूअस रूमेन बायोरिएक्टर' विकसित किया गया है।
- एफ़्लाटॉक्सिन का प्रभाव कम करना: जिन करण-फ्राइज़ (KF) गायों के आहार में 35-55 ppb एफ़्लाटॉक्सिन B1 मौजूद था, उन्हें 15-20 ग्राम/दिन मन्नानोलिगोसेकेराइड (MOS) देने से उनके रक्त मानकों (हीमोग्लोबिन, TLC और लिम्फोसाइट्स) में सुधार देखा गया।
- NIRS तकनीक: 'नियर-इन्फ्रारेड स्पेक्ट्रोस्कोपी' (NIRS) के माध्यम से चारे की सामग्री (जैसे सरसों की खल, सोयाबीन मील, मक्का, जौ और चोकर) के पोषण घटकों का तेजी से अनुमान लगाया गया। इसकी सटीकता पारंपरिक गीली रसायन विज्ञान (Wet Chemistry) विधि के बराबर पाई गई।
- एलोवेरा-आधारित पोस्टबायोटिक: प्रोबायोटिक स्ट्रेन का उपयोग करके तैयार किए गए एलोवेरा-आधारित पोस्टबायोटिक फॉर्मूलेशन ने 'सबक्लीनिकल मैस्टाइटिस' (थनैला रोग का शुरुआती चरण) में सोमैटिक सेल काउंट (SCC) और सूजन बढ़ाने वाले साइटोकिन्स को प्रभावी ढंग से कम किया, जबकि दूध की मात्रा और गुणवत्ता बनी रही।
- मीथेन उत्सर्जन का तुलनात्मक अध्ययन: उच्च उत्पादन वाले मवेशियों ने प्रतिदिन 212.66 ग्राम मीथेन का उत्सर्जन किया (कम उत्पादन वालों के 102.44 ग्राम की तुलना में); वहीं उच्च उत्पादन वाली भैंसों ने 200.57 ग्राम/दिन उत्सर्जन किया (कम उत्पादन वाली भैंसों के 115.67 ग्राम की तुलना में)।
- प्रति किलोग्राम उत्सर्जन में कमी: यद्यपि कुल मीथेन उत्सर्जन अधिक था, लेकिन उच्च उत्पादन वाले मवेशियों ने प्रति किलोग्राम दूध उत्पादन पर कम मीथेन उत्सर्जित की (19.01 ग्राम बनाम 34.25 ग्राम)। भैंसों में भी यही प्रवृत्ति देखी गई (20.01 ग्राम बनाम 25.72 ग्राम प्रति किलोग्राम दूध)।
- साइलेज गुणवत्ता में सुधार: धान के पुआल की साइलेज (अचार) बनाने के लिए ताप-सहनशील फाइब्रोलिटिक LAB (लैक्टिक एसिड बैक्टीरिया) और Saccharomyces cerevisiae (खमीर) के मिश्रण का उपयोग करने से साइलेज की गुणवत्ता में सुधार हुआ और बछड़ों के प्रदर्शन को प्रभावित किए बिना मीथेन उत्सर्जन में कमी आई।
- प्रीबायोटिक निर्माण: ज्वार के डंठल और बाजरे के पुआल को जाइलोलिगोसेकेराइड्स) में बदलने की एक जैव-प्रक्रिया विकसित की गई, जो मजबूत प्रीबायोटिक गतिविधि, एंटीऑक्सीडेंट क्षमता और जठर स्थिरता प्रदर्शित करती है।

- Heat mitigation tested in 84 Murrah buffaloes across seven systems. Shower was most effective, followed by pond and mist+fan.
- Mixing high-SCC milk with low-SCC milk reduced SNF, minerals, specific gravity and increased conductivity and enzymes, accelerating quality deterioration, shorter shelf-life, off-flavours and poor yogurt texture.
- Comprehensive Climate Index (CCI), incorporating temperature, humidity, wind, and radiation, correlated better with physiological responses in dairy animals than THI, which ignores wind and radiation.
- ICAR-NDRI Karnal trials in Ghaghar Plains showed anionic mishran improved summer buffalo reproduction, milk yield and overall health.
- A novel Continuous Rumen Bioreactor was developed to simulate rumen conditions for methane estimation and feed evaluation.
- Supplementation of mannanoligosaccharide (15–20 g/day) in KF cows fed rations containing 35–55 ppb aflatoxin B1 improved haematological parameters (Hb, TLC, lymphocytes).
- NIRS rapidly estimated nutritional components of feed ingredients (MOC, SBM, CSC, maize, barley, brans, concentrates) with accuracy comparable to wet chemistry.
- An Aloe vera-based postbiotic formulation using probiotic strains effectively reduced SCC and inflammatory cytokines in subclinical mastitis while maintaining milk yield and composition.
- High-producing cattle emitted 212.66 g methane/d (vs. 102.44 g for low producers); high-producing buffaloes emitted 200.57 g/d (vs. 115.67 g for low producers).
- Despite higher total methane, high-producing cattle emitted less methane per kg milk (19.01 vs 34.25 g). Similar trend in buffaloes (20.01 vs 25.72 g/kg milk).
- Combining thermo-tolerant fibrolytic LAB and *Saccharomyces cerevisiae* for paddy straw

- एंटीबायोटिक प्रभावशीलता में वृद्धि: दूध के छोटे बाह्यकोशिकीय पुटिकाओं (ने थनैला रोग पैदा करने वाले 'स्टेफिलोकोकस ऑरियस' के विरुद्ध ß-लैक्टम एंटीबायोटिक की सक्रियता को बढ़ा दिया।
- आनुवंशिक प्रतिरक्षा: कांगयम और थारपारकर नस्ल के मवेशियों में साहिवाल, गीर, करण फ्राइज़ और होल्स्टीन फ्रीजियन की तुलना में जन्मजात प्रतिरक्षा जीन की अधिक प्रत्तियां) पाई गईं, जो उनकी बेहतर रोग प्रतिरोधक क्षमता को दर्शाती हैं।
- प्रतिरक्षा मार्कर की पहचान: परिधीय रक्त मोनोन्यूक्लियर कोशिकाओं (PBMC) के 'ट्रांसक्रिप्टोम प्रोफाइलिंग' के माध्यम से प्रोटोकैडरिन-1 (PCDH1) को एक विशिष्ट जन्मजात प्रतिरक्षा मार्कर के रूप में पहचाना गया है। यह मार्कर करण-फ्राइज़ की तुलना में साहिवाल, थारपारकर और गीर नस्लों में अधिक प्रभावी पाया गया।
- माइटोकॉन्ड्रियल जीनोम और दुग्ध उत्पादन: स्वदेशी मवेशियों के माइटोकॉन्ड्रियल जीनोम अनुक्रमण से पता चला कि उच्च दूध उत्पादन का संबंध संरक्षित और मुख्य रूप से 'सिनोनिमस' mtDNA वेरिएंट से है। इसके विपरीत, कम उत्पादन का संबंध उच्च 'नॉन-सिनोनिमस' SNP घनत्व से है। यह शोध माइटोकॉन्ड्रियल स्थिरता और दुग्ध स्राव दक्षता के बीच सीधा संबंध दर्शाता है।
- प्रजनन अनुसंधान (CRISP-1): एपिडिडिमल एपिथेलियम द्वारा स्रावित प्रोटीन CRISP-1 ने शुक्राणु की 'कैपेसिटेशन' (निषेचन क्षमता), टायरोसिन फास्फोराइलेशन और NO, cAMP एवं Ca^{2+} सिग्नलिंग को बाधित किया। यह परिणाम क्रायोकैपेसिटेशन (ठंडे तापमान पर भंडारण के दौरान होने वाली क्षति) को रोकने की क्षमता का संकेत देता है।
- लैक्टोट्रांसफेरिन का प्रभाव: भैंस के 80 kDa एपिडिडिमल लैक्टोट्रांसफेरिन (1.5 µM) ने इन-विट्रो शुक्राणु की गतिशीलता और कैपेसिटेशन को दृढ़ता से बाधित किया। वहीं, गाय के दूध के लैक्टोफेरिन (100 µg/mL) ने भी गतिशीलता को दबाया, फिर भी दोनों ने तरल वीर्य भंडारण के दौरान प्रगतिशील गतिशीलता और झिल्ली अखंडता में सुधार किया।
- गधी का दूध और मधुमेह अनुसंधान: गधी के दूध की पहचान DPP-IV निरोधात्मक पेप्टाइड्स के एक समृद्ध स्रोत के रूप में की गई है। 'इन सिलिको' (कंप्यूटर आधारित विश्लेषण) कैसीन पाचन के माध्यम से एक शक्तिशाली और गैर-विषाक्त 'ट्राइपेप्टाइड इनहिबिटर' प्राप्त हुआ, जो स्वास्थ्य क्षेत्र में उपयोगी हो सकता है।
- ऊँटनी के दूध का चिकित्सीय प्रभाव: ऊँटनी के दूध के प्रोटीन हाइड्रोलाइजेट्स (विशेष रूप से D-WP-PTC <3 kDa) ने मधुमेह (डायबिटीज) प्रबंधन में मजबूत क्षमता दिखाई है। इसने मधुमेह से ग्रस्त चूहों में इंसुलिन स्राव, एंटीऑक्सीडेंट सुरक्षा और प्रजनन स्वास्थ्य में सुधार किया।

ensiling improved silage quality and reduced methane without affecting calf performance.

- Developed a bioprocess converting sorghum stalks and pearl millet straw into xylooligosaccharides, showing strong prebiotic activity, antioxidant capacity and gastric stability.
- Small milk extracellular vesicles enhanced β-lactam antibiotic activity against intracellular mastitis-causing *Staphylococcus aureus*.
- Kangayam and Tharparkar cattle showed higher duplications in innate immune genes than Sahiwal, Gir, Karan Fries and Holstein Friesian.
- Transcriptome profiling of peripheral blood mononuclear cells identified protocadherin-1 (PCDH1) as a distinctive innate immunity marker in Sahiwal, Tharparkar and Gir vs Karan Fries.
- Mitochondrial genome sequencing of indigenous cattle showed high milk yield links to conserved, mainly synonymous mtDNA variants, while low yield correlates with higher non-synonymous SNP density, linking mitochondrial stability to lactation efficiency.
- CRISP-1 (Cysteine-Rich Secretory Protein 1), a protein secreted by the epididymal epithelium inhibited sperm capacitation, tyrosine phosphorylation and NO, cAMP and Ca^{2+} signalling, indicating potential to prevent cryocapacitation.
- 80 kDa buffalo epididymal lactotransferrin (1.5 µM) strongly inhibits sperm motility and capacitation in vitro; bovine milk lactoferrin (100 µg/mL) also suppresses motility, yet both improve progressive motility and membrane integrity during liquid semen storage.
- Donkey milk identified as a rich source of DPP-IV inhibitory peptides; in silico casein digestion yielded a potent, non-toxic tripeptide inhibitor.
- Camel milk protein hydrolysates, particularly D-WP-PTC <3 kDa, showed strong therapeutic potential for diabetes management by enhancing insulin secretion, antioxidant defense, and reproductive health in diabetic rats.

- बकरी के दूध के प्रोटीन का प्रभाव: चूहों पर किए गए अध्ययन में बकरी के कैसीन प्रोटीन और उसके हाइड्रोलाइजेट ने 'पैनक्रियाटिक लाइपेज' (वसा को पचाने वाला एंजाइम) को काफी हद तक नियंत्रित किया, जिससे मल के माध्यम से ट्राइग्लिसराइड के उत्सर्जन में वृद्धि हुई।
- प्रोबायोटिक लैक्टोबैसिली: प्रोबायोटिक बैक्टीरिया से प्राप्त 'एक्सोपॉलीसेकेराइड्स' और 'सतह प्रोटीन' ने ऑक्सीडेटिव तनाव के दौरान हानिकारक ROS को कम किया और एंटीऑक्सीडेंट एंजाइम की गतिविधि को बढ़ाया। इसने ऑक्सीडेटिव तनाव में आंतों की कोशिकाओं को जीवित रहने में मदद की और चूहों को इथेनॉल से होने वाले नुकसान से बचाया।
- तुलनात्मक पाचन अध्ययन: सिमुलेटेड पाचन परीक्षणों से पता चला कि गाय, बकरी और गधी के 'कैसीन' में कोई खास अंतर नहीं था, लेकिन गधी के दूध का 'व्हे' एंजाइम अवरोधन में काफी बेहतर पाया गया। साथ ही, गधी का कैसीन और व्हे 'पैनक्रियाटिक लाइपेज' को रोकने में सबसे प्रभावी रहे।
- गोबर आधारित कंपोजिट पेलेट्स: ईंधन के रूप में उपयोग के लिए गोबर आधारित दो मिश्रणों को अनुकूलित किया गया है: गोबर: नारियल के छिलके का पाउडर: करंज की खल। गोबर: लकड़ी का बुरादा: बेंटोनाइट मिट्टी।
- भैंसों में प्रजनन सुधार: 'लेट्रोज़ोल' आधारित प्रोटोकॉल ने भैंसों में प्रमुख कूप के विकास और प्री-ओवुलेटरी फॉलिकल के आकार को बढ़ाया, जिससे उनके गर्भधारण की दर में सुधार हुआ।
- इंट्रावाइजनल स्पंज एप्लिकेटर: स्वदेशी मवेशियों, संकर नस्ल की गायों और भैंसों के लिए एक उपयोगकर्ता के अनुकूल इंट्रावाइजनल स्पंज एप्लिकेटर और डिलीवरी सिस्टम सफलतापूर्वक विकसित किया गया है। यह तकनीक क्षेत्र में उपयोग करने में आसान है और पशुओं के प्रजनन प्रबंधन में सहायक होगी।
- प्रोजेस्टेरोन नैनोफाइबर स्पंज: देओनी और HF क्रॉसवेड गायों एवं बछियों में 'ज़ीन नैनोफाइबर' से निर्मित प्रोजेस्टेरोन युक्त इंट्रावाइजनल स्पंज के उपयोग से मद चक्र के लक्षणों (जैसे माउंटिंग, चिन रेस्टिंग, सूँघना आदि) में बेहतर सुधार देखा गया।
- लंगड़ापन और चाल का अध्ययन: क्रॉसड्रेड मवेशियों की चाल और खुरों की विशेषताओं पर उम्र, अंगों की बनावट और लंगड़ापन का महत्वपूर्ण प्रभाव पाया गया।
- Zn-करक्यूमिन नैनोकंजुगेट: 'सबक्लीनिकल मैस्टाइटिस' (थनैला) से प्रभावित गायों को Zn-करक्यूमिन नैनोकंजुगेट देने से कैलिफोर्निया मैस्टाइटिस टेस्ट स्कोर, सोमैटिक सेल काउंट (SCC) और बैक्टीरिया की संख्या में उल्लेखनीय कमी आई, जबकि दूध में SNF की मात्रा बढ़ गई।
- एंटीबायोटिक प्रभाव में वृद्धि: 'एमोक्सिसिलिन' और 'N-एसिटाइलसिस्टीन' के सहक्रियात्मक प्रभाव पर शोध से पता चला कि NAC के साथ उपयोग करने पर एमोक्सिसिलिन की

- Goat casein protein (600 mg/kg bw) and its hydrolysate (360 mg/kg bw) significantly inhibited pancreatic lipase in mice, increasing faecal triglyceride excretion.
- Exopolysaccharides and surface proteins from probiotic Lactobacilli reduced ROS, enhanced antioxidant enzyme activity, improved intestinal epithelial cell survival under oxidative stress, and protected mice from ethanol-induced oxidative damage.
- Simulated digestion showed no difference among cow, goat, and donkey casein in α-glucosidase and DPP-IV inhibition; however, donkey whey showed significantly better inhibition of both enzymes, and donkey casein/whey most efficiently inhibited pancreatic lipase.
- Two cow dung based composite pellet blends were optimized: 1) cow dung : coconut shell powder : pongamia oil cake; 2) cow dung : sawdust : bentonite clay.
- Letrozole based protocol enhanced dominant follicle growth, increased pre ovulatory follicle size and improved conception in parous buffaloes.
- Successfully designed and developed a user-friendly intravaginal sponge applicator and delivery system tailored for indigenous cattle, crossbred cattle, and buffaloes, ensuring broader applicability and improved field usability.
- Use of Progesterone incorporated in Zein nanofibers intravaginal sponges in Deoni/HF crossbred heifers and cows resulted in better estrus induction efficiency (mounting, chin resting, sniffing, nudging) in both Deoni/HF crossbred heifers and cows.
- Age, limb, and lameness showed significant influence on gait kinematics and claw traits of crossbred cattle.
- Oral supplementation of Zn-curcumin nanoconjugate in Subclinical Mastitis affected cows resulted in significant reduction of California Mastitis Test (CMT) score, milk

मात्रा को 50% तक कम किया जा सकता है, बिना उसकी मारक क्षमता को प्रभावित किए।

- बकरे के वीर्य का संरक्षण: ब्लैक बंगाल बकरे के वीर्य को कम शुक्राणु सांद्रता (25×10^6) पर जमाने (Cryopreservation) से 'पोस्ट-थॉ रिकवरी' में सुधार हुआ, जबकि फील्ड स्तर पर गर्भाधान के लिए उच्च खुराक (100×10^6) अधिक प्रभावी पाई गई।
- क्षमता निर्माण और डेटा विश्लेषण: पश्चिम बंगाल के तीन कृषि-जलवायु क्षेत्रों में क्षमता निर्माण की आवश्यकताओं को प्राथमिकता देने के लिए DEMATEL-MCDM और एन्ट्रॉपी वेटेड TOPSIS जैसी आधुनिक डेटा-संचालित पद्धतियों का उपयोग किया गया। इससे सटीक निर्णय लेने में मदद मिली।
- बकरी के प्लेसेंटा (गर्भनाल) पर शोध: बकरी के प्लेसेंटा का कुल कोटिलेडनरी सतही क्षेत्रफल (TCSA), मेमने के जन्म के समय वजन और उसके विकास का पूर्वानुमान लगाने के लिए कोटिलेडन की संख्या या आकार की तुलना में अधिक सटीक पाया गया। शोध में देखा गया कि TCSA >11,000 वर्ग मिमी होने पर जन्म के समय वजन में 12.39%, विकास दर में 5.77% और शरीर के वजन में 8.87% की वृद्धि हुई।
- वीर्य थॉइंग (Thawing) उपकरण: गोवंश के वीर्य की स्ट्रॉ (Straw) को पिघलाने या सामान्य तापमान पर लाने के लिए एक 'आइसोथर्मल बोवाइन सीमेन स्ट्रॉ थॉइंग डिवाइस' सफलतापूर्वक विकसित किया गया है। यह उपकरण कृत्रिम गर्भाधान की प्रक्रिया में तापमान की स्थिरता बनाए रखने में सहायक होगा।

डेरी प्रसंस्करण

- आंतों के स्वास्थ्य पर MFGM का प्रभाव: साहिवाल गाय, जमुनापारी बकरी और मानव दूध से प्राप्त 'मिल्क फैट ग्लोब्यूल मेम्ब्रेन' (MFGM) सामग्री का मूल्यांकन किया गया। परीक्षणों में पाया गया कि MFGM और इससे उपचारित प्रोबायोटिक (LGG) ने आंतों में हानिकारक बैक्टीरिया (साल्मोनेला और ई. कोलाई) के जमाव को कम किया और अच्छे बैक्टीरिया के चिपकने की क्षमता को बढ़ाया।
- इन विट्रो में, प्रत्यक्ष एमएफजीएम और एमएफजीएम-उपचारित *Lacticaseibacillus rhamnosus GG* (LGG) दोनों ने साल्मोनेला और ई. कोलाई के उपनिवेशण को कम करते हुए प्रोबायोटिक आसंजन को बढ़ाया।
- प्रोबायोटिक कार्यक्षमता में सुधार: MFGM से उपचारित *Lacticaseibacillus rhamnosus* GG (LGG) ने बेहतर अम्लता और पित्त सहनशीलता प्रदर्शित की, जो इसकी कार्यक्षमता को बढ़ाता है।
- यूरोलिथिन ए (Urolithin A) का उत्पादन: 'यूरोलिथिन ए' (UroA) सकारात्मक मल के नमूनों से बैक्टीरिया के आइसोलेट्स की जांच की गई और HPLC एवं GC-MS के माध्यम से 14 आइसोलेट्स के UroA उत्पादक होने की पुष्टि हुई।

Somatic Cell Count (SCC), *Staphylococcus spp*. colony count (CFU/ml) and increased SNF content in milk compared to non-supplemented cows.

- Studies on synergistic effect of amoxicillin and N-acetylcysteine against mastitis-associated bacteria showed that an effective concentration of amoxicillin can be reduced by 50% when used in combination with NAC, without compromising antibacterial efficacy *in vitro.*
- Cryopreservation of Black Bengal buck semen at low sperm concentration (25×10^6/dose) improved post-thaw recovery, while higher sperm dose (100×10^6) resulted in better conception rates under field cervical insemination.
- DEMATEL MCDM + entropy weighted TOPSIS enabled data driven prioritization of capacity building needs across three agro climatic zones of West Bengal.
- Integration of DEMATEL-based MCDM with entropy-weighted TOPSIS enabled data-driven prioritization of capacity-building needs across three agro-climatic zones of West Bengal.
- Total cotyledonary surface area (TCSA) of the goat placenta was a better predictor of kid birth weight and growth than cotyledon number or size; TCSA >11,000 sq mm increased birth weight, growth rate, and body weight by 12.39%, 5.77%, and 8.87%, respectively.
- Developed isothermal bovine semen straw thawing device.

Dairy Processing

- Milk fat globule membrane (MFGM) material from Sahiwal cow, Jamunapari goat, and human milk was evaluated using *in vitro* and DSS-induced murine colitis models for gut health modulation.
- *In vitro*, both direct MFGM and MFGM-treated *Lacticaseibacillus rhamnosus* GG (LGG) enhanced probiotic adhesion while reducing *Salmonella* and *E. coli* colonization.

- बैक्टीरिया की पहचान: 16S rRNA सीक्वेंसिंग के जरिए UroA उत्पादक बैक्टीरिया की पहचान *Enterococcus faecalis, Enterococcus lactis* और *Proteus mirabilis* के रूप में की गई, जबकि अन्य *Lactobacillus* प्रजातियां पाई गईं।
- विटामिन B12 युक्त पेय: *Limosilactobacillus reuteri* NCDC 958 के लिए बायोप्रोसेसिंग स्थितियों को अनुकूलित किया गया, ताकि एक 'बायोफोर्टिफाइड व्हे ड्रिंक' (Biofortified whey drink) विकसित की जा सके। इसमें विटामिन B12 की मात्रा अधिक है और प्रोबायोटिक्स की जीवित रहने की दर बेहतर है।
- दही से बैक्टीरिया का संरक्षण: दही से प्राप्त 27 लैक्टिक एसिड बैक्टीरिया (LAB) आइसोलेट्स की पहचान *Lactobacillus, Lactococcus, Streptococcus* और *Leuconostoc* प्रजातियों के रूप में की गई। इन्हें 'नेशनल सेंटर फॉर वेटरनरी टाइप कल्चर्स' (NCVTC) में जमा किया गया है।
- दही और दूध से LAB का संरक्षण: दूध और दही से 69 लैक्टिक एसिड बैक्टीरिया (LAB) आइसोलेट्स प्राप्त किए गए, जिनमें *S. thermophilus* और *L. delbrueckii* की 46 विभिन्न प्रजातियां शामिल हैं। ये प्रजातियां तेजी से दूध को जमाने (Acidification), कम पानी छोड़ने (Low syneresis) और बेहतरीन बनावट (Texture) देने में सक्षम हैं।
- स्प्रे ड्राइंग तकनीक: *Lactiplantibacillus plantarum* DVS स्टार्टर्स के लिए 'स्प्रे ड्राइंग' प्रक्रिया को अनुकूलित किया गया, जिससे 91.25% बैक्टीरिया जीवित रहे। यह तकनीक तेजी से दही जमाने और 12 महीनों से अधिक के भंडारण स्थायित्व (Storage stability) को सुनिश्चित करती है।
- कोलाइटिस का उपचार: *Lacticaseibacillus rhamnosus* CRD9 और CRD11 के इन-विट्रो और इन-विवो अध्ययनों ने 'कोलाइटिस' (आंतों की सूजन) के खिलाफ इनकी सुरक्षा और चिकित्सीय प्रभावकारिता की पुष्टि की है।
- साहिवाल गोबर का मेटाजेनोमिक विश्लेषण: साहिवाल गाय के गोबर के विश्लेषण से ऐसे सूक्ष्मजीवों के संकेतों (Microbial signatures) का पता चला है जो सीधे दूध उत्पादन से जुड़े हैं। इनमें *Prevotella, Fibrobacter, Ruminococcus* और Lactobacillus की प्रचुरता पाई गई।
- बैक्टीरियोफेज और रोगाणुरोधी प्रतिरोध (AMR): डेयरी क्षेत्र के बहु-दवा प्रतिरोधी (MDR) और बायोफिल्म बनाने वाले रोगजनकों के खिलाफ 12 'लाइटिक बैक्टीरियोफेज' और धातु आयनों की सहक्रियात्मक क्रिया देखी गई। MRSA-विशिष्ट बैक्टीरियोफेज ने स्टेनलेस स्टील की सतहों पर बने बैक्टीरिया के बायोफिल्म को प्रभावी ढंग से कम किया।
- MRSA-विशिष्ट बैक्टीरियोफेज ने स्टेनलेस स्टील की सतहों पर प्लैंकटोनिक कोशिकाओं और बायोफिल्म को प्रभावी ढंग से कम कर दिया।

- MFGM-treated *Lacticaseibacillus rhamnosus* GG (LGG) showed improved probiotic functionality, including enhanced acid and bile tolerance, hydrophobicity, and auto- and coaggregation properties.
- Bacterial isolates from Urolithin A (UroA)–positive faecal samples were screened and 14 isolates confirmed as UroA producers via HPLC and GC-MS.
- 16S rRNA sequencing identified UroA producers as *Enterococcus faecalis*, *Enterococcus lactis* and *Proteus mirabilis*, while others were Lactobacillus species.
- Bioprocessing conditions for *Limosilactobacillus reuteri* NCDC 958 were optimized to enhance vitamin B12 production for a biofortified whey drink with improved probiotic survival and nutritional quality.
- 27 LAB isolates from dahi were identified as *Lactobacillus, Lactococcus, Streptococcus, and Leuconostoc* species and deposited at National Centre for Veterinary Type Cultures (NCVTC) with accession VTCC DM0000846B–895.
- 69 LAB from milk/curd included 46 different *S. thermophilus* and *L. delbrueckii subsp. bulgaricus* strains giving rapid acidification, low syneresis, good texture, and >8 log CFU/g.
- RSM optimized spray drying of *Lactiplantibacillus plantarum* DVS starters with 91.25% survivability, fast curd formation and >12-month storage stability.
- *In vitro* and *in vivo* studies confirmed safety and therapeutic efficacy of *Lacticaseibacillus rhamnosus* CRD9 and CRD11 against DSS-induced colitis.
- Metagenomic analysis of Sahiwal dung revealed microbial signatures linked with milk yield, enriched with *Prevotella, Fibrobacter, Ruminococcus* and *Lactobacillus*.
- Twelve lytic bacteriophages and metal ions were isolated showing synergistic action against MDR and biofilm-forming dairy pathogens.

- रैपिड पेपर स्ट्रिप सेंसर्स: 'ESBL E. coli', 'MRSA' और 'VRE' जैसे खतरनाक बैक्टीरिया का पता लगाने के लिए तेजी से काम करने वाले पेपर स्ट्रिप सेंसर्स विकसित किए गए हैं। ये सेंसर रोगाणुरोधी प्रतिरोध (AMR) की तुरंत पहचान करने और उपचार में मदद करते हैं।
- ऐ अम आर (AMR) निगरानी डेटा: MDR *E. coli* और MRSA पर आधारित निगरानी डेटा तैयार किया गया है, जो एंटीबायोटिक दवाओं के विवेकपूर्ण उपयोग (Antimicrobial stewardship) के लिए मार्गदर्शन प्रदान करेगा।
- जीनोम विश्लेषण: डेयरी क्षेत्र से प्राप्त *E. coli* के 172 नमूनों के संपूर्ण जीनोम विश्लेषण के माध्यम से एंटीबायोटिक प्रतिरोधी जीन (ARGs), विषाणु जीन और प्लास्मिड की पहचान की गई, जो संक्रमण फैलाने में सहायक होते हैं।
- एंटीबायोटिक अवशेषों की जांच: दूध के 225 नमूनों के LC-MS/HPLC विश्लेषण से पुष्टि हुई कि इनमें एंटीबायोटिक अवशेष FSSAI द्वारा निर्धारित सुरक्षित सीमाओं के भीतर हैं।
- AFM1 का आकलन: विभिन्न डेयरी उत्पादों में 'एफ़्लाटॉक्सिन M1' (AFM1) के आकलन के लिए एक HPLC-FLD विधि को वैध बनाया गया। परीक्षणों ने दही और पनीर में AFM1 की तापीय स्थिरता को प्रदर्शित किया, जो कच्चे दूध की गुणवत्ता नियंत्रण के महत्व को रेखांकित करता है।
- रैपिड पेपर स्ट्रिप सेंसर: दूध की सूक्ष्मजैविक गुणवत्ता का पता लगाने के लिए एक तेज़ और किफायती कलरीमेट्रिक पेपर स्ट्रिप सेंसर विकसित किया गया है। यह 20 मिनट के भीतर 93% से अधिक संवेदनशीलता और ISO-मान्यता प्राप्त सटीकता के साथ परिणाम देता है।
- डेयरी सतह स्वच्छता: डेयरी संयंत्रों की सतहों को संक्रमण मुक्त करने के लिए चांदी और सोने के नैनोकणों और धातु आयनों ने बहु-दवा प्रतिरोधी (MDR) बैक्टीरिया के खिलाफ मजबूत 'एंटीबायोफिल्म' गतिविधि दिखाई।
- एंटीफंगल पेप्टाइड्स: लैक्टोबैसिलस का उपयोग करके गाय के कोलोस्ट्रम व्हे (खीस का पानी) के किण्वन से एंटीफंगल पेप्टाइड्स (NTSV1 और NTSV2) तैयार किए गए।
- नैनोकण-पेप्टाइड संयोजन (ZnONPCs): जिंक ऑक्साइड (ZnO) नैनोकण-पेप्टाइड संयोजन ने थनैला (Mastitis) के रोगजनकों के खिलाफ प्रभावी रोगाणुरोधी गतिविधि दिखाई। फील्ड परीक्षणों में यह पाया गया कि ZnONPCs के उपयोग से दुग्ध शाला के फर्श पर मात्र 5 मिनट के भीतर बैक्टीरिया में 6-लॉग (6-log) की भारी कमी आई।
- RL-4 जीनोम: *Lacticaseibacillus rhamnosus* RL-4 के ड्राफ्ट जीनोम से इसके प्रोटीयोलाइटिक और ग्लाइकोसाइड हाइड्रोलेज सिस्टम का पता चला, जो बायोएक्टिव पेप्टाइड उत्पादन में सहायक हैं।

- MRSA-specific bacteriophages effectively reduced planktonic cells and biofilms on stainless steel surfaces.
- Rapid paper strip sensors were developed for detecting ESBL E. coli, MRSA and VRE, enabling quick AMR detection and antimicrobial intervention.
- Generated AMR surveillance data on MDR *E. coli*, MRSA and resistance genes to guide antimicrobial stewardship.
- Whole genome analysis of 172 dairy *E. coli* isolates identified ARGs, virulence genes, plasmids and resistance vectors involved in ESBL spread.
- LC-MS/HPLC analysis of 225 milk samples confirmed antibiotic residues within FSSAI-specified limits.
- A HPLC-FLD method for AFM1 estimation across different matrices validated and also demonstrated the thermal stability of AFM1 in curd and paneer, emphasizing the importance of raw milk quality control.
- Developed a rapid colorimetric paper strip sensor for milk microbial quality detection within 20 minutes (>93% sensitivity).
- Metal ions and nanoparticles (silver and gold) showed strong antibiofilm activity against MDR bacteria for dairy surface sanitation.
- Antifungal peptides (NTSV1 and NTSV2) were produced from cow colostrum whey fermentation using Lactobacillus.
- ZnO nanoparticle–peptide conjugates (ZnONPCs) showed strong antimicrobial activity against mastitis pathogens with reduced haemolysis. Field trials showed 6-log bacterial reduction within 5 minutes on milking floors using ZnONPCs.
- Draft genome of *Lacticaseibacillus rhamnosus* RL-4 revealed proteolytic and glycoside hydrolase systems supporting bioactive peptide production.

- कोलोस्ट्रम (खीस) के लाभ: कोलोस्ट्रम व्हे प्रोटीन (>50 kDa) और पेप्टाइड (<10 kDa) के संयोजन ने मजबूत रोगाणुरोधी और रोग-प्रतिरोधक क्षमता बढ़ाने वाली गतिविधि प्रदर्शित की।
- दस्त रोग का उपचार: अनुकूलित 'व्हे प्रोटीन-पेप्टाइड' फॉर्मूलेशन ने चूहों में शिगेला (Shigella) के कारण होने वाले दस्त को कम किया और आंतों के ऊतकों को पुनः स्वस्थ करने में मदद की।
- PROPEP फॉर्मूलेशन: 'PROPEP' फॉर्मूलेशन ने *E. coli* जनित दस्त के मॉडल में रोगाणुरोधी और जैव-अनुकूल प्रभाव दिखाए, जिससे आंतों की संरचना को फिर से ठीक करने में सफलता मिली।
- दूध-आधारित करक्यूमिनोइड सिस्टम: पीएच-संचालित नैनोकॉम्प्लेक्स और स्प्रे-ड्राइड माइक्रोएनकैप्सुलेशन का उपयोग करके 700-1500 मिलीग्राम/100 ग्राम के स्तर वाला दूध-आधारित करक्यूमिनोइड (हल्दी का अर्क) वितरण तंत्र विकसित किया गया।
- कार्यात्मक डेयरी उत्पाद: दूध प्रोटीन मैट्रिक्स में एनकैप्सुलेटेड करक्यूमिन युक्त फंक्शनल आइसक्रीम विकसित की गई। एनकैप्सुलेटेड करक्यूमिन के साथ पनीर भी विकसित किया गया, जिसकी शेल्फ-लाइफ (भंडारण क्षमता) अधिक है।
- दूध में मिलावट की जांच: दूध में बोरिक एसिड, स्टार्च, नाइट्राइट और नाइट्रेट का पता लगाने के लिए पेपर-आधारित परीक्षण (Assay) विकसित किया गया।
- मोज़ेरेला चीज़ में सुधार: उच्च नमी वाले मोज़ेरेला चीज़ की सतह पर होने वाले 'स्लाइमी' (चिपचिपे) दोष को रोकने की तकनीक विकसित की गई।
- सौर ऊर्जा आधारित किण्वन: सौर जल तापक (Solar water heater) आधारित इनडोर किण्वन प्रणाली विकसित की गई, जिसने दही/योगर्ट उत्पादन में ऊर्जा की खपत को लगभग 25% कम कर दिया।
- सिमुलेशन अध्ययन: बेहतर हीट ट्रांसफर सिस्टम के लिए नोजल की संख्या, पंप प्रवाह दर और जेट वेग को सिमुलेशन अध्ययनों के माध्यम से अनुकूलित किया गया।
- मशीनीकरण: 90 किग्रा/घंटा की क्षमता वाली एक यंत्रीकृत 'पिन्नी मोल्डिंग यूनिट' विकसित की गई।
- मैग्नेटिक इंडक्शन हीटिंग: पनीर उत्पादन के लिए 5 लीटर की मैग्नेटिक इंडक्शन यूनिट विकसित की गई, जिसने एलपीजी (LPG) की तुलना में लगभग 25% ऊर्जा की बचत की।
- दूध कूलिंग यूनिट में सुधार: चेस्ट-फ्रीज़र मिल्क कूलिंग यूनिट की तापीय कार्यक्षमता को बेहतर बनाने के लिए उसमें एक स्वचालित HTF (हीट ट्रांसफर फ्लूइड) रिसर्कुलेशन सिस्टम को एकीकृत किया गया है।
- फॉक्सटेल मिलेट पायसम मिक्स: ड्राई-क्रिस्टलाइज्ड 'फॉक्सटेल मिलेट' (कंगनी) पायसम मिक्स को तीन प्रकारों में मानकीकृत

- Colostrum whey protein (>50 kDa) and peptide (<10 kDa) combinations showed strong antimicrobial and immunomodulatory activity.
- Optimized whey protein–peptide formulation reduced Shigella-induced diarrhea and restored colon histopathology in rats.
- PROPEP formulation demonstrated antimicrobial, immunomodulatory and biocompatible effects with restoration of intestinal structure in *E. coli* diarrhea models.
- Developed milk-based curcuminoid delivery system with curcuminoid levels of 700–1500 mg/100 g using pH-driven nanocomplex and spray-dried microencapsulation.
- Developed functional ice cream containing curcumin encapsulated in milk protein matrix. Also developed extended shelf-life paneer with encapsulated curcumin.
- Developed paper-based assay for detection of boric acid, starch, nitrites and nitrates in milk.
- Developed technology to prevent slimy surface defect in high-moisture Mozzarella cheese.
- Solar water heater–based indoor fermentation system developed ich reduced energy consumption in dahi/yoghurt production by ~25%.
- Simulation studies optimized nozzle number, pump flow rate and jet velocity for improved heat transfer systems.
- A mechanized pinni moulding unit was developed with a capacity of 90 kg/h.
- Developed magnetic induction milk heating unit (5 L) for paneer production saving ~25% energy over LPG.
- An automated HTF recirculation system was integrated into a chest-freezer milk cooling unit to improve thermal performance.
- Dry-crystallised foxtail millet payasam mix was standardised in three variants: refined sugar, partial jaggery replacement, and coconut sugar replacement.

किया गया है: परिष्कृत चीनी, आंशिक गुड़ प्रतिस्थापन, और कोकोनट शुगर (नारियल की चीनी) प्रतिस्थापन के साथ।

- घी के अवशेषों से पोषक तत्व: औद्योगिक घी के अवशेषों से वैक्यूम सुखाने की विधि द्वारा एक फॉस्फोलिपिड-समृद्ध पाउडर (7.47%) विकसित किया गया है, जिसका उपयोग एक कार्यात्मक घटक (Functional Ingredient) के रूप में किया जा सकता है।
- कार्बन क्वांटम डॉट्स: 'कार्बन क्वांटम डॉट्स' ने *S. aureus* और *E. coli* जैसे बैक्टीरिया के खिलाफ एंटीबैक्टीरियल, एंटीबायोफिल्म, एंटीऑक्सीडेंट और सूजन-रोधी गतिविधि प्रदर्शित की है। इसकी जैव-अनुकूलता की भी पुष्टि हो चुकी है।
- विटामिन B12 समृद्ध पाउडर: दूध और मिलेट (बाजरा/कंगनी) के किण्वन से एक पाउडर विकसित किया गया है जिसमें 71 µg B12/100g की उच्च मात्रा मौजूद है।
- देओनी मवेशियों का महत्व: चॉइस प्रयोगों (Choice Experiments) के माध्यम से देओनी मवेशियों के प्रमुख गैर-बाज़ार गुणों की पहचान की गई। इनमें देओनी दूध उत्पादों के स्वाद और स्वास्थ्य लाभों के प्रति प्राथमिकता, सांस्कृतिक/धार्मिक महत्व और मृदा स्वास्थ्य (Soil Health) में उनके योगदान का मूल्य शामिल है।

बौद्धिक संपदा अधिकार

- भाकृअनुप- राष्ट्रीय डेरी अनुसंधान संस्थान द्वारा 14 नए पेटेंट आवेदन दाखिल किए गए एवं 7 कॉपीराइट दाखिल किए गए।
- आईसीएआर-एनडीआरआई द्वारा 8 कॉपीराइट पंजीकृत किए गए।
- 10 प्रौद्योगिकियों को 2 लाइसेंस समझौतों के माध्यम से 2 व्यावसायिक प्रतिष्ठानों को व्यावसायीकरण के लिए उपलब्ध कराया गया।
- आईसीएआर-एनडीआरआई द्वारा 11 नई प्रौद्योगिकियां विकसित की गईं जो व्यावसायीकरण के लिए तैयार हैं।

शिक्षा

- भाकृअनुप- राष्ट्रीय डेरी अनुसंधान संस्थान को 'डेयरी प्रोसेसिंग' और 'एनिमल जेनेटिक्स एंड ब्रीडिंग' में **उन्नत संकाय प्रशिक्षण केंद्र (CAFT)** के रूप में मान्यता दी गई है। वर्ष 2025-26 के दौरान, संकाय ने दो CAFT सत्र, ICAR द्वारा प्रायोजित चार विंटर स्कूल और "पशुधन में जीनोम एडिटिंग पर राष्ट्रीय कार्यक्रम (NPGET)" द्वारा प्रायोजित एक राष्ट्रीय प्रशिक्षण कार्यक्रम का आयोजन किया।
- संस्थान और इसके क्षेत्रीय केंद्रों द्वारा **43 सेमिनार, कार्यशालाएं और संगोष्ठियां** आयोजित की गईं। छह संकाय सदस्यों को अंतर्राष्ट्रीय दौरों पर भेजा गया, और 110 कर्मचारियों ने भारत के भीतर विभिन्न आवश्यकता-आधारित प्रशिक्षण कार्यक्रमों में भाग लिया।

- A phospholipid-rich powder (7.47%) was developed from industrial ghee residue via vacuum drying as a functional ingredient.
- Carbon Quantum Dots demonstrated antibacterial, antibiofilm, antioxidant, and anti-inflammatory activity against *S. aureus* and *E. coli*, with confirmed biocompatibility.
- B_{12}-rich milk-millet fermented powder with 71 µg B_{12}/100g was developed.
- Key non-market attributes of Deoni cattle identified through choice experiments included preference for taste and perceived health benefits of Deoni milk products, cultural/religious significance, and soil health value.

Intellectual Property Rights

- 14 new patent applications were filed by ICAR-NDRI.
- 08 copyright applications were registered and 07 application were filed by ICAR-NDRI.
- 10 technologies were commercialized to 02 Commercial houses through 02 License agreement
- 11 new technologies were developed by ICAR-NDRI which are ready for commercialization.

Education

- ICAR-NDRI has been recognized as a Centre of Advanced Faculty Training (CAFT) in Dairy Processing and Animal Genetics & Breeding. During 2025-26, the faculty organized two CAFT sessions, four Winter Schools sponsored by ICAR, and one National training programme sponsored by the "National Program on Genome Editing in Livestock (NPGET)."
- The Institute and its Regional Stations organized 43 seminars, workshops, and symposia. Six faculty members were deputed for international visits, and 110 staff members participated in various need-based training programmes within India.

1

INTRODUCTION



ICAR-National Dairy Research Institute (NDRI) at Karnal, Haryana is one of the premier Institutes in dairy sector. The Institute has contributed tremendously to the growth of the Indian dairy industry and played a crucial role in India's emergence as leading milk producing country in the world with its research and frontier areas of dairy science. Over 100-year-old, NDRI's lineage goes back to the Imperial Institute for Animal Husbandry & Dairying, which was set up in Bangalore in 1923 as a Centre for dairy education. It was shifted to its present site at Karnal in 1955 and renamed as National Dairy Research Institute. The infrastructure of Imperial institute was retained as Southern Regional Station of NDRI and later in 1964, Eastern Regional Station was set up at Kalyani in West Bengal. NDRI was brought under the aegis of Indian Council of Agricultural Research (ICAR) in the year 1970. The Institute has the distinction of being a Deemed to be University for implementing its academic programmes since, 1989. NDRI secured 1st Rank among all Agricultural Universities in India consecutively for five years in the ranking of these Universities by ICAR from 2016-2021. The Institute has been accredited by National Agricultural Education Accreditation Board, ICAR up to 2026. In the year 2024, ICAR-NDRI has secured the 2nd rank in the National Institutional Ranking Framework (NIRF)-2024 in Agriculture and Allied Category of the Union Ministry of Higher Education, Govt. of India. The Institute is also ISO 9001:2015 certified. This unique campus has residential buildings, various well equipped research laboratories as well as green spaces with perennial plants and gardens. Well-equipped sports facilities and attractive leisure time opportunities are offered to the students and employees of the Institute.

Southern Station, Bengaluru

The foundation stone of the edifice of NDRI was laid at Bengaluru on July 1, 1923. It was the forerunner institution in starting dairy education programmes to meet the manpower requirements of the Nation's dairy industry. After shifting of the Institute Head Quarters to Karnal in 1955, the establishment at Bengaluru continued as the Southern Regional Station of NDRI. This Centre was the first to initiate training in artificial insemination in cattle in the country and has the honour of imparting training to Mahatma Gandhi and Pandit Madan Mohan Malviya. The station has been catering to the research, training and extension needs of the dairy farmers and dairy industry of the southern region of the Nation.

Eastern Station, Kalyani

The Eastern Regional Station of the Institute was established at the Central Dairy in Kolkata in 1964 and was shifted in 1966 to Kalyani (Nadia district), about 50 km north of Kolkata. The main objective of establishing the Eastern Regional Station was to identify the major constraints of dairy production in eastern and northeastern India and to offer solutions through research and extension activities to these problems.

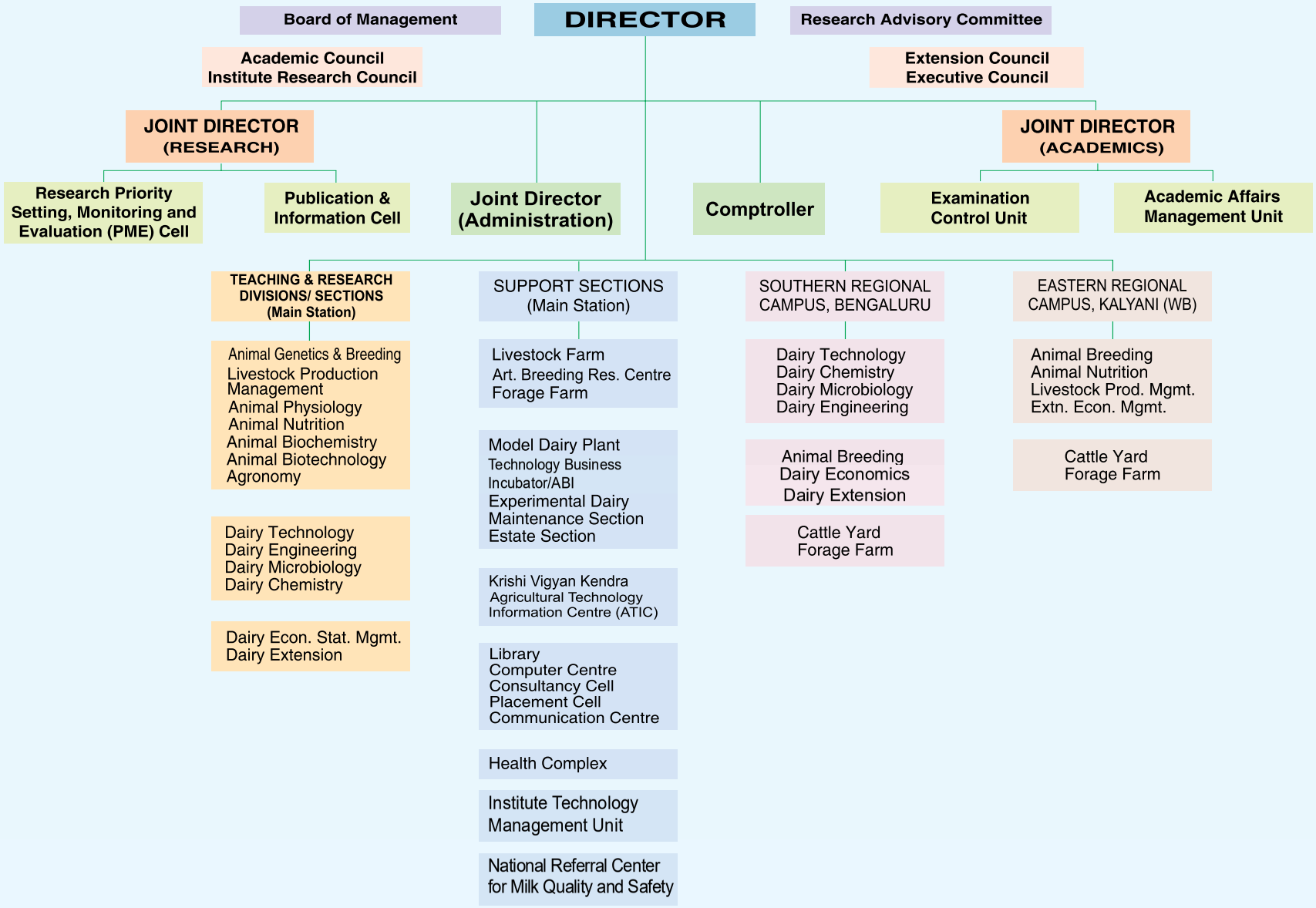
Krishi and Dairy Vikas Kendra, Piprakothi-Motihari

ICAR-NDRI established Krishi and Dairy Vikas Kendra (KDVK) at KVK, Piprakothi, East Champaran (Bihar) in the premises of Dr. Rajendra Prasad Central Agricultural University, Pusa. The Centre was inaugurated by Hon'ble Union Agriculture and Farmers Welfare Minister, Shri Radha Mohan Singh on July 10, 2016.

Kisan Seva Kendra at Lalukheri-Muzaffarnagar and Pusar-Bagpat

These Centres were established at Lalukheri-Muzaffarnagar (become functional in 2015) and Pusar-Bagpat (become functional in 2025), Uttar Pradesh under the project approved by ICAR, New Delhi vide letter No. 2-2/02-ASR-II dated 25.09.2002. These centres cater the requirement of farmers of surrounding villages by providing germplasm of elite bulls of cows and buffaloes, mineral mixtures, fodder crop seeds and create awareness among the farmers for scientific dairy farming.

Organizational Structure of ICAR-NDRI



2

ORGANIZATIONAL SETUP

The organizational structure of ICAR-NDRI follows the Deemed University pattern of the ICAR. The policy-making functions of research, education and extension activities are managed through Five main bodies.

- **Board of Management**
- **Research Advisory Committee**
- **Academic Council**
- **Institute Research Council**
- **Extension Council**

The highest policy-making body is the Board of Management (BOM). The Director, ICAR-NDRI, is the Chairman of this Board. The Research Advisory Committee (RAC) is responsible for the all-round progress in research at the Institute and its application. The Academic Council is responsible for all issues relating to education and training. The Academic Council, in turn, is supported by (i) Standing Committees, (ii) the Post Graduate Faculty, and (iii) the Board of Studies in the respective disciplines. The Extension Council is responsible for guiding extension programs. The Institute Research Committee (IRC) is responsible for prioritization, monitoring and evaluation of research conducted in the Institute. The research, education and extension activities of the Institute are managed by the Director and the Joint Directors through scientific, technical, administrative and supporting staff. The Director is the overall Administrative Head of the Institute and its Regional Stations. The Joint Directors in addition to extending support to the Director in the area of research, academics and administration are responsible to co-ordinate research and educational activities of various Divisions and Regional Stations, respectively. Each of the Regional Stations is administered through the Head located at the station. The scientific and teaching work at the main campus and its regional campuses is conducted in 1 subject-matter disciplines.

Chairman	Dr. Dheer Singh, Director, ICAR-NDRI, Karnal
Members	
Dr. Rajan Sharma	Joint Director (Research), ICAR-National Dairy Research Institute (ICAR-NDRI), Karnal, Haryana
Dr. A. K. Singh	Joint Director (Academics), ICAR-National Dairy Research Institute (ICAR-NDRI), Karnal, Haryana
Dr. Triveni Dutt	Director, ICAR-Indian Veterinary Research Institute (ICAR-IVRI), Izatnagar, Uttar Pradesh
Dr. Anupam Mishra	Vice-Chancellor, Central Agricultural University (CAU), Imphal, Manipur
Dr. Archana Verma	PS, AGB & I/c PME ICAR-National Dairy Research Institute (ICAR-NDRI), Karnal, Haryana.
Dr. Inderjeet Singh	Vice-Chancellor, Guru Angad Dev Veterinary & Animal Sciences University (GADVASU), Ludhiana, Punjab
Dr. Umesh Rai	Vice Chancellor, Jammu University, Jammu
Dr. A. K. Puniya	Principal Scientist, Dairy Microbiology Division, ICAR-National Dairy Research Institute (ICAR-NDRI), Karnal, Haryana
Dr. A. K. Dang	Head, Animal Physiology Division, ICAR-National Dairy Research Institute (ICAR-NDRI), Karnal, Haryana
Dr. P. Barnwal	Head, Dairy Engineering Division, ICAR-National Dairy Research Institute (ICAR-NDRI), Karnal, Haryana.
Dr. Suneel Kumar Onteru	Head, Animal Biochemistry Division, ICAR-National Dairy Research Institute (ICAR-NDRI), Karnal, Haryana.
Dr. Shilpa Vij	Academic Coordinator & Head, Dairy Microbiology Division, ICAR-National Dairy Research Institute (ICAR-NDRI), Karnal, Haryana.
Dr. Gopal Sankhala	Head, Extension Division, ICAR-National Dairy Research Institute (ICAR-NDRI), Karnal, Haryana.
Dr. Manmohan Singh Chauhan	Vice Chancellor, Govind Ballabh Pant University of Agriculture and Technology, Pantnagar, Uttarakhand
Dr. Ashok Kumar	Assistant Director General (Animal Health), Indian Council of Agricultural Research, Krishi Bhavan, New Delhi.
Dr. A.K. Singh	Director, Indian Agricultural Research Institute, Pusa Campus, New Delhi.

Dr. Abhijit Mitra	The Animal Husbandry Commissioner, Govt. of India, Department of Animal Husbandry & Dairying, Krishi Bhawan, New Delhi
Sh. D. D. Verma	Sr. Comptroller, Indian Agricultural Research Institute, Pusa Campus, New Delhi.
Commissioner	Rohtak Division, Rohtak
Sh. Teg Singh Rana	Village & Post Office – Arainpura, H.No. 645, Block-Gharounda, Dist. Karnal
Sh. Sugriv Singh Chauhan	Gram-Manouna, Post-Pinahat, Block-Pinahat, Tehsil-Bah, 152, Parshavnath, Panchvati, Fatehabad Road, Agra
Member Secretary	
Sh. B. D. Phansal	Joint Director (Admn.) & Senior Registrar, ICAR-National Dairy Research Institute (ICAR-NDRI), Karnal, Haryana.

RESEARCH ADVISORY COMMITTEE

Chairman	Dr. Nagendra Sharma, Ex-Vice Chancellor, SKUAST Jammu and Ex Director, NDRI Karnal, Haryana & CIRG Makhdoom, Uttar Pradesh
Members	
Dr. Dheer Singh	Director, ICAR-National Dairy Research Institute (ICAR-NDRI), Karnal, Haryana.
Deputy Director General (Animal Science),	Deputy Director General (Animal Science), Indian Council of Agricultural Research, New Delhi
Dr. C.G. Joshi	Director, Gujarat Biotechnology Research Centre, Gandhinagar, Gujarat
Dr. C. Anandharamakrishnan	Director, CSIR-National Institute for Interdisciplinary Science and Technology (NIIST), Council of Scientific & Industrial Research (CSIR), Thiruvananthapuram, Kerala
Dr. V.K. Saxena	Director (Research), Bihar Animal Sciences University (BASU), Patna, Bihar
Dr. Pratap Singh Birthal	Director, (ICAR - National Institute of Agricultural Economics and Policy Research (ICAR-NIAP), New Delhi
Dr. Kusumakar Sharma	Ex-ADG (HRM), Education Division, Krishi Anusandhan Bhawan-II, New Delhi; H.No. D-5073, ATS Greens Paradise Sector-Chi-IV, Greater Noida
Dr. S.S. Mann	Founder, Mann Ventures Faridabad (Haryana) (Dairy Industry Partner)
Member Secretary	
Dr. Rajan Sharma	Joint Director (Research), ICAR-National Dairy Research Institute (ICAR-NDRI), Karnal, Haryana.

ACADEMIC COUNCIL

Chairman	Dr. Dheer Singh, Director, ICAR-National Dairy Research Institute, Karnal, Haryana
Vice Chairman	**Dr. A. K. Singh,** Joint Director (Academic), ICAR-NDRI, Karnal, Haryana
Members	
Dr. Rajan Sharma, Joint Director (Research), ICAR-NDRI, Karnal Haryana	**Dr. M.S. Chauhan,** Vice-Chancellor ,G.B. Pant University of Agriculture and Technology, Pantnagar-263145 (Uttarakhand)
Dr. N.V. Patil, Vice-Chancellor Maharashtra Animal and Fisheries Sciences University, Futala Lake Road, Nagpur-440001	**Dr. Anupama Singh,** Joint Director (Academic) & Dean ICAR-Indian Agricultural Research Institute, New Delhi
Sh. B. D. Phansal, (Member-Secretary) Joint Director (Admn.) & Senior Registrar, ICAR-NDRI, Karnal	**Dr. Naveen Pratap Singh,** Member (Official), CACP, 382-B, Krishi Bhawan, New Delhi
Dr. N. K. Shivakumar Gouda, Dean Veterinary College, Hebbal Bangalore, Karnataka Veterinary Animal and Fisheries Science University, Bidar (Karnataka)	**Mr. Ajit Patel,** Managing Director, Everest Instruments Pvt. Ltd., Ahmedabad (Gujarat)
Dr. Suneel Onteru, Head, Animal Biochemistry Division	**Dr. Vivek Sharma,** Head, Dairy Chemistry Division
Dr. Deep Narayan Yadav, Head, Dairy Technology Division	**Dr. A. K. Dang,** Head, Animal Physiology Division
Dr. Gopal Sankhla, Head, Dairy Extension Division	**Dr. Subhashis Mandal,** Head, Dairy Economics Statistics & Management Division
Dr. P. Barnwal, Head, Dairy Engineering Division	**Dr. Shilpa Vij,** Head, Dairy Microbiology Division
Dr. A. K. Samanta, Head, Animal Nutrition Division	**Dr. Jai K. Kaushik,** Head, Animal Biotechnology Division
Dr. Vikas Vohra, Head, Animal Genetics & Breeding Division	**Dr. Anurag Saxena,** Head, Agronomy Division
Dr. Pawan Singh, Head, Livestock Production & Management Division	**Dr. Santanu Banik,** Head, Eastern Regional Station, Kalyani

Dr. Arindham Dhali, Head, Southern Regional Station of NDRI, Bangalore	**Dr. A.K. Mishra,** PS & CHW, LPM Division
Dr. Anjali Aggarwal, Principal Scientist, Academic Coordinator	**Dr. Suman Kapila,** Principal Scientist, Animal Biochemistry Division, Controller of Examination
Dr. B. S. Meena, Principal Scientist, Dairy Extension Division	**Dr. Gopal Gowane,** Senior Scientist, Animal Genetics & Breeding Division
Dr. Rekha Menon, PS, D.E. SRS of NDRI Bangalore	**Dr. Sumit Arora,** PS, DC Division
Dr. Sanjit Maiti, Sr. Sci., Agril. Extn. Education	**Dr. Yogesh Khetra,** Sr. Scientist, DT Division
Dr. Richa Singh, Sr. Scientist, DC Division	**Dr. Sachin Kumar,** Scientist (SS) Animal Nutrition
Ms. Sindhu V K, PG 1st Year Topper	**Ms. Veda T V,** Ph.D. 1st Year Topper

EXTENSION COUNCIL

Chairman	Dr. Dheer Singh, Director, ICAR-National Dairy Research Institute, Karnal
Members	
Dr. A. K. Singh, Joint Director (Academic), ICAR-NDRI, Karnal	**Dr. Rajan Sharma,** Joint Director (Research), ICAR-NDRI, Karnal
DDG (Extension Education), ICAR, New Delhi or his nominee	**Dr. A.K. Mishra,** Principal Scientist, LPM Section
Dr. S. S. Lathwal, Principal Scientist, LPM Section	**Dr. Vivek Sharma,** Principal Scientist & Head, DC Division
Dr. S. Mandal, Principal Scientist & Head, DES&M Division	**Dr. A.K. Dang,** Principal Scientist & Head, AP Division
Dr. Jai K. Kaushik, Principal Scientist & Head, ABT Division	**Dr. Pawan Singh,** Principal Scientist & Head, LPM Section
Dr. Suneel Kumar Onteru, Principal Scientist & Head ABC Division	**Dr. Deep Narayan, P**rincipal Scientist & Head, DT Division
Dr. S. Banik, Principal Scientist & Head, ERS Kalyani	Agriculture Commissioner, Govt. of India, Ministry of Agriculture & Farmers welfare, Department of Agriculture & Cooperation, Krishi Bhawan, New Delhi-110 001 or his nominee
Director General, Department of Animal Husbandry & Dairying Govt. of Haryana Pashudhan Bhawan, Sector- 2, Panchkula or his nominee	Director (Farm Information), Directorate of Extension, Govt. of India, New Delhi
Member Secretary	**Dr. Gopal Sankhala,** Principal Scientist & Head, Dairy Extension Division

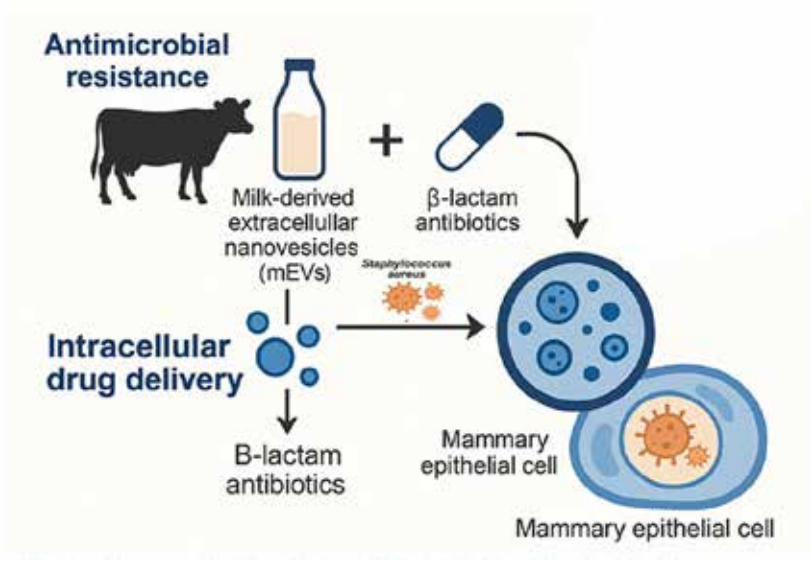
Meeting of Board of Management held on April 21, 2025

3 SIGNIFICANT RESEARCH ACHIEVEMENTS

BIOTECHNOLOGICAL INTERVENTIONS FOR HIGHER PRODUCTIVITY

Milk extracellular vesicles deliver β-lactam antibiotics into mammary epithelial cells and combat intracellular mastitis causing *Staphylococcus aureus*

Mastitis-causing pathogens such as *S. aureus* evade treatment by residing within mammary epithelial cells, leading to persistent infections. Conventional β-lactam antibiotics are water-soluble and poorly penetrate cell membranes, limiting intracellular efficacy. To address this, milk-derived extracellular nanovesicles (mEVs) from healthy bovine milk were evaluated as delivery vehicles for ampicillin (AMP). The mEVs were well-characterized and demonstrated high biocompatibility, with minimal size change after drug loading (~93 nm to ~96 nm). AMP loading efficiency reached 68.86%. The mEVs-AMP formulation significantly reduced viable *S. aureus* counts by 40.85% extracellularly and 51.72% intracellularly within 4 hours, using doses four times lower than the standard MIC of AMP. Overall, mEVs effectively enhanced intracellular delivery and antimicrobial activity of ampicillin.

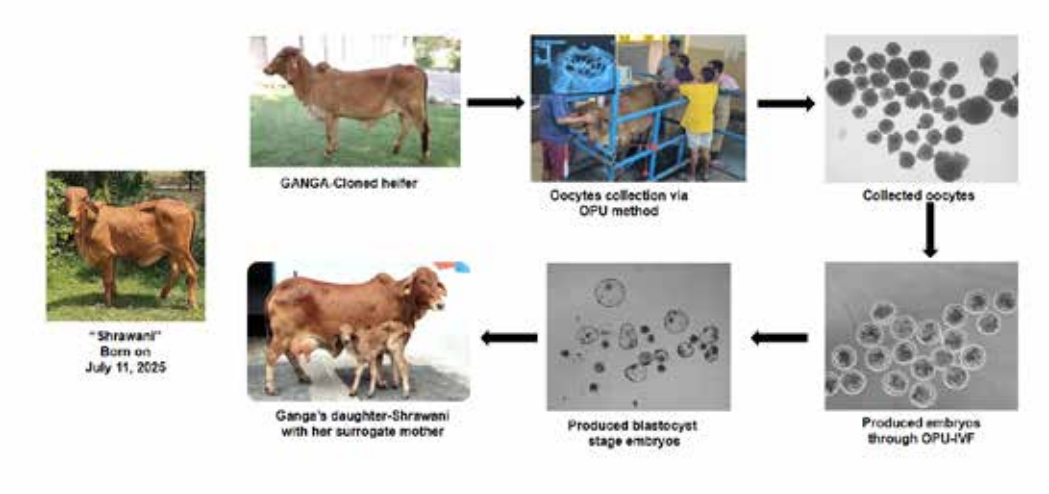


Milk extracellular nanovesicles delivers β-lactam antibiotics to in the intracellular niche of Staphylococcus aureus

Rapid multiplication of elite germplasm through cloning and OPU–IVF in cattle

The institute has successfully produced a Gir calf using ovum pick-up and *in vitro* fertilization (OPU-IVF) from oocytes (developing eggs) retrieved from a cloned Gir cow — marking the first achievement of its kind in the country. This holds powerful potential for integrating reproductive technologies to rapidly multiply elite indigenous breeds. The Gir calf, born to a Sahiwal surrogate, marks the second generation from an elite donor cow within just 39 months, significantly reducing the conventional breeding interval of 46–50 months.

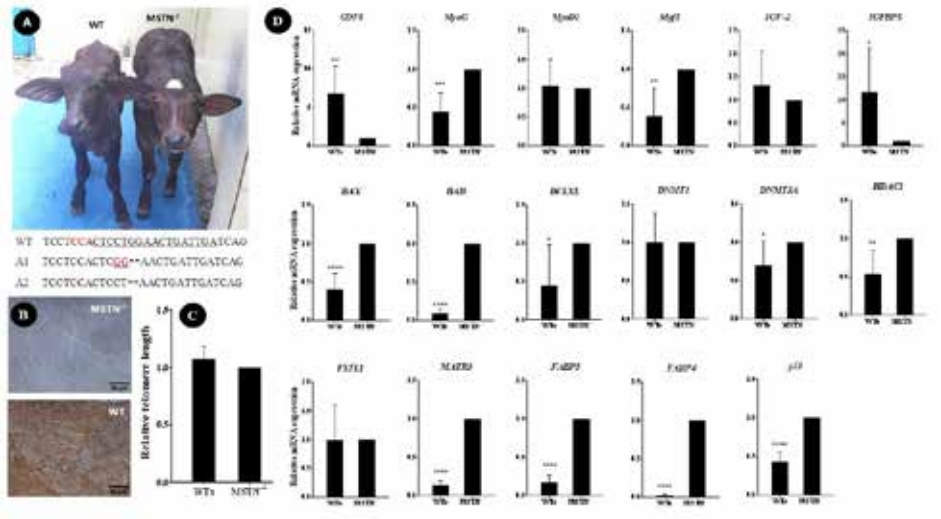
In this work, the cloned animal, produced in 2023, was subsequently used for OPU–IVF-based embryo production. This year, its reproductive performance was evaluated to assess follicular growth and ovarian response. The animal was subjected to a standard hormonal stimulation protocol for oocyte recovery through OPU, followed by IVF. The clone exhibited a high-quality oocyte pool comparable to that of its donor. The resulting embryos were transferred into surrogate Sahiwal cows, leading to the birth of a healthy calf named Shravani. This demonstrates that elite germplasm can be rapidly multiplied through an initial round of cloning followed by conventional OPU–IVF, enabling accelerated genetic dissemination.



Cloning Technology integrated with OPU-IVF for rapid germplasm multiplication

Assessment of systemic effects of myostatin (MSTN) knockout in gene-edited buffalo

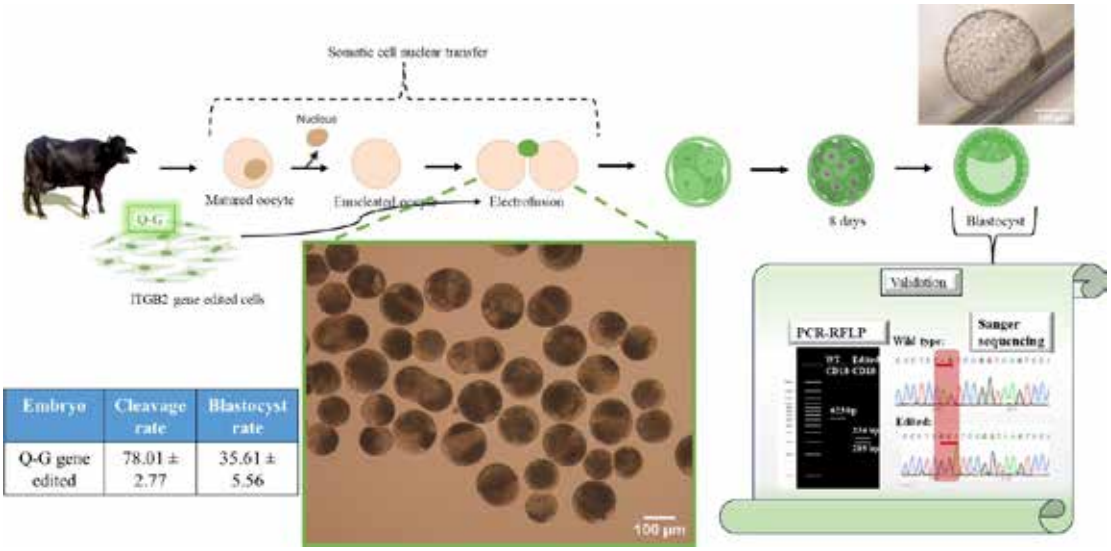
The CRISPR/Cas9-generated MSTN$^{-/-}$ buffalo (Selokar et al., 2025) was analyzed to understand the systemic effects7 of myostatin loss and the early mortality observed in knockout calf. Our data showed that compared with age-matched wild-type animals, the MSTN-knockout revealed strong upregulation of myogenic regulators MyoG and Myf5 and reduced IGFBP5, supporting enhanced muscle growth. Genes linked to apoptosis and epigenetic regulation (BAD, BAX, p53, BCL-XL, DNMT3a, HDAC1) were elevated. Serum biochemistry indicated altered protein and nitrogen metabolism, while multiplex cytokine profiling revealed heightened inflammatory, chemotactic, and angiogenic signals. Telomere length was unchanged, suggesting mortality was not due to cellular senescence but to systemic metabolic and inflammatory stress associated with MSTN disruption.



Comparative analysis of MSTN knockout and wild-type Calves. (A) Phenotype of MSTN knockout and wild-type calf. (B) Immunohistochemical detection showing absence of MSTN protein in the knockout. (C) Telomere length comparison between knockout and wild-type calves. (D) Expression of muscle and myogenic transcripts in both groups.

Precise CRISPR-Cas9–mediated ITGB2 editing and production of gene-edited cloned buffalo embryos

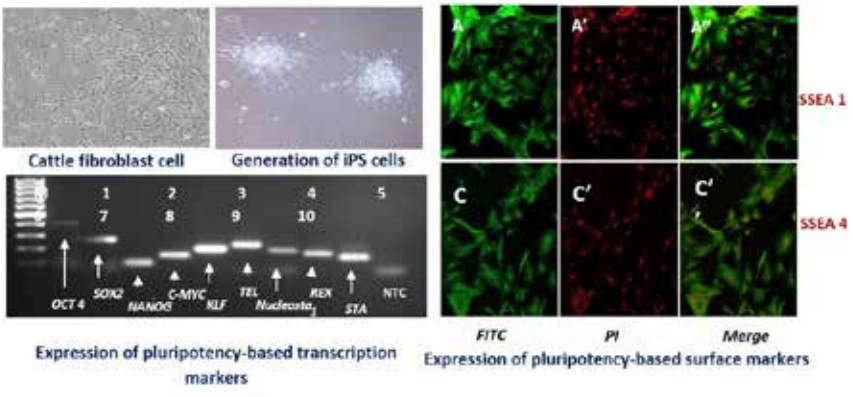
This study established a CRISPR–Cas9 genome-editing platform to precisely modify the ITGB2 (CD18) gene in buffalo fibroblasts and further evaluated the developmental competence of SCNT embryos derived from edited cells. Using Cas9 RNPs, sgRNAs, and an ssODN donor, a Q-to-G knock-in was efficiently introduced at the leukotoxin A interaction site, with HDR enhancer markedly improving bi-allelic knock-in recovery. A high-precision bi-allelic clone was used for the production of cloned embryos, yielding cleavage and blastocyst rates comparable to controls. Molecular analyses confirmed specific transmission of the edit, and TUNEL assays showed normal embryo quality, demonstrating feasibility of producing gene-edited buffalo embryos.



Production of itgb2 edited embryos using the ITGB2 gene-edited somatic cells (Q-G HDR donor template)

Establishment of induced pluripotent stem cells of cattle

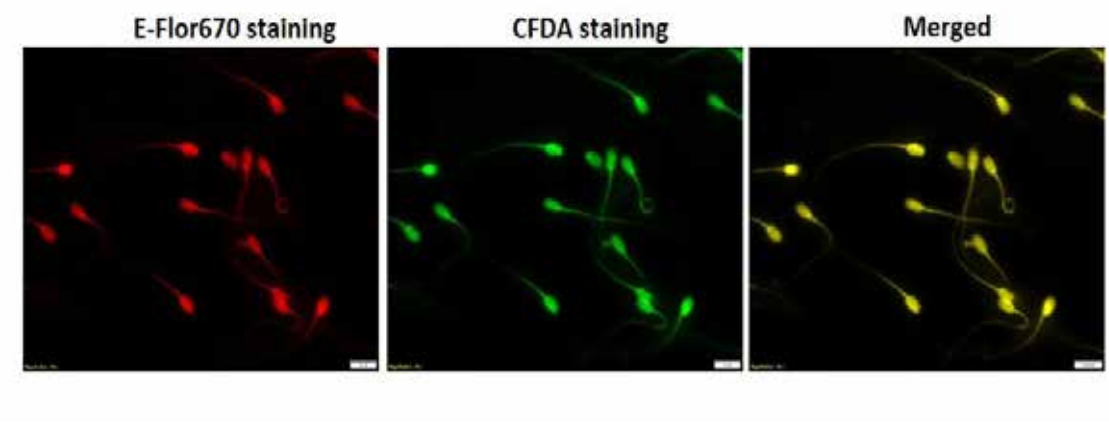
Induced pluripotent stem cells (iPSCs) can differentiate into any cell type, making them valuable for research and therapy. In this study, bovine iPSCs were generated by reprogramming fibroblasts using lentiviral delivery of OCT4, SOX2, c-MYC, and KLF4. Reprogrammed cells showed morphological changes from spindle-shaped fibroblasts to epithelial-like, polygonal cells, indicating successful induction. Colonies were passaged using dispase or mechanical methods to reduce stress and maintained in stem cell media. Characterization at passages 3 and 6 confirmed expression of key pluripotency markers, including OCT4, SOX2, NANOG, c-MYC, KLF4, telomerase, REX1, and STAT3, along with surface markers SSEA1, SSEA4, TRA-1-60, and TRA-1-81. The iPSCs exhibited significantly higher ($P<0.05$) expression of pluripotency-associated genes, confirming successful reprogramming.



Generation and characterization of induced pluripotent stem (iPS) cells

Adsorption of buffalo beta-defensin 126 (BuBD126) protein on sperm membrane and improvement in sperm functional parameters

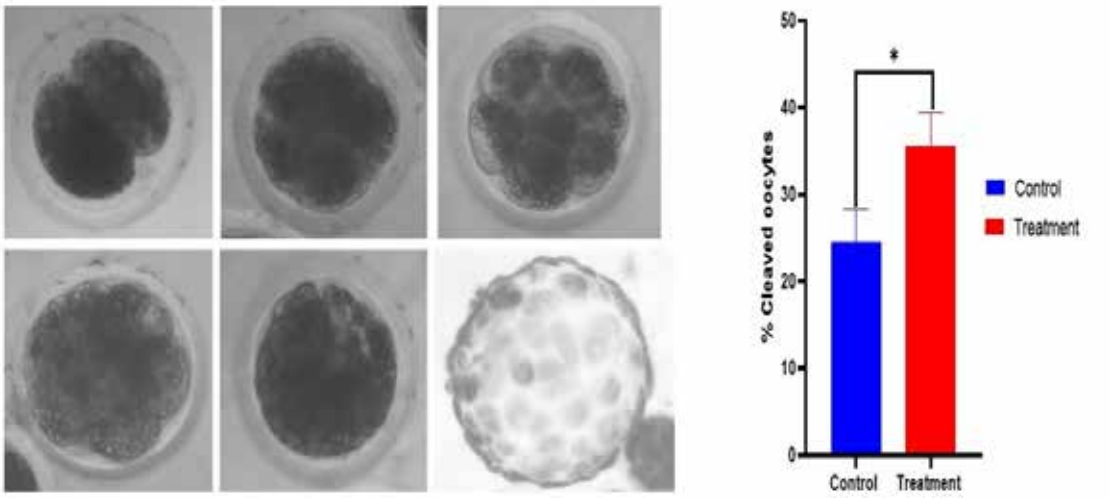
This study evaluated the functional role of recombinant BuBD126 (rBuBD126) produced in a bacterial system and its adsorption onto buffalo spermatozoa. Fluorescence imaging showed uniform coating of rBuBD126 across the sperm surface. In silico analysis indicated strong binding affinity to CCR6 receptors, supporting efficient interaction across the head, neck, and tail regions. Following adsorption, sperm functional parameters improved significantly ($p < 0.05$), including total and progressive motility. rBuBD126 treatment also enhanced sperm viability and acrosomal integrity, indicating better preservation of fertilization potential. Additionally, treated sperm exhibited significantly improved cervical mucus penetration compared to untreated low-fertile samples. Overall, rBuBD126 effectively enhances sperm functionality and may improve fertility outcomes.



rBubD126 tagged with eFlor 670 staining of spermatozoa, CFDA staining and merged images of eFlor 670 and CFDA staining. CFDA staining revealed the membrane integrity of sperm after rBuBD126 protein adsorption

Buffalo beta-defensin 126 (BuBD126) coating of sperm enhances spermatozoa–zona pellucida (ZP) binding and *in vitro* fertilizing (IVF) potential

The most vital functional characteristics of spermatozoa is to bind to ZP and achieve the successful fertilization. Fusion of rec-BuBD126 protein onto spermatozoa resulted in a higher number of spermatozoa bound to the zona pellucida compared to the control group, indicating improved sperm–zona recognition and attachment. This enhancement suggests that rec-BuBD126 facilitates the key interactions at the gamete interface, potentially increasing the likelihood of successful fertilization. Furthermore, the percentage of cleaved oocytes was significantly higher in the rec-BuBD126-treated group compared to the control, demonstrating that rec-BuBD126 treatment positively influenced early embryonic development and improved fertilization outcomes in buffaloes.



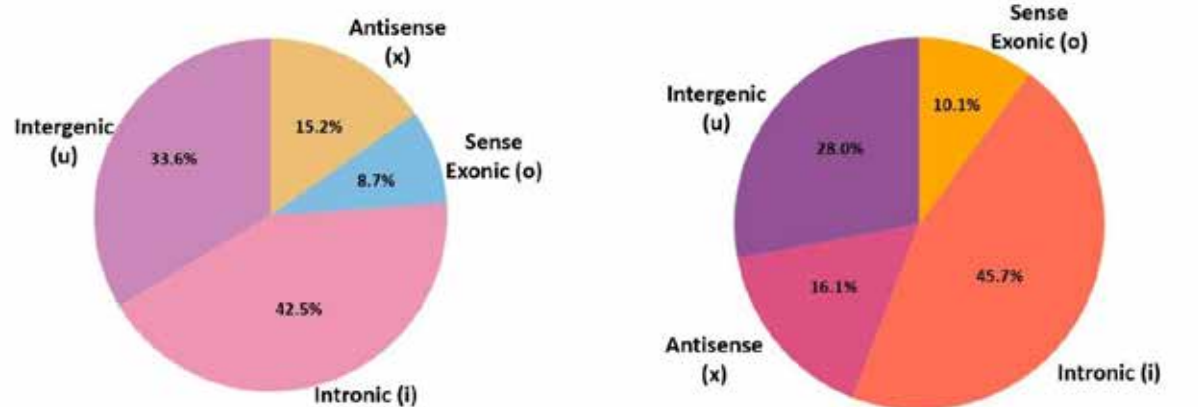
Bright-field images of 2, 4, 8, 16-celled stage, morula, and hatched blastocyst stage of buffalo embryos. There was a significant difference between the control and treatment groups (p<0.5)

Engineering a novel endolysin against multidrug resistant *Escherichia coli*

Given the critical problem of antimicrobial resistance developed by *E. coli* and other Gram-negative pathogens even against 5th Gen cephalosporins and carbapenems, there is a serious need to develop alternative antimicrobials. Endolysins are encoded by bacteriophages to lyse their host cells and have been proposed to be efficient agents. However; the Gram-negative bacteria due to the presence of outer membrane are impervious to endolysins and fail to efficiently kill bacteria. To address this problem, we engineered a *E. coli* bacteriophage encoded endolysin by fusing with a peptide to help permeabilization of the outer membrane of *E. coli.* The peptide showed synergistic effect and enhanced the antibacterial activity of the fusion protein many-fold in term of reduction in the minimum inhibitory concentration and viable *E. coli* cells when treated with fusion protein. The engineered endolysin also showed enhanced stability and could be a viable alternative of antibiotics to treat pathogenic multi-drug resistant *E. coli*.

Transcriptomic profiling and Identification of differentially expressed Long non coding RNA (lncRNAs) and mRNAs in milk -derived cells in Sahiwal cows

To understand the regulatory role of long non-coding RNAs (lncRNAs) associated with milk production in Sahiwal cows, we mapped the differential expression of lncRNAs and mRNAs in high and low milk yielding cows during peak lactation. For this, milk samples for two groups: high milk yielders (15-16 L/day) and low milk yielders (<8 L/day), in their 2nd or 3rd parity during peak yield stage (between day 40-60) of lactation were collected and analyzed. Illumina Novaseq6000 sequencing platform was used to generate high quality paired-end reads of lncRNAs and mRNAs. The clean paired-end reads were aligned to the reference genome using HISAT2 (refseq assembly- GCF_002263795.3_ARS.UCD.1.2) and then assembled using stringtie in reference genome-based approach.

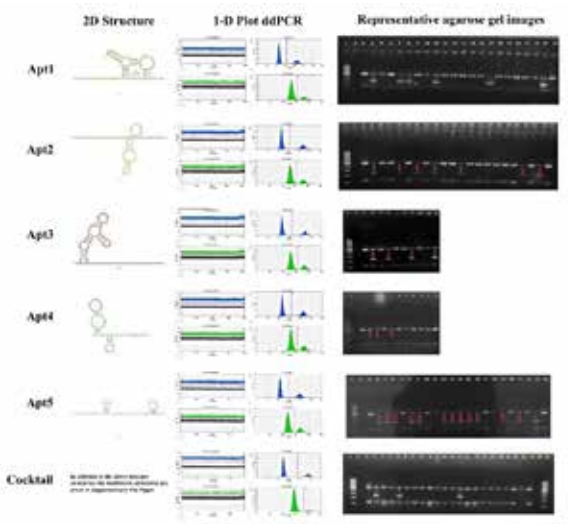


Characterization of long non coding RNAs based on genomic location (class codes uxio) for HY (left side Pie diagram) and for LY (right side)

Comparative transcriptomic analysis revealed a substantial number of novel loci and distinct expression profiles between the two groups. Differentially expressed lncRNAs (DELs) were evaluated for their potential cis and trans regulatory interactions with downstream target genes and a total of 52 potential cis targets genes and 191 trans targets genes were selected for functional enrichment analyses.

Aptamer-based enrichment of X chromosome-bearing sperm in bovine

Five Y-chromosome-specific ssDNA aptamers (Apt1–Apt5) were identified using SELEX–NGS and minimal free energy analysis. Their enrichment efficiency was evaluated via ddPCR following magnetic separation using biotin-labeled aptamers and streptavidin beads. Individually, aptamers achieved 55–64% sorting efficiency, while an aptamer cocktail significantly improved efficiency to 75.9%. IVF using sorted sperm showed comparable results, with ~80% enrichment using the cocktail. The strong agreement between ddPCR and IVF confirms effective and selective exclusion of Y-bearing sperm. This approach is simple, biologically relevant, and offers strong potential for practical application in livestock sex selection and reproductive biotechnology.

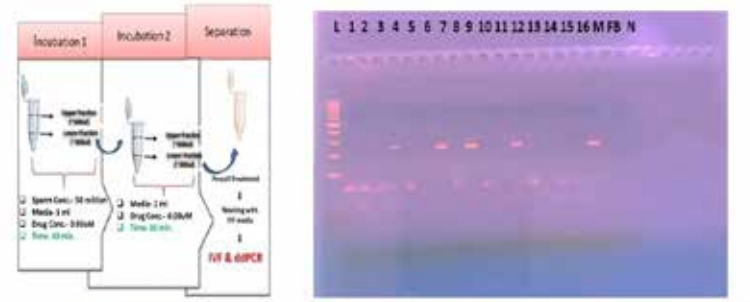


The 2D structures, 1-D ddPCR plots and representative agarose gel electrophoresis images of IVF-embryo DNA PCR for all aptamers (Apt1 to Apt5) and cocktail of aptamers

Ligand-based enrichment of X chromosome-bearing spermatozoa and their validation through *in vitro* fertilization and embryo sexing

Selective enrichment of X- and Y-bearing sperm can be achieved via ligand-mediated targeting. This study identified Toll-like receptor 7 (TLR7) and GABA receptor epsilon (GABAE) as X-sperm biomarkers through bioinformatics. Their ligands, Resiquimod (R848) and Clonazepam, showed stable interactions in docking and molecular dynamics analyses.

Experimental validation using cattle semen treated with Resiquimod (0.03 µM) enabled separation of a lower sperm fraction enriched for X-bearing cells. IVF with this fraction produced 44 embryos, and sexing using Y-specific TSPY primers revealed 75% females (33/44), confirming effective partial enrichment. This proof-of-concept demonstrates the potential of ligand-based sperm selection as a simple and biologically relevant strategy for sex selection in dairy cattle, pending large-scale validation.



Embryo Type	Total embryos produced	Phenotypic sex after PCR	% of embryos produced
Ligand treated	44	11 Male (XY)	25
		33 Female (XX)	75

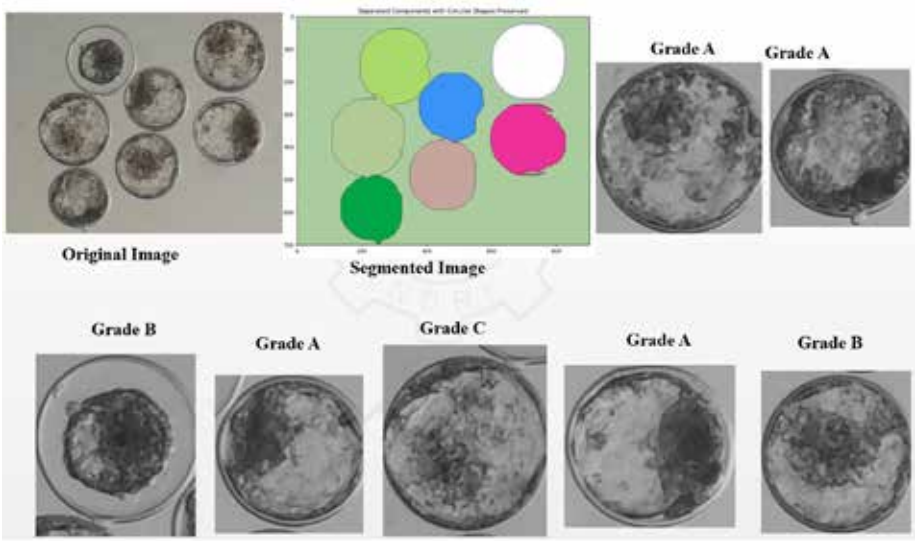
In vitro embryo production from ligand-treated sperms followed by PCR-based embryo sexing using TSPY

Designing of transgene cassette carrying human lysozyme gene

Primers were designed to amplify key components for transgene construction, including the 5' homology arm (~537 bp) of the buffalo βLG gene, goat β-casein promoter (~1550 bp), human lysozyme gene (447 bp), and polyA tail (168 bp), all of which were cloned and sequence-verified. Additional elements—CMV promoter (~510 bp), puromycin-GFP fragment (~2480 bp), and the 3' homology arm (~503 bp) of βLG—were amplified, cloned, and confirmed. These fragments were assembled into a single construct: pAC-5'HA-βCas-HLYZ-PA-CMV-Puro-GFP-3'HA-GFP1-N1. Furthermore, hybrid sgRNAs were cloned into PX458 (GFP) and PX459 (PURO) vectors and validated by sequencing, completing the transgene cassette development.

Development of an AI-based prediction tool for the assessment of buffalo and cattle blastocysts quality

A blastocyst grading system was developed using images of cattle and buffalo embryos from ICAR-NDRI and public sources. Images were pre-processed using watershed segmentation, contour detection, and color mapping. To address class imbalance, data augmentation (flips, brightness/contrast adjustment, Gaussian noise) was applied—targeting grades B and C in cattle and all grades in buffalo. Six pre-trained

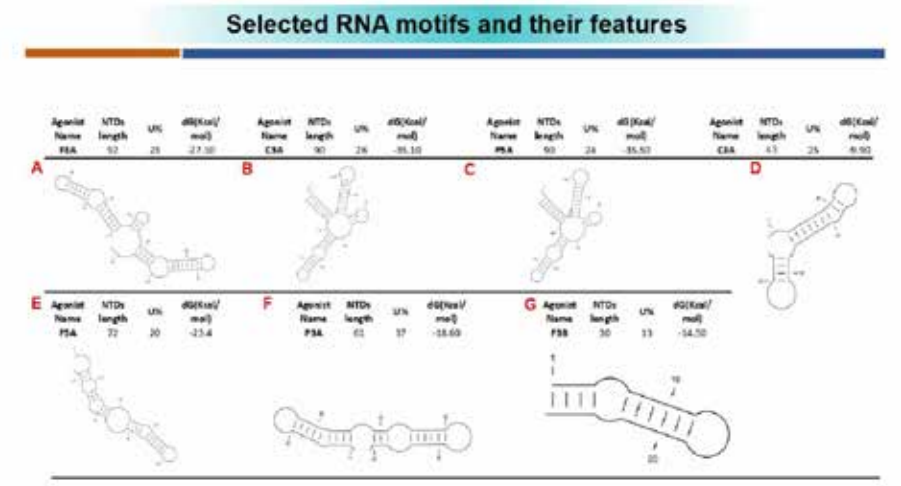


The left panel shows the original microscopic image containing multiple blastocysts. The middle panel depicts automated segmentation results, where individual blastocysts are accurately separated while preserving their circular morphology. The right and bottom panels show cropped single-blastocyst images classified into quality grades (A, B, and C) based on morphological characteristics

models (ResNet50, DenseNet121, VGG19, Xception, InceptionResNetV2, EfficientNetV2) were trained with multiple optimizers. ResNet50 with Nadam performed best, achieving 91.5% accuracy in cattle and 94.2% in buffalo. The model showed high precision for grade A (0.93) and near-perfect precision/recall (0.99) for grade C, demonstrating robust and balanced classification across species.

RNA motifs identified as stimulant of antiviral response

RNA ligands are designed to achieve an appropriate immunostimulatory response, with limited adverse effects, for prophylactic and preventive response against viruses in animal. In vitro transcribed seven 5'ppp-RNA ligands of varying length and structure to target RIG-I and MDA5 were evaluated for their ability to trigger the expression of IFN-β, IL06, IL1β, and ISGs in buffalo primary fibroblast cells using RT-qPCR and immunoblotting. The RNA motifs P5A, F3A, and P3A, which contained three and two stem-loops, respectively, induced higher IFN-β expression. The smallest motif, F5B, with a single stem-loop, was recognized but did not trigger an IFN-β response. C5A, containing three stem-loops and a 5' triphosphate, induced highest IFN-β response. Therefore, multiloop, small size and chemically defined novel RNA motif could be used as host-directed new strategy to prevent viral infection as vaccine adjuvant or antiviral prophylactic intervention.



Designing of small RNA motifs and evaluation of their immunostimulatory competence

Immune responses of epithelial and non-epithelial cells against RNA sensors

RNA sensors trigger the immune response, mimicking the viral infections. In our study, epithelial and non-epithelial cells responded differently to Poly IC. Epithelial cells showed higher IFN-λ3 transcript level than that of fibroblasts cells. Cytosolic RNA sensors such as RIG-I and MDA5 were highly expressed in BuEECs. The expression profile of IFN-λ3 was strongly associated with expression of IFN-λR1. Interestingly, IFN-λR1 was solely expressed in epithelial cells. Antiviral proteins MX1, ISG15, and ISG54 expressed higher in BuEECs.

Dr. Dheer Singh, Director ICAR-NDRI, Mrs. Alka Upadhyaya, Secretary, Department of Animal Husbandry & Dairying and Dr. Abhijit Mitra, Commissioner (AH), Government of India observing Gene edited Buffaloe calves

GENETIC IMPROVEMENT OF DAIRY ANIMALS

Implementation genomic selection in Sahiwal Cattle at NDRI, Karnal

The study was conducted under the project "Early Identification of Superior Dairy Animals Through Genomic Selection," with the objective of implementing genomic selection for 305 day milk yield in Sahiwal cattle using a univariate animal model and the singlestep genomic best linear unbiased prediction (ssGBLUP) method. Firstlactation milk yield records and pedigree data from the Sahiwal herd of ICAR-NDRI, Karnal, spanning 1957–2024, were used to estimate genetic parameters. Genomic estimated breeding values were obtained for all animals, with a mean accuracy of 43.11%. The ssGBLUP framework allowed detection and correction of pedigree errors, leading to more reliable relationship structures, and is therefore recommended for routine genomic evaluation and selection of candidates in a genomic selection programme. Frozen semen doses of gnomically evaluated Sahiwal bulls are available at ICAR-NDRI sale counter for the farmers.

Sahiwal Bull #2979 maintained at NDRI Bull Station was identified with maximum Genomically Estimated Breeding Value (GEBV)

Genetic parameters of Murrah buffaloes at NDRI herd

The ICAR-NDRI herd comprised 201 breedable buffaloes. Key reproductive traits included an average age at first calving of 42 months, a service period of 126 days, and a 50% conception rate (2023). Calf mortality (0–3 months) was low at 6.56%. Production averaged 7.6 kg (wet) and 4.9 kg (herd). Milk composition (n=1032) was: fat 8.30%, SNF 10.04%, total solids 18.33%, protein 3.73%, and lactose 5.58%. Annual milk production was 2,33,551 kg from ~95 milch animals. A total of 21,160 frozen semen doses were produced, including 4,075 from 21st and 22nd set bulls. Elite Murrah buffaloes showed superior performance, with an average best lactation yield of 2,904 kg (17.6% higher than herd average) and peak 305-day yield of 3,368.5 kg.

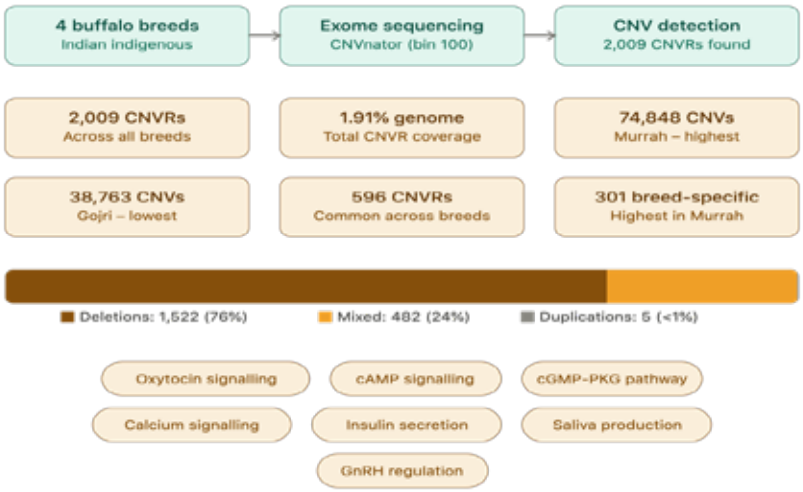
Field progeny testing of Murrah buffaloes in Karnal district

A total of 5008 inseminations were performed in Murrah Buffaloes under field conditions during the year, and as a result an overall conception rate of 46.29% was obtained. The highest conception rate was achieved in the month of April 2024 (48.03%) and the lowest was found for the month of December 2024 (44.35%). Across the villages, the highest conception rate was observed in Kheriman Singh (61.47%) village and lowest in Darar (45.76%), when recorded village till January 2025. A total of 1548 (911 Male and 637 Female) Murrah buffalo calves were born in the farmers' herds and performance data on milk recording of 134 daughters have been recorded for evaluation of bulls under field conditions. The average lactation yield in the field was recorded as 2370.97 ± 326.9 kg daily milk yield in the recorded daughter were 7.8 kg/day. The total herd strength of registered females and the breedable females at different centers was 5678 and 4505, respectively.

A young Murrah Bull maintained at ICAR-NDRI Bull Station

Whole exome-based identification of copy number variation in buffalo breeds

Copy number variations (CNVs), major structural genomic variants, influence adaptation and performance traits. This study identified common and breed-specific CNVs in four Indian buffalo breeds using exome sequencing and CNVnator (read depth, bin size 100). Overlapping CNVs were merged into 2,009 CNV regions (CNVRs), covering 1.91% of the genome. Murrah showed the highest CNVs (74,848) and Gojri the lowest (38,763), with deletions predominating. Of the CNVRs, 1,522 were deletions, 482 mixed, and 5 duplications. Common CNVRs numbered 596, while breed-specific CNVRs were highest in Murrah (301). Functional annotation revealed genes involved in key pathways, including oxytocin, cAMP, cGMP-PKG, calcium signalling, insulin secretion, saliva production, and GnRH regulation.



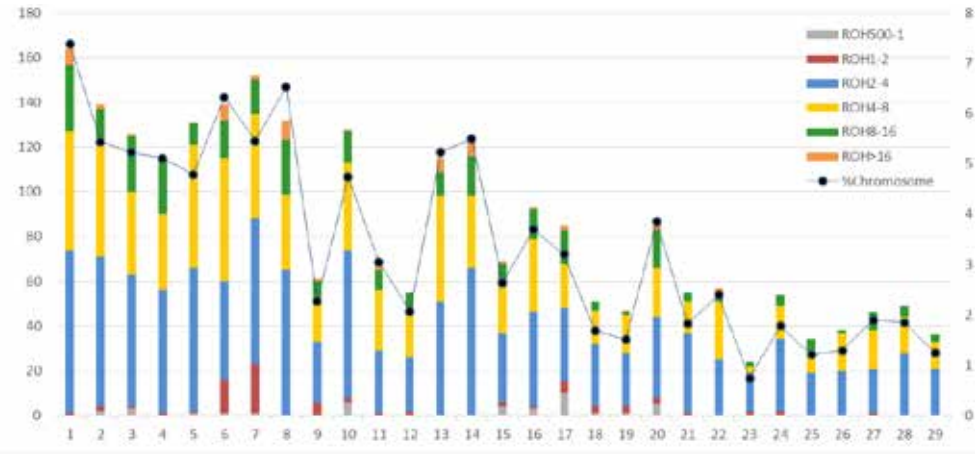
Whole exome-based identification of copy number variation in buffalo breeds

seliNDRIx: An R package for multi-trait selection of dairy animals

The seliNDRIx is an R package, a complete suite of analysis to identify and list the genetically superior animals. The seliNDRIx will be helpful to the researchers, academicians, students and commercial farmers. Package will be mainly used to estimate the additive genetic variances, phenotypic variances, residual variances, additive genetic variance covariance matrix, phenotypic variance covariance matrix and the additive genetic correlation matrix and phenotypic correlation matrix. From these estimates, in the second step, the index values for different traits are calculated which are used to estimate the aggregate genetic worth for each animal. The accuracy, reliability and the genetic gain for one round of selection will also be presented. In the third step, based on the aggregate index values, top 20% of the animals are listed.

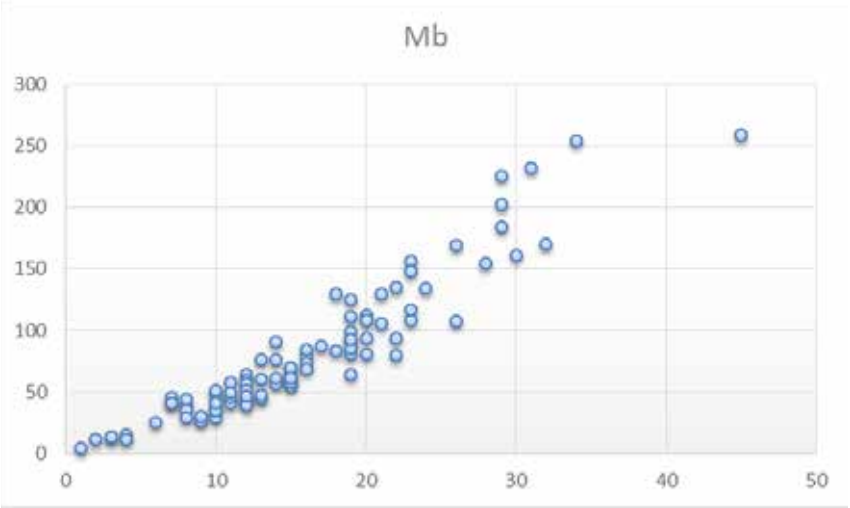
Identification of Runs of Homozygosity (ROH) and assessment of inbreeding in Karan Fries cattle

A total of 2472 homozygous segments from Runs of Homozygosity (ROH) were identified across the KF population. The mean number of ROH per individual was observed as 15.45, contributing to a total ROH



Numbers of Runs of Homozygosity (ROH) per chromosome among the individuals and bars exhibited the total number of ROH per chromosome based with X-axis as No. of chromosomes, axis Y1 as No. of ROH segment and % of Genome Covered by ROH per Chromosome as axis Y2

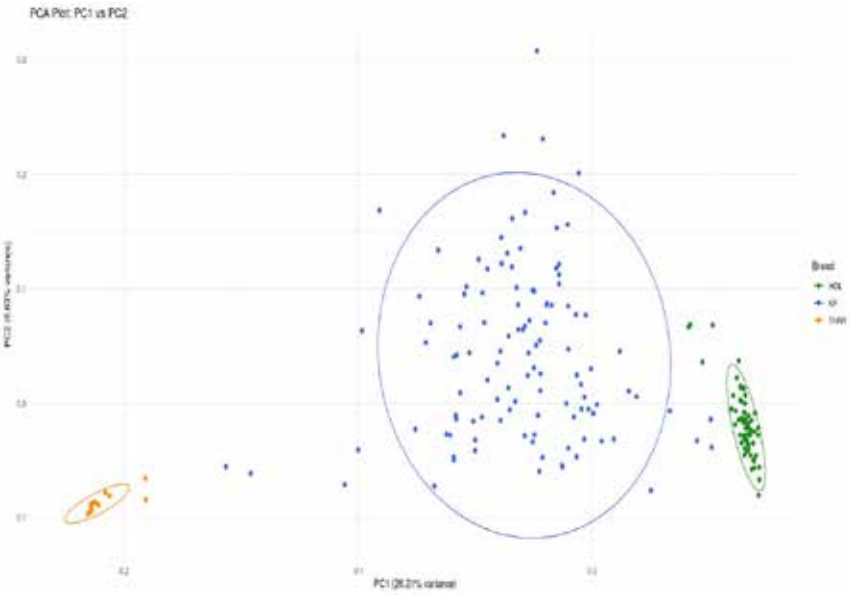
length of 12723.48 Mb. The average ROH segment length was 5.15 Mb. On average, 79.52 Mb of each individual's genome was covered by ROH, which accounted for approximately 2.81% of the total genome length F_{ROH}. The mean F_{ROH} was reported as 0.03 ± 0.02 along with the average number of ROH segment per chromosome was observed as 85. The largest proportion of ROH was observed in the 2-4 Mb category, constituting nearly 47.17% of all segments, followed by 4-8 Mb (32.97%). Short ROH segments (<8 Mb) made up over 85% of all segments, while long ROH (>16 Mb) represented a small proportion (2.35%). The overall F_{ROH} across individuals was 0.0281, suggesting low levels of inbreeding in Karan Fries (KF) population.



The scatter plot represented the number of homozygous segments detected per individual at X-axis, while Mb indicated the total length of these segments in megabases at Y-axis

Population structure of Karan Fries cattle along with parental breeds of HF and Tharparkar

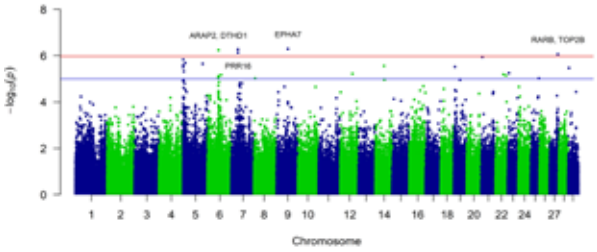
Population structure of Karan Fries cattle along with parental breeds of HF and Tharparkar was studied using Principal component analysis (PCA) and plotted in R, showing clear-cut genetic clustering among three cattle populations based on SNP genotype data. The 1st principal component (PC1) explains 26.21% of the total variance, while the 2nd and 3rd principal component (PC2, PC3) explain 6.63% and 6.02% of the variance. The PCA study relied on the basis of genetic structure of the KF cattle, along with the parental breeds i.e. Tharparkar and Holsetin Friesian (HF) cattle. The PCA is a powerful approach, it has correctly placed the KF in between the HF and Tharparkar cattle. As of now, KF contains 62.5% exotic inheritance and is considered to be stable in the existing breeding management conditions.



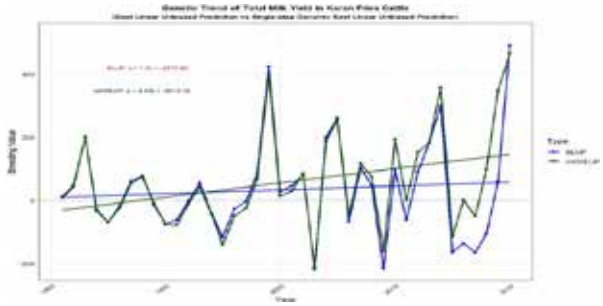
The PCA plot representing the desired separate grouping of Karan Fries, with average distances from parental breeds (Tharparkar and Holstein Friesian)

A genomic breeding value estimation, genetic trend and genome-wide association study (GWAS) in Karan Fries cattle

Genomic breeding value estimation and genetic evaluation of various production and reproduction traits, including their genetic trends of Karan Fries cattle was carried out using multi-trait single-step genomic best linear unbiased prediction (ssGBLUP) method (Ilayaraja et al., 2025; Animal, 19: 101692). A genome-wide association study (GWAS) was conducted in KF cattle using SNP genotyping data and estimated breeding values (EBVs) as dependant variable for four economically important dairy traits: first lactation total milk yield (FLTMY), total fat yield (TFY), total solids-not-fat yield (TSNFY), and stature. Analysis revealed 54 significant SNPs associated with these traits, with several exhibiting pleiotropic effects. Candidate genes such as *EPHA7*, *SCFD2*, *DCUN1D4*, *CWH43*, *ZMAT4, KYNU, GINS4*, *GPAT4*, *GOLGA7,* and *OCIAD1* were associated with milk yield and compositional traits, while *CBLB*, *CCDC14*, *ALCAM*, *MALRD1*, and *MUC13* were linked to stature.



The Manhattan plot representing the significant single nucleotide polymorphisms (SNPs) in Karan Fries cattle for studied traits.



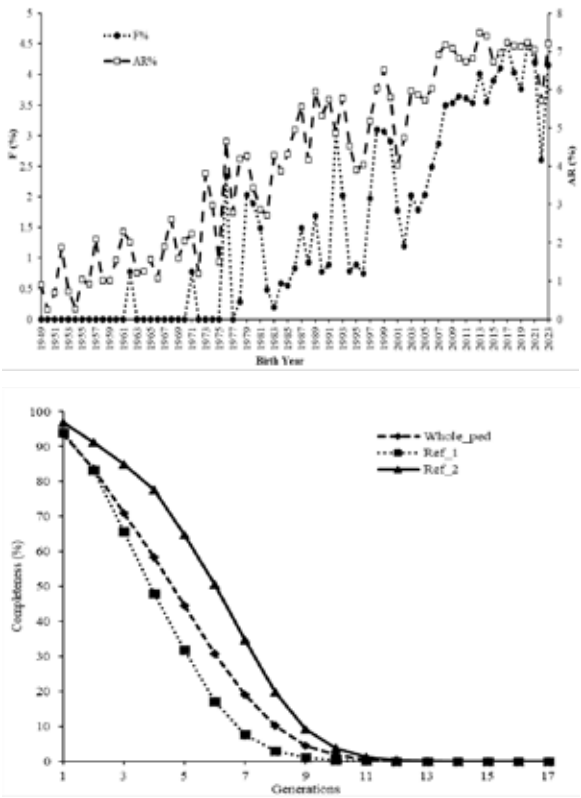
The Genetic trend plot for Best Linear Unbiased Prediction (BLUP) versus Single-step Genomic Best Linear Unbiased Prediction (ssGBLUP) in Karan Fries cattle for studied traits

Transboundary selection signature studies in Sahiwal cattle

Comparative selection signature analysis in transboundary Sahiwal cattle revealed distinct genomic adaptations driven by breeding goals. Indian Sahiwal showed strong selection for milk production and reproduction, with key genes such as NEK11, HMGCS1, BTN1A1, KCNH3 (milk traits) and SH3BGR, PSMG1, BRWD1, B3GALT5 (reproduction). In contrast, Pakistani Sahiwal were selected for growth and meat traits, involving RALGAPA2, RIN2, CFAP61. Genes like HMGCS1 and NIM1K were linked to lactation persistency and lipid metabolism, while BTN1A1 and LPIN2 influenced milk composition. Fertility and development were associated with SH3BGR, PSMG1, BRWD1, HMGN1. Immune-related signatures included BPIFB1 and disease resistance genes DEK, RNF144B (bovine TB), and ABT1 (leukemia resistance), highlighting functional divergence across populations.

Genetic selection for milk traits using genomic approach in Sahiwal cattle

This study analyzed genealogical (N=4164; 1949–2023) and genomic data of Sahiwal cattle to assess inbreeding and its impact. The population showed average relatedness of 5.92%, inbreeding coefficient of 2.69%, and generation interval of 8.2 years. The fg/fa ratio indicated that 54% of ancestral genetic diversity is retained. Genomic inbreeding ranged from 0.008 to 0.41, and a 1% increase in inbreeding reduced yields by 1.42–1.98 kg (fat), 2.84–3.93 kg (SNF), 0.27–0.87 kg (protein), and 0.22–0.43 kg (lactose). These results highlight the importance of integrating pedigree- and genomic-based measures to minimize inbreeding depression and ensure sustainable Sahiwal breeding programs.

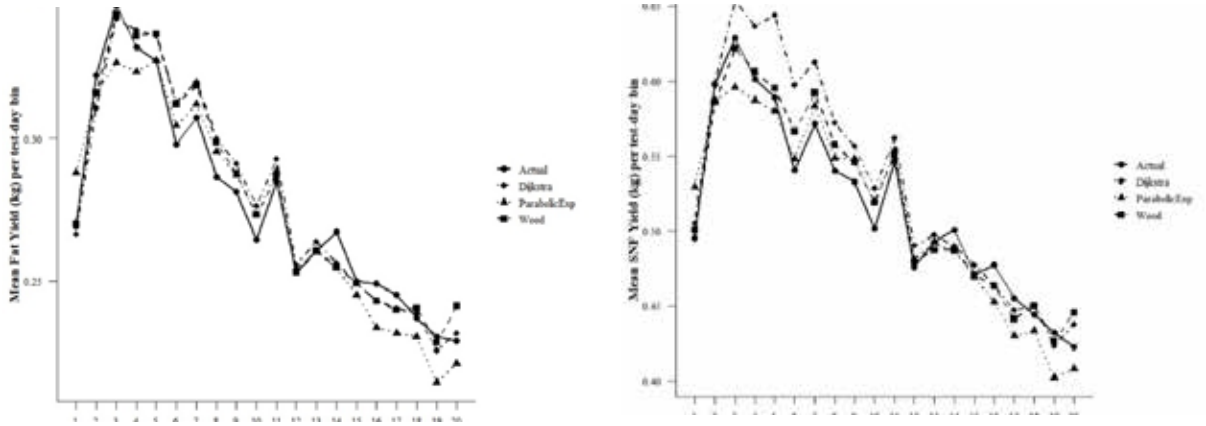


Pedigree completeness (%) analysis (left), Trends of inbreeding and Average Relatedness (right) in Sahiwal cattle

Lactation curve modelling for milk composition traits in Sahiwal cattle

The temporal patterns of milk composition traits were evaluated based on fifteen empirical lactation curve functions. The parabolic exponential function

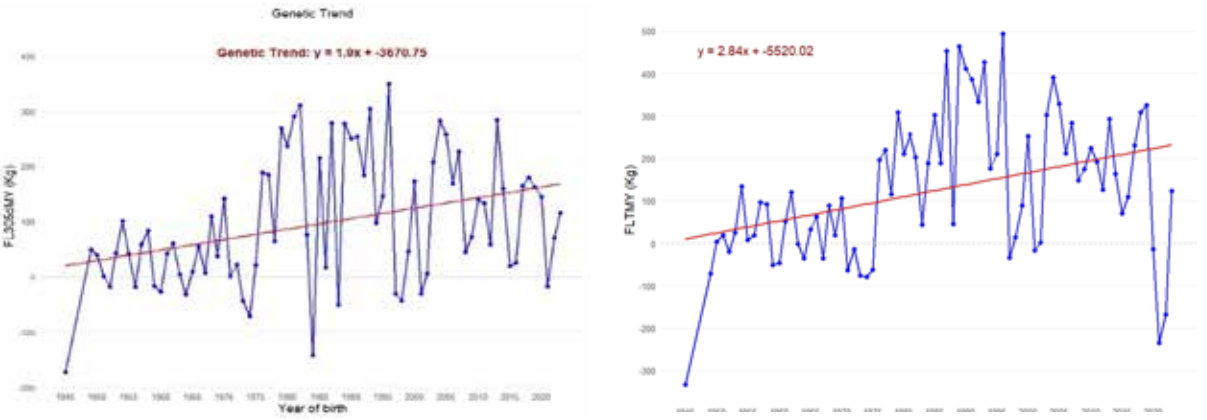
consistently demonstrated superior fit, with the highest adjusted R^2 (89.41-91.57%), lowest RMSE (2.27-5.78 kg/test day) and minimum AIC (2.65-20.60) and BIC (2.58-20.85) values across all traits. These findings emphasize the practical utility of the PX function in modelling milk composition dynamics in Sahiwal cattle.



Actual and Predicted fat yield (kg) and SNF yield (kg) with average test day bin for best three functions

Indigenous breed improvement program – AICRP-Sahiwal

As of 31 December 2024, the female herd at ICAR–NDRI comprised of 359 animals, including 186 breedable females, along with 89 growing males and breeding bulls. During the year, 118 normal calvings resulted in 56 male and 62 female calves. In 2025, herd performance showed positive trends. The average age at first calving was 1216.02 ± 23.37 days. First-lactation and total milk yields averaged 2201.35 ± 78.06 kg and 2072.51 ± 70.42 kg, respectively. Peak yield averaged 10.16 ± 0.25 kg, with a maximum of 21.5 kg. Lactation length was 245.55 ± 12.0 days, dry period 110.83 ± 6.76 days, calving interval 396.13 ± 5.47 days, and service period 100.91 ± 6.29 days. Wet and dry season yields were 7.6 kg and 4.4 kg. Milk yield and conception rate (43.57%) improved over time, alongside a declining age at first calving. Out of 45 screened male calves, 14 were selected based on EPD (6.23%), dam performance, and conformation. A total of 43 bulls were used, with 15 evaluated and 4 proven, subsequently used in elite matings. Based on EPA, 35 of 186 females (~20%) were identified as elite. During the year, 35,449 frozen semen doses from Set-V bulls and 15,088 doses from elite bulls were distributed. Long-term trends indicated genetic improvement in production traits, while reproductive traits showed unfavourable or inconsistent trends.

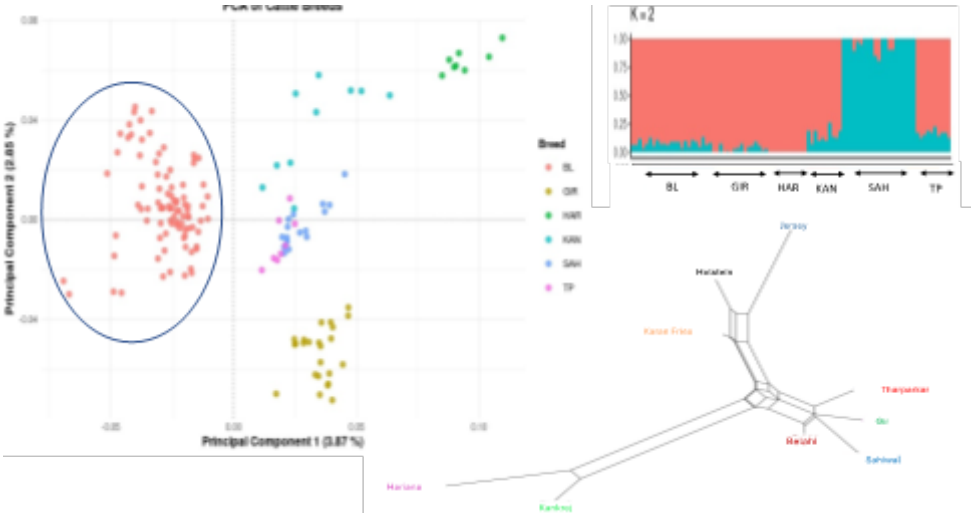


Genetic trends for the First lactation 305 day milk yield (left) and First lactation total milk yield (right) in Sahiwal cattle

Unravelling the genomic diversity and identifying putative Single Nucleotide Polymorphism (SNPs) for milk quality and production in Belahi and HF crossbred population in Haryana state

Belahi cattle, a recently registered pastoral breed, were studied to assess genetic diversity, population structure, and milk quality traits using genome-wide SNP data and phenotypic profiling. Milk composition analysis showed higher protein and solids-not-fat (SNF) in Belahi and HF crossbreds, while Sahiwal and Tharparkar had comparatively lower values. Fatty acid profiling indicated superior nutritional quality of Belahi milk, with higher monounsaturated (MUFA) and polyunsaturated fatty acids (PUFA) and lower long-chain saturated fatty acids (LCFA), making it healthier for human consumption. Genome-wide

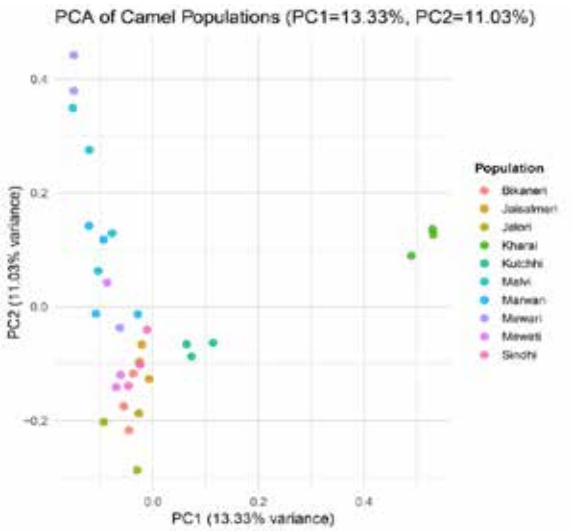
SNP analysis using the Illumina BovineSNP50 array revealed high polymorphism and well-distributed genetic variation in Belahi cattle. Observed and expected heterozygosity were comparable, indicating low inbreeding. Effective population size suggested a moderate risk of genetic diversity loss, highlighting the need for conservation strategies. Population structure analysis showed that Belahi clusters with indigenous zebu breeds and lacks recent taurine admixture, confirming its distinct genetic identity and importance as a valuable indigenous genetic resource.



Standalone genomic grouping of Belahi cattle, indicating no recent admixture and distinct evolution history as revealed by PCA, admixture and lineage

Indian dromedary camel genome diversity analysis

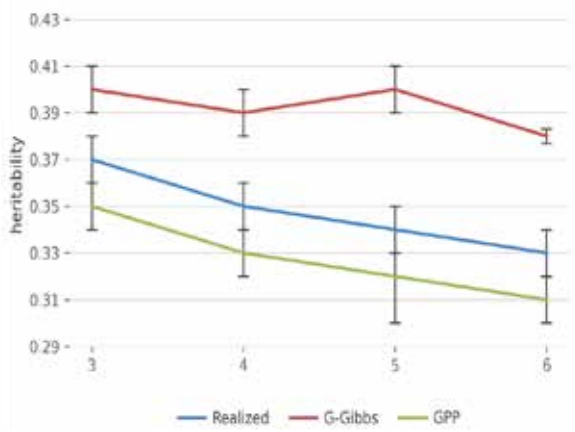
This project aims to develop comprehensive genomic resources for Indian camel breeds to support genetic diversity conservation of camelids in India. During the second year, substantial progress was made in whole-genome sequencing, bioinformatic analysis, and population characterization. A total of 35 camel samples representing 10 breeds and populations were sequenced using the Illumina NovaSeq 6000 platform at approximately 20× coverage, generating 40–50 GB of high-quality data per sample. Reads were aligned to the mCamDro1 reference genome, and SNPs and indels were identified using BCFtools, followed by quality control with PLINK. Population structure analysis clearly separated double-humped camels from single-humped populations. Among the latter, the Kharai breed displayed a distinct genetic signature, reflecting its unique adaptation to coastal saline environments and specialized behaviors such as swimming to forage on mangroves. Runs of homozygosity analysis detected 833 ROH segments with moderate lengths (~600 kb), indicating historical bottlenecks but limited recent inbreeding. Linkage disequilibrium decay suggested a relatively small effective population size. Admixture analysis showed distinct ancestry in double-humped camels and low-level gene flow among single-humped breeds, particularly between Sindhi and Jaisalmeri.



Distinct genomic grouping of Kharai camel as revealed by principal component analysis (PCA) analysis as compared to other camel population in India

Development of new methods for estimation of heritability and genetic correlations for large dimensional genomic data

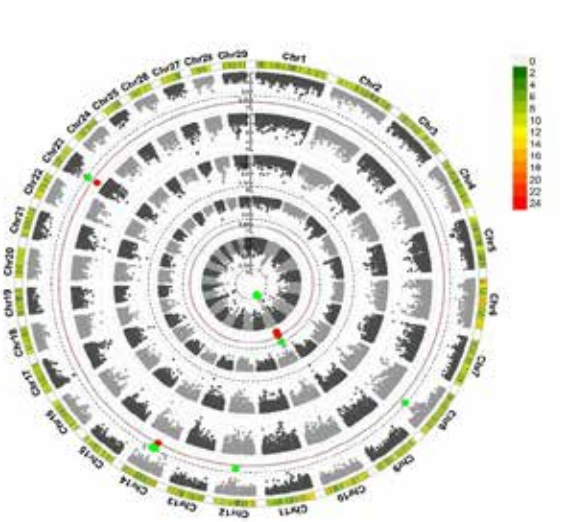
Large genomic data has a limitation of computing inverse of the genomic relationship matrix (GRM), due to which the already available methods such as REML, GGibbs cannot be utilized for the estimation of genetic parameters. This limitation forced genetic evaluation to use only pedigree based estimates in large dimensional genomic models. To overcome this Misztal and Gowane (2025, Genetics: doi: 10.1093/genetics/iyaf066.) developed new methods and formulae based on predictivity which can estimate these genetic parameters for any data size without any extra cost and in short time. The method is now called 'Genetic parameters via predictivity' or 'GPP' in short.



Heritability estimates for a simulated production trait by generation based on true breeding values (realized), Genomic Gibbs sampling (G-Gibbs), and predictivity (GPP). SE are SE of replicates

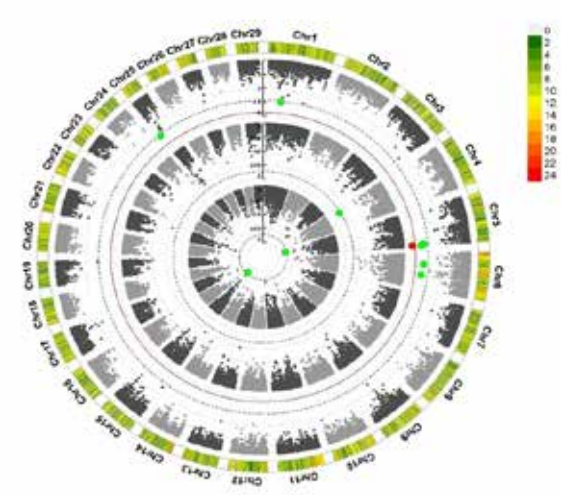
Genome Wide Association Studies (GWAS) for fertility traits in Sahiwal cattle

Quality control of the ovine 50K SNP chip (51,278 markers) was conducted on 303 animals using PLINK v1.9. SNPs were filtered based on minor allele frequency (MAF ≥ 0.05), Hardy–Weinberg equilibrium ($p \geq 1\times10^{-5}$), genotype call rate (≤ 10% missing), and retention of autosomal markers only. After quality control, 28,206 SNPs for Sahiwal cattle were retained for GWAS. Fertility traits analyzed included age at first calving (AFC), interval between first and last AI (IFL), interval between calving and AI (ICAI), service period (SP), number of services per conception (NSPC), and pregnancy rate (PR), with analyses performed separately for heifers and cows. In cows, 13 significant SNPs were identified across multiple chromosomes, with strongest signals on BTA10 and BTA14, mainly associated with PR, IFL, and NSPC. The most significant SNP for PR was on BTA23 ($p = 2.78 \times 10^{-7}$), near PLA2G7, MEP1A, and TDRD6.



Manhattan plot showing the significant SNPs corresponding to Cow fertility traits (IFL_NSPC_SP_ICAI_PR)

In heifers, 10 significant SNPs were detected, predominantly on BTA5, associated with AFC, IFL, and NSPC, implicating genes such as CELSR1, GTSE1, TRMU, KLF12, IGFBP7, and TRPS1, suggesting pleiotropic effects across fertility traits.

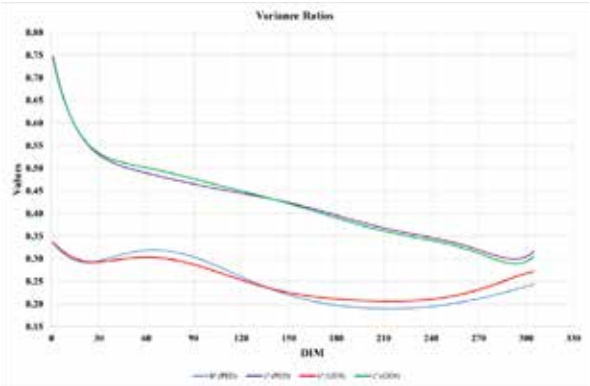


Manhattan plot showing the significant SNPs corresponding to Heifer fertility traits (AFC_NSPC_IFL)

Development of genomic evaluation model for field crossbred cattle using a Single-Step Random Regression Test-Day Model

Crossbred cows play a crucial role in India's dairy sector, contributing 31.11% of total milk production. This study applied computational modelling to optimize genomic evaluation of lactation curves in field crossbred cattle of Kerala under a smallholder production system. A total of 169,169 first-parity test-day records from 18,079 animals were analyzed, of which 2,273 animals had genomic data comprising 45,585 SNPs after quality control. A single-trait, linear, mixed single-step random regression test-day model

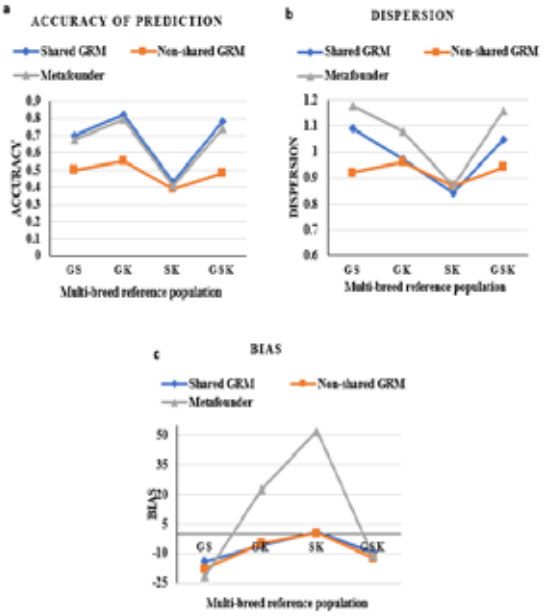
(SS-RRTDM) using a fourth-order Legendre polynomial for additive genetic and permanent environmental effects (F3A4P4) was implemented for genetic parameter estimation and breeding value prediction via single-step genomic BLUP. Variance components were estimated using single-step genomic REML. The lactation curve peaked at 13.14 kg on day 27 and declined to 6.94 kg by day 305. Heritability of test-day milk yield was moderate (0.25±0.05), with a permanent environment ratio of 0.42±0.09. Genomic estimated breeding values showed higher accuracy (0.83) and reduced bias (0.92) compared to pedigree BLUP. High genetic correlations between adjacent test days and computational efficiency support the model's suitability for large-scale genomic evaluation and precision dairy breeding.



Trend of h2 and c2 across the span of 305 days of lactation obtained using pRRTDAM (PED) and ss-gRRTDAM (GEN)

Improving the multibreed genomic evaluation accuracy using shared SNP effects across breed

Genomic selection accelerates genetic improvement in livestock, but its application in developing countries is constrained for numerically small breeds due to the lack of large, breed-specific reference populations. This study evaluated the effectiveness of multi-breed reference populations to enhance genomic prediction accuracy in Kankrej cattle with limited phenotypic and genomic resources. Genotypic and phenotypic data from 1,298 Gir, 1,291 Sahiwal, and 500 Kankrej cattle were used. PCA combined with K-means clustering revealed genetic overlap between Gir and Kankrej, supported by similar linkage disequilibrium decay patterns, indicating shared haplotype blocks. Heritability estimates for 305-day milk yield were 0.30±0.07 (Gir), 0.27±0.07 (Sahiwal), and 0.17±0.01 (Kankrej). Single-breed genomic prediction accuracies were 0.65, 0.60, and 0.49, respectively. Multi-breed genomic evaluations using shared GRM, non-shared GRM, and metafounder-corrected shared GRM improved prediction accuracy in Kankrej by 23.6%, 24.6%, and 16.9%, respectively, with the Gir–Kankrej reference population. Linear regression validation identified the shared GRM approach as optimal, yielding improved accuracy with reduced bias and dispersion. These results demonstrate that multi-breed genomic evaluation is a viable strategy for improving genetic prediction in numerically small indigenous breeds in India.



Validation by linear regression method. Accuracy (a), dispersion (b), and bias (c) of Genomic Estimated Breeding Value (GEBV) prediction using a multi-breed reference population

Transcriptome Profiling for identification of key regulators of cold exposure response in indigenous and crossbred cattle

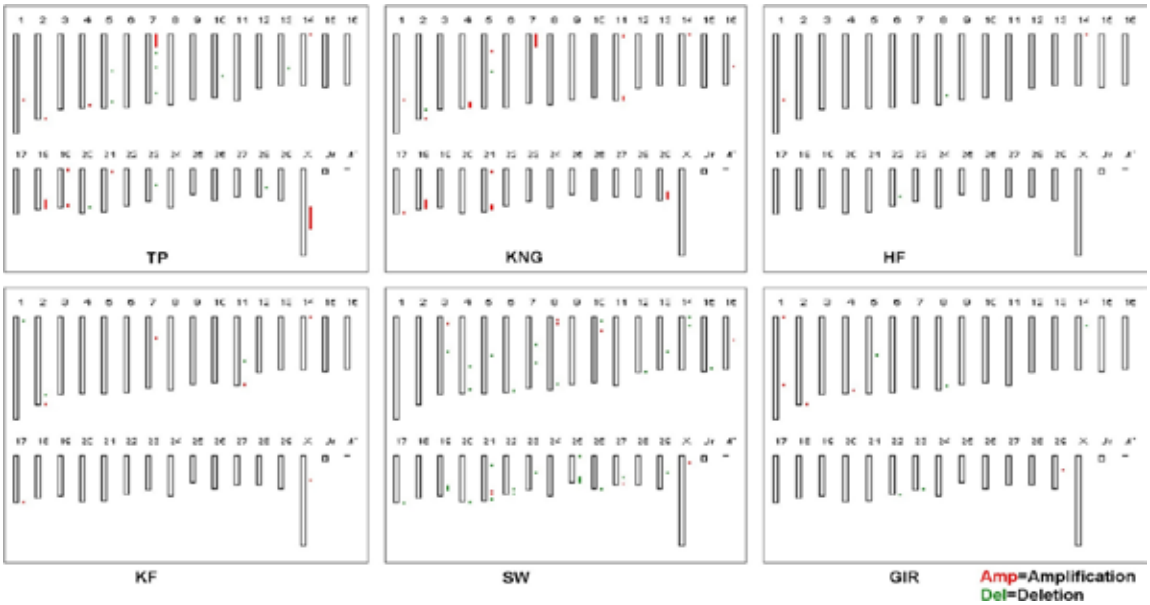
Climate change has intensified thermal extremes, making cold stress a major challenge for cattle in India and globally. Prolonged exposure to low temperatures disrupts metabolism, reduces milk yield, and compromises overall performance, threatening livestock productivity and economic sustainability. This study investigated transcriptomic responses to cold (winter) and thermoneutral (spring) conditions in indigenous Tharparkar and crossbred Karan Fries cattle using RNA-Seq. Differential expression analysis in DESeq2 ($|\log_2$ fold change$| \geq 2$, padj < 0.05) identified 6,537 differentially expressed genes (DEGs) in Tharparkar cattle, comprising 471 upregulated and 6,066 downregulated genes. In Karan Fries cattle, 5,101 DEGs were detected, with 539 upregulated and 4,562 downregulated genes. In Tharparkar, significantly upregulated genes included BOLA-DQA2, H2BC9, H4C2, LOC112446470, and H4C7, while FOSL1, ZFYVE28, DLX1, SOHLH1, and PRLHR were downregulated. In Karan Fries, LOC112442278, LOC112442408, F13A1, LOC104968484, and LOC100295645 were upregulated, whereas ANO1, CSMD3, UNC79, LOC101906490, and TRPM5 were downregulated. Pathway analysis revealed significant enrichment of Fc gamma R-mediated phagocytosis in Tharparkar and N-glycan biosynthesis in Karan Fries, indicating breed-specific molecular responses to cold stress.

Identification of SNPs for climate resilient dairy cattle for increasing productivity

Daily milk yield, pedigree, and performance records of 500 Sahiwal cows calved between 1994 and 2024 at ICAR–NDRI, Karnal, were analyzed. Genotypes of 218 cows generated using the Bovine SNP50K chip were used for genomic estimated breeding value (GEBV) prediction and GWAS. Lactation curves were fitted using Wood's, Wilmink's, and random regression models (RRM), with RRM using second-order Legendre polynomials for additive genetic and fourth-order for permanent environmental effects providing the best fit. Milk loss due to thermal stress was estimated as deviations between observed and predicted yields, generating resilience traits: number of days in stress (NDS), total milk loss (TML), and average milk loss (AML), based on temperature–humidity index (THI) and comprehensive climate index (CCI). Under THI, first-lactation cows lost 62.17 kg milk over 59 heat-stress days, with peak loss in July. CCI indicated 56.33 kg loss over 52 days, including both heat and cold stress. Heat stress caused maximum loss during mid-lactation, while cold stress affected early lactation. Milk yield declined beyond THI 71–75, with high and medium yielders more sensitive. Resilience traits showed low to moderate heritability (0.06–0.15) and positive genetic correlations with production traits. GEBVs estimated using ssGBLUP achieved 25.3–51.6% accuracy. ssGWAS identified multiple SNPs associated with heat and cold stress, implicating candidate genes ANAPC4, SMYD3, RGS6, SHH, TCAF1, and SYT6.

Kangayam and Tharparkar cattle exhibit higher duplications in innate immune genes than Sahiwal, Gir, Karan Fries, and Holstein Friesian, an insight from array comparative genomic hybridization

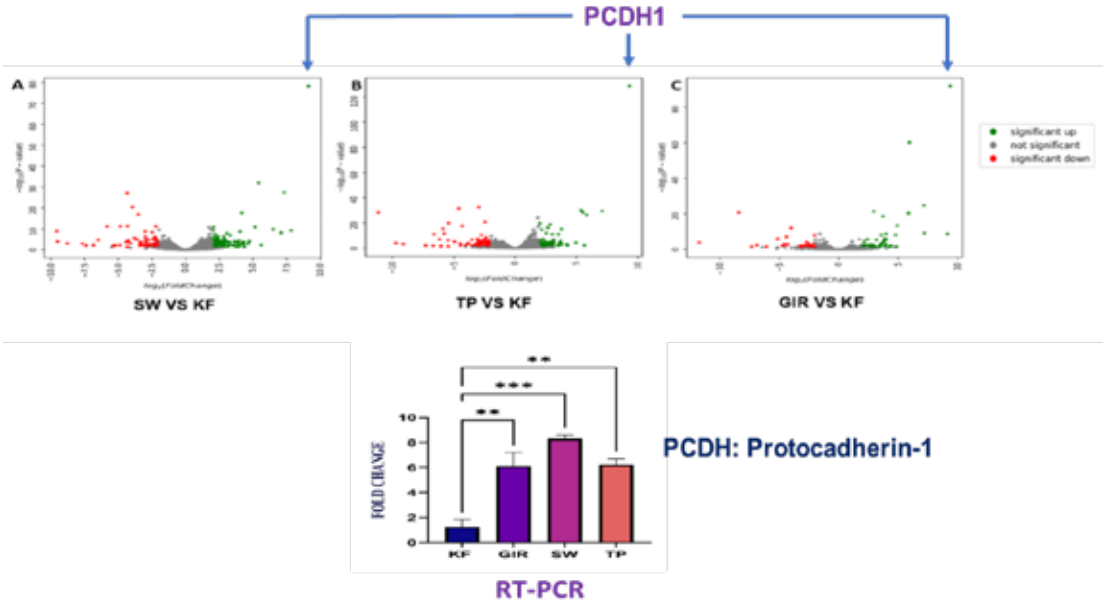
Innate immunity, the first line of defence, is influenced by genetic variation, including copy number variations (CNVs). This study used array comparative genomic hybridisation (aCGH) to assess CNVs in six cattle breeds—four indigenous (Kangayam, Tharparkar, Sahiwal, Gir), one crossbred (Karan Fries), and one exotic (Holstein Friesian, used as reference). Kangayam showed the highest gene duplications (1189), followed by Tharparkar (534), while Sahiwal had the most deletions (774). Notably, 183 and 76 innate immune genes were duplicated in Kangayam and Tharparkar, respectively, with key hubs such as TGF-β1, CD79A, and IL4. In contrast, Sahiwal exhibited deletions in 113 immune genes, including PSMC5, MAPK1, and AXIN1. Karan Fries and Holstein Friesian showed fewer immune-related CNVs. Functional analysis linked these variations to immune pathways like Th17 differentiation and Hippo signalling. Overall, indigenous breeds displayed greater genetic diversity, contributing to enhanced innate immune potential.



Copy number variation (CNV) distribution among six cattle breeds. Red, amplifications green, losses or deletions. TP: Tharparker; KNG: Kangayam; HF: Holstein Friesian; KF: Karan Fries; SW: Sahiwal; GIR: Gir

Protocadherin-1 (PCDH1), a distinctive innate immunity signature in the peripheral blood mononuclear cells of Sahiwal, Tharparkar and Gir compared to Karan Fries cattle

Gene expression in PBMCs underpins immune function. To explore molecular evidence of disease resistance, transcriptomic profiles of unchallenged PBMCs from indigenous cattle breeds—Sahiwal (SW), Tharparkar (TP), Gir (GIR)—were compared with crossbred Karan Fries (KF). A total of 259 genes were upregulated and 180 downregulated in indigenous breeds relative to KF. SW showed the highest number of upregulated innate immune genes (23), followed by TP (20) and GIR (5). Key genes such as PCDH1, LRP1B, CCL8, and WNT4—were consistently upregulated



Comparative Transcriptome profiling of Peripheral Blood Mononuclear Cells suggests PCDH1, LRP1B, CCL8 and WNT4 genes as distinctive innate immunity signatures in Sahiwal, Tharparker and Gir compared to Karan Fries cattle

across all indigenous breeds, with PCDH1 exhibiting >9-fold higher expression. Downregulated genes were most in TP (80), followed by SW (71) and GIR (29). Overall, the findings provide molecular evidence of stronger innate immune potential in indigenous cattle compared to crossbred KF.

Assessment of mitochondrial genome variability in relation to lactation performance in Indigenous Cattle

Building on earlier findings on mtDNA copy number, this study used complete mitochondrial genome sequencing (Illumina) in 40 indigenous cattle (Sahiwal, Gir, Tharparkar) across production groups. High-quality reads (63–96.7% mapping) enabled identification of SNPs in coding and regulatory regions. High-producing animals showed more conserved mitochondrial genomes, with predominantly synonymous variants in genes related to energy metabolism and oxidative phosphorylation. In contrast, low producers exhibited higher SNP density, including non-synonymous changes potentially affecting mitochondrial function. These results suggest that mitochondrial genome stability, rather than copy number alone, is more closely associated with milk production efficiency. The findings highlight the potential of integrating mitochondrial genomic information into breeding programs to improve productivity in indigenous dairy cattle.

Evaluating variations of feeding behaviours and their associations with production and reproduction performance of Jersey crossbred cattle

This study analyzed 24,751 sensor-based records of daily rumination and eating time from 70 Jersey crossbred lactating animals over three years. Data were standardized and validated using 24-hour CCTV-based manual observations. Average rumination and feeding times were 517.06 and 294.33 minutes/day in cows, and 485.35 and 283.53 minutes/day in heifers, respectively. Environmental factors such as year, season, parity, and genetic group significantly influenced these traits. Estrus reduced rumination and feeding time by 17% and 33%, while sickness caused reductions of 23% and 37%, respectively, compared to healthy animals. Moderate heritability (0.33–0.42) indicates good potential for genetic improvement of these behavioral traits alongside production traits.

Establishment of field-based conservation unit of Lakhimi cattle of Assam

The project demonstrated a community- and field-based approach for conservation and utilization of Lakhimi cattle of Assam. Genuine animals and farmers from Morigaon and Kamrup districts were identified, with phenotypic, production, and reproductive data recorded under field conditions. Performance was modest but consistent, with ~2.18 L/day milk yield, ~7.9 months lactation, and acceptable reproductive efficiency. The initiative enhanced livelihoods of 110 farmers through input support (feed, fodder, mineral mixture, medicines), health camps, and training programs, including a 7-day course at ICAR-NDRI-ERS, Kalyani. Farmers' knowledge in breeding, feeding, health care, and conservation improved significantly, with Lakhimi cattle contributing to income through milk and calf sales. Institutionally, the project strengthened linkages with KVKs and the Assam Government, influencing policy discussions and contributing to the Assam Dairy Conclave. Key recommendations included conservation pockets, community-based clusters, ex situ conservation, farmer incentives, and a dedicated breeding policy for Lakhimi cattle.

On-Farm Training on "Scientific animal husbandry practices for NEH states with special reference to Lakhimi cattle" organized at ERS-NDRI, Kalyani

Meeting on Dairy Development at Raj Bhawan, Assam on 5th Aug, 2025 (left), Conclave on Development of Dairy Sector of Assam, Guwahati during November 2-4, 2025 (right)

Characterization of native livestock and poultry population of West Bengal state

Surveys in North 24 Parganas and Birbhum districts of West Bengal identified a distinct non-descriptive cattle ecotype in the Sundarban region, termed Sundarbani cattle. These small, compact, and docile animals are well adapted to low-input coastal systems and are mainly reared by marginal farmers for draught power, manure, and subsistence milk production. Phenotypically, they show variable coat colours (white to blackish brown), black muzzle and hooves, straight horns, and strong legs suited to waterlogged conditions. Production is modest, with ~1.15 kg daily milk yield and ~300 kg per lactation, but milk quality is acceptable. Reproductive traits include delayed maturity and longer calving intervals, though fertility remains satisfactory under extensive management. Overall, Sundarbani cattle are valued for their endurance, draught ability, and resilience to heat, humidity, and feed scarcity.

Evaluation of genetic merit in Deoni cattle using emerging machine learning algorithms

This study analyzed 22 years (2002–2023) of first lactation data of Deoni cattle from ICAR-NDRI, SRS, Bengaluru. The least squares means for first lactation milk yield (FLMY) and lactation length (FLL) were 922.62 kg and 239.71 days, respectively. Machine learning models—ANN, KNN, Random Forest, and SVR—were evaluated for predicting breeding values using RMSE and R^2. For FLMY, SVR performed best (RMSE: 0.5842; R^2: 0.9057), while for FLL, SVR and ANN showed comparable performance, with SVR slightly superior. Overall, all models demonstrated good accuracy, highlighting the potential of machine learning for early selection of elite animals and improving efficiency in dairy breeding programs.

Dr. M. L. Jat, Secretary (DARE) & DG (ICAR) visiting Livestock Research Centre, ICAR-NDRI on 13.10.2025

INNOVATIVE APPROACHES IN MANAGEMENT OF DAIRY ANIMALS

Identification of heat stress-specific biomarkers to develop a biosensor for formulating mitigation strategies in high yielding dairy animals

Milk yield, quality, and mammary stress biomarkers were compared between Sahiwal and Karan Fries cows. Season and THI significantly ($p<0.05$) affected all traits. Although Sahiwal showed better heat tolerance, stress responses appeared beyond THI 79. Karan Fries cows were more adversely affected, with greater disruption in immunity and hormonal balance. Milk cortisol and Hsp90 were identified as reliable non-invasive stress biomarkers. Heat mitigation was evaluated in 84 Murrah buffaloes (THI 82.29–84.62) across seven groups (shade, mist+fan, shower, mud pool, water pool, pond, control). Infrared thermography, milk SCC, and cortisol were recorded. The shower system was most effective in reducing heat stress, followed by water pond and mist+fan. Muzzle and eye temperatures showed positive correlation with milk cortisol, indicating their utility as stress indicators.

Generation of milk somatic cell reference values and intelligent predictive modelling for monitoring mammary profile and milk quality of indigenous dairy animals

Milk samples were analyzed using Receiver Operating Characteristic (ROC) curves to assess the diagnostic accuracy of milk parameters—fat, protein, lactose, electrical conductivity (EC), and pH—for detecting subclinical mastitis (SCM), with SCC (>200,000 cells/ml) as the gold standard. Area Under Curve (AUC) values identified the best predictors, and optimal cut-offs for sensitivity and specificity were established. Higher AUC indicated better diagnostic performance. In a separate experiment, mixing high-SCC milk with low-SCC milk reduced overall quality. Solids-not-fat, minerals, and specific gravity declined, while EC and enzyme activity increased due to inflammation. Elevated SCC accelerated product deterioration, reducing shelf-life and negatively affecting flavor and texture, particularly in products like yogurt.

Effect of similar range of temperature humidity index during heat stress on physio- biochemical status and semen quality of buffalo bulls

Murrah buffalo bulls show poorer semen quality during hot-humid seasons due to impaired thermoregulation, reflected in altered stress biomarkers (RR, catalase, SOD, IL-10, skin and scrotal temperatures). This results in higher sperm abnormalities and reduced cryosurvival, highlighting the need for targeted heat-stress mitigation. In dairy animals, the Comprehensive Climate Index (CCI), which includes temperature, humidity, wind, and radiation, proved superior to THI in assessing thermal stress. Studies on Sahiwal, Tharparkar, Karan Fries, and Murrah across seasons showed peak stress in hot-dry periods, significantly increasing physiological responses ($p<0.05$) and reducing milk yield. Declines were most consistent in Tharparkar, while Sahiwal, Karan Fries, and Murrah showed progressive losses. CCI correlated better with physiological and thermal responses, capturing both acute and cumulative stress effects. Overall, CCI is a more reliable tool than THI for managing heat stress in Indian dairy species.

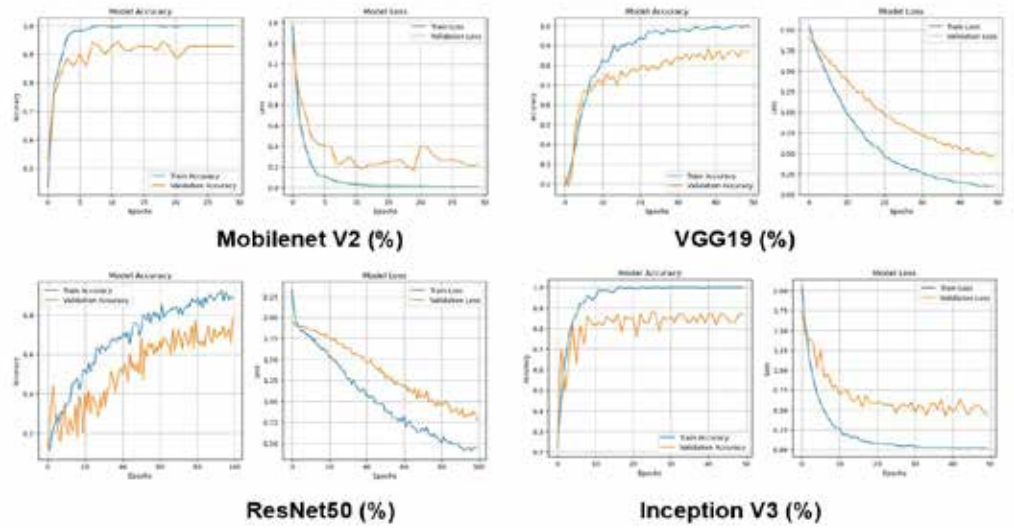
Impact of mango seed kernel and ramie on digestive physiology of rumen and enteric methane emission in Sahiwal heifers under heat stress

This study assessed seasonal climate effects and dietary interventions on physiological, biochemical, methane emissions, rumen fermentation, and metagenomic profiles in heat- stressed Sahiwal heifers. Sixteen animals split into control (standard ICAR 2013 diet) and treatment groups (50% fodder replaced with ramie grass + 3% DMI mango seed kernel powder) were monitored across hot-dry, hot-humid, and thermoneutral seasons. THI was calculated from daily temperature/humidity; physiological responses, blood, rumen liquor (VFA, ammonia-N), methane (respirometry chambers), and digestion trials were evaluated seasonally. Treatment significantly ($p<0.05$) lowered rectal temperature, respiration/pulse rates, eye/forehead surface temperatures, hemoglobin, RBC/WBC counts (no PCV change),

plasma glucose (increased), total proteins/albumin/globulin (decreased), cholesterol/triglycerides vs. control across seasons. Enteric methane dropped markedly (highest in thermoneutral), with higher VFA and lower ammonia-N in treatment. DMI peaked thermoneutral/lowest hot-humid, lower in treatment; nutrient digestibility (DM/OM/CP/ADF/NDF/EE) unchanged. Tannins in supplements inhibited methanogens, cutting emissions; polyphenols provided antioxidants, easing heat stress via cortisol modulation and rumen shifts.

Facial image-based biometric recognition for unique animal identification using machine learning (artificial intelligence)

This project developed a non-invasive facial image–based biometric system for unique cattle identification using AI/ML. A standardized image capture protocol (camera distance, angle, lighting, ROI) was established for both DSLR and smartphones. A large dataset (>24,000 images across age groups) was created and pre-processed through resizing, normalization, augmentation, and classification (full image, without ears, face-only, frontal face). Feature extraction and model evaluation included ML (HOG-based KNN, SVM, Decision Trees) and deep learning models (MobileNetV2, VGG19, ResNet50, InceptionV3). KNN performed best among ML models, while InceptionV3 and MobileNetV2 achieved >90% accuracy. InceptionV3 was optimal for full and with-ear images, whereas MobileNetV2 performed best for face-only and mobile scenarios. The study demonstrates that facial biometrics is a practical, reliable, and scalable method for cattle identification, with data quality and standardization being more critical than model complexity.



Comparative model accuracy and loss of different deep learning models for animal identification using machine learning approach

Non-genetic factors affecting placental morphology of Black Bengal goats

Black Bengal goats (N=82) were investigated for kidding and placental characteristics. Dams' age had no significant effect on placental characteristics ($P>0.05$). Season of kidding significantly influenced cotyledon numbers ($P<0.001$), cotyledonary surface area ($P<0.01$), and cotyledonary density ($P<0.05$). Summer kidding goats had 11.93% higher cotyledon numbers, 18.73% greater total cotyledonary surface area (TCSA), and 25% more cotyledonary density (CD) than winter. In multiple births, CD was 28.08% higher and placental weight 45% higher compared to single-offspring births, though cotyledon numbers were similar. Female sex positively influenced CD, though this requires further verification. Kid survivability was also associated with placental characteristics — dams with all kids survived had 11.14% higher cotyledonary diameter and 18.16% higher TCSA than those with at least one kid lost within 30 days post-natal. Offspring of does with TCSA>11000 sq mm showed 12.39% higher birth weight, 5.77% higher growth rate, and 8.87% higher body weight (1–90d) compared to does with TCSA≤11000 sq mm. A supplementary study on slatted flooring found that ante-natal self-exercise through raised flooring did not significantly influence placental morphological traits, placental efficiency, or cotyledonary efficiency in Black Bengal goats.

Evaluation of the efficacy of new device for diagnosis of subclinical mastitis in eastern region

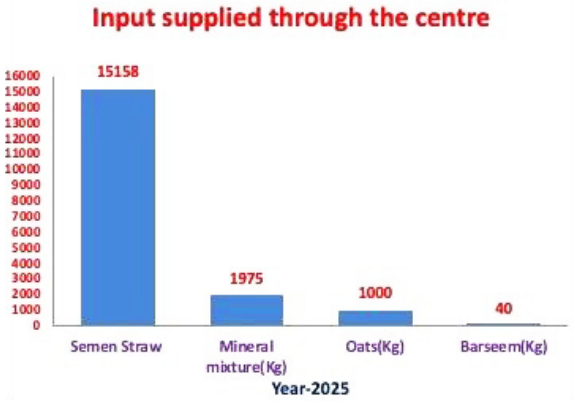
Mastitis, particularly subclinical mastitis (SCM), is a major economic disease in dairy cows of the eastern region, largely linked to management practices. This study evaluated 440 milk samples (200 from organized farms and 240 from field conditions in Nadia district) of Jersey crossbred cows to compare a new device for mastitis detection (NDMD) with established tests—DMSCC, CMT, and MWST. Results showed diagnostic

accuracy in the order: DMSCC > CMT > MWST > NDMD, with similar trends for sensitivity, specificity, and kappa values. In farm conditions, accuracy was 93.5% (CMT), 90.5% (MWST), and 71.5% (NDMD), while in field conditions it was 87.5%, 86.25%, and 62.5%, respectively. Despite lower accuracy, the sensor-based, handheld NDMD offers a practical cow-side tool and can serve as an alternative for SCM detection under both farm and field conditions.

Development of state-of-the-art dairy production systems using better housing and fertility management practices, climate change and its impact on livestock production

(Kisan Seva Kendra, ICAR-NDRI, Karnal, at Lalukheri (Muzaffarnagar, UP)

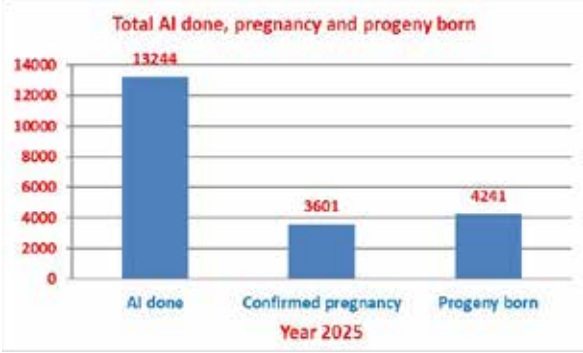
The ICAR-NDRI service centre at Lalukheri (Muzaffarnagar, UP) supports farmers by promoting genetic improvement and better dairy management practices. It supplies quality seeds of fodder and grain crops, mineral mixture, and frozen semen of buffalo, Sahiwal, Tharparkar, and crossbred cattle. Regular Kisan Gosthis create awareness on breed improvement, balanced feeding, mineral supplementation, and the use of AI with elite germplasm. As a result, demand for inputs has increased, superior calves have been born using high genetic merit semen, and notable improvements in milk production and fertility have been observed in the region.



Inputs supplied through Kisan Seva Kender, ICAR-NDRI, Karnal at Lalukheri Centre (Muzaffarnagar, UP) during the year 2025

Establishment of artificial insemination network for improving milk production potential of dairy animals in district Muzaffarnagar (UP)

The Ministry of Fisheries, Animal Husbandry and Dairying has sanctioned ₹8.5 crores to NDRI to expand the present services of the centre in 100 villages of district Muzaffarnagar. The main aim of the project is to improve breed of dairy animals by using semen of high genetic merit bulls for improving their milk yield and also make the farmers aware of adopting scientific dairy farming through Kisan Gosthies in adopted villages under the project and to get their cows and buffaloes inseminated with quality bulls' semen. Under this project, more than 13000 artificial inseminations (AIs) were performed and more than 3600 confirmed pregnancies were recorded in cows and buffaloes in the project adopted villages. So far more than 4200 progenies have been born during January to December 2025.



Progress of work done during year 2025 under artificial insemination (AI) Network project

Farmers in field under artificial insemination (AI) Network project

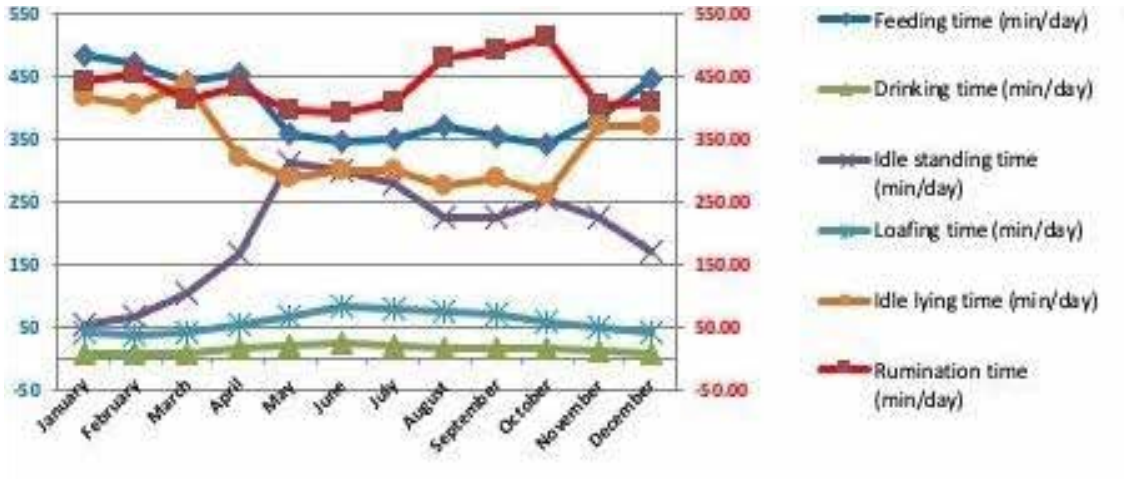
Circadian behaviours of loose housed lactating buffalo herd and their relationship with social dominance

Evaluation of baseline normal circadian behaviors round-the-year under man-made husbandry conditions serves as reference values and provides valuable insights for designing husbandry practices

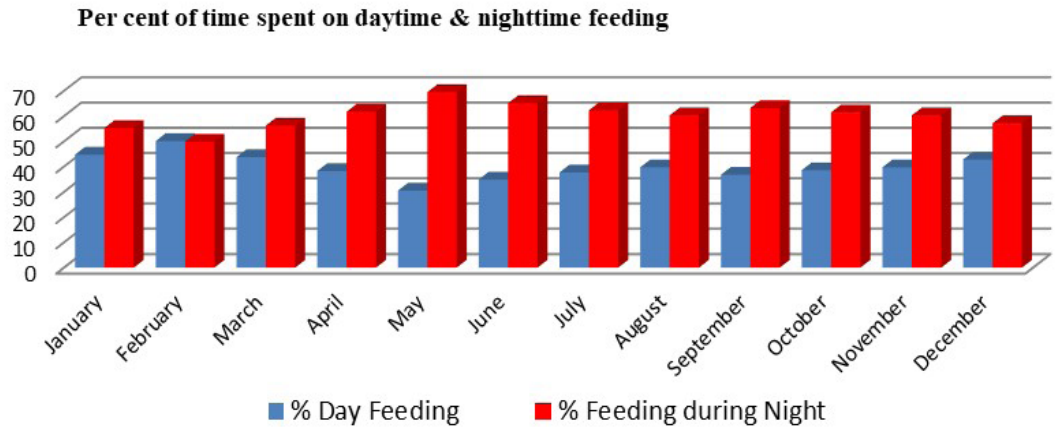
according to animal's behavioral needs. Furthermore, any deviation from normal behavioral repertoire helps in finding deficiency in management protocols and also helps in estrus and disease detection. The aim of this study was to investigate the circadian behaviors of loose housed lactating herd of buffaloes maintained at Livestock Research Centre of this institute. For this purpose feeding, rumination, water drinking and resting behaviors of an average 79 lactating Murrah breed of buffaloes (range: 69-117) loose housed in a single group were measured at fortnightly intervals throughout the year using CCTV cameras. Significance of difference in means of experimental variables were analyzed using one-way ANOVA using SPSS.

Feeding behaviour of buffaloes in relation to social ranking

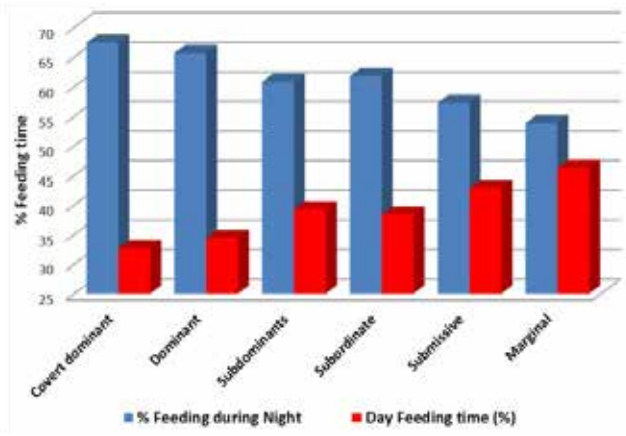
Overall mean daily feeding time (minutes/day) and feeding frequency was 399.03±8.11 (6.65 hours/day) and 10.03±0.832 which significantly (P<0.01) decreased in summer months (May-October: 358.97±5.63 to 340.52±9.77 minutes/day and July-October: 6.35±0.42 to 5.22±1.27 bouts/day). Mean daily manger visits were 11.08±0.75 which increased (P<0.01) from November (10.79±0.72) to April (13.06±0.64). Mean day and night feeding time was 160.75±6.74 minutes (2.68 hours/day) and 238.27±6.98 minutes (3.97 hours/day) which varied (P<0.05) in summer and winter months. The social status of buffaloes significantly influenced the day and night time feeding times of buffaloes with dominant buffaloes spending more time on feeding during night hours than the socially submissive and marginal buffaloes. Feeding, rumination & resting times were lower in summer months. Feeding & rumination was more during night in summers. Resting time was lower than the desired 12 hours a day.



Average daily feeding, rumination and resting time of lactating buffaloes over different months throughout the year with different social ranking



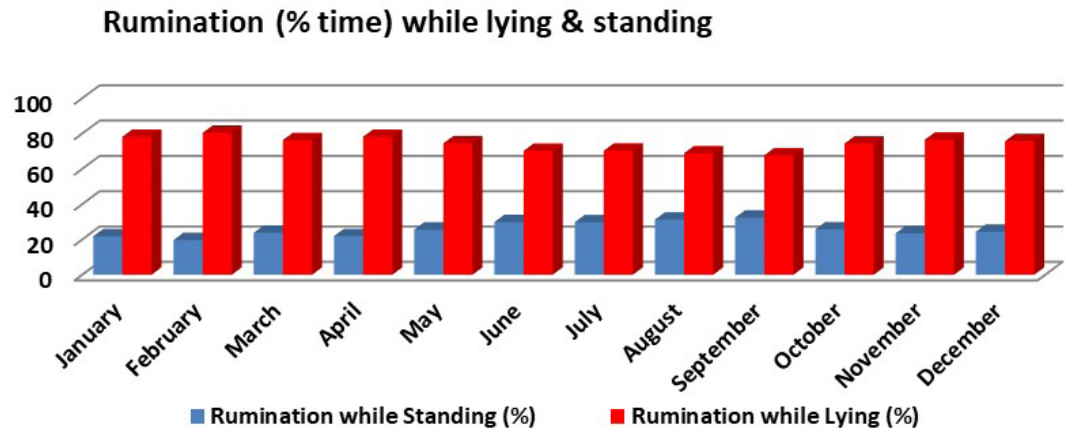
Average daily per cent of time during daytime feeding and night time feeding by lactating buffaloes over different months throughout the year with different social ranking



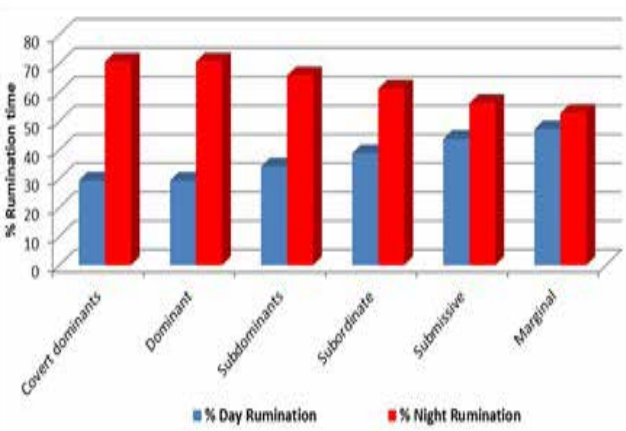
Average daily per cent of time during daytime feeding and night time feeding by lactating buffaloes with different social ranking

Rumination behaviour of buffaloes in relation to social ranking

Mean rumination time (minutes/day) was 435.43±9.39 (7.25 hours/day) of which 74.21% was in lying (322.85±7.13) and 25.79 % in standing position (112.57±6.945). Mean drinking time (minutes/day) and frequency/day (14.04±4.38 and 11.52±0.78) increased significantly ($P<0.05$) during summer months (23.28±8.14 and 19.58±1.95). Rumination in lying position was lower and standing position higher in heat stress period during the months from May to September. Covert dominant, dominant and subdominant buffaloes did most of rumination during night time in resting position indicating better effectiveness of rumination in these buffaloes.



Average daily per cent of rumination time of buffaloes while standing and lying over different months throughout the year



Average daily per cent of rumination time during day and night of buffaloes with different social ranking

Performance of lactating buffaloes in different social rank categories

There was a significant association of social dominance of buffaloes with their daily milk yield. The highest daily milk yield (8.46 kg) was recorded in buffaloes which were socially dominant and were in more than fourth lactation and were about 8 years of age followed by subdominant buffaloes (6.67 kg). The subordinate (5.24 kg) and submissive (5.47 kg) buffaloes which were in 2-3 parity and 6-7 years of age produced the lowest amount of daily milk yield.

Milk yield of buffaloes in relation to their social rank category, age and parity

Category	Age (years)	Parity	Days in milk	Milk yield (kg)
Dominant	8.13±1.02	4.25±0.75	190.25±51.67	8.46±0.73
Subdominant	8.46±1.11	3.88±0.73	198.33±22.90	6.78±0.78
Subordinate	6.80±0.42	2.66±0.33	251.38±18.35	5.24±0.57
Submissive	6.07±0.56	2.15±0.37	217.60±19.78	5.47±0.48
Marginal	5.77±0.93	1.60±0.40	137.00±43.17	6.46±0.17

Livestock mobility and resource management: A case study of migratory herders in Goras, Madhya Pradesh

The primary and secondary data on existing production system and migration pattern was collected from 120 pastoralists from the Goras region of Madhya Pradesh. All the farmers are rearing Gir type cattle and having fully grazing system. Limited availability of green fodder was observed, and no one providing concentrate and mineral mixture to their animals. Natural breeding system is being adopted. Vaccination and deworming of animals was almost neglected. It was observed that the calving interval was 391 ± 46 days with the service period of animals was 155 ± 37 days. Repeat breeding, non-availability of high pedigree semen, shortage of green fodder, lack of balanced nutrition and infestation of parasites were the major problems found in the study area. The herd travelled about 11.5 km per day and covered about 1493 km per migration cycle. The study highlights strong ecological dependency, adoptive response to low milk yield and structural limitations of pastoral livelihoods in the Goras region.

Photos showing cattle housing and milking practices in the Goras area

Effect of combined Chaya and Moringa enriched pellet supplementation on nutrient intake, utilization and performance of Barbari goats.

The present study was conducted on 27 lactating Barbari goats. The control group received conventional pellets, while the T1 and T2 groups were supplemented with pellets enriched with Moringa and Chaya at 8% and 12%, respectively, for a period of 90 days. The results showed a significant increase in dry matter intake in the supplemented groups, with improved nutrient utilization. Milk yield was significantly higher with enhanced milk quality, i.e. the milk fatty acid profile by increasing monounsaturated and polyunsaturated fatty acids (MUFA/PUFA) while moderating certain saturated fatty acids (SFA), thereby improving the nutritional value of the milk. SDS-PAGE analysis confirmed qualitative improvements in milk protein fractions, and LC-MS analysis revealed a higher number of milk proteins in T2 and T1 groups compared to control.

Normal pellet feeding to the goats (a) control group (b) Moringa & Chaya pellet feeding in treatment group

Studies on natural wallowing behaviour and its effect on growth performance of Murrah buffalo heifers.

Managing buffaloes during heat stress is crucial, as it directly affects productivity. An experiment was conducted to study the effects of wallowing on the growth performance, feed intake and physiological response of Murrah buffalo heifers during May to October. The heifers of treatment were given 24 hrs accesses to pond for wallowing. Physiologically, wallowing animals exhibited lower heat stress markers including reduced rectal temperature, respiration rate, pulse rate, and lower cortisol levels, while growth hormone and reproductive hormones were significantly elevated; indicating improved metabolic and reproductive status. Feeding time was higher in wallowing heifers than control. Wallowing markedly improves the behavioural comfort of Murrah buffalo heifers, as evidenced by marked increase in ingestive behaviour in the wallowing group compared to control heifers. These changes indicate better welfare, greater comfort in the hot environment, and more efficient utilization of time for feed intake and rumination rather than passive heat-stress–related inactivity.

Wallowing Murrah heifers in the pond

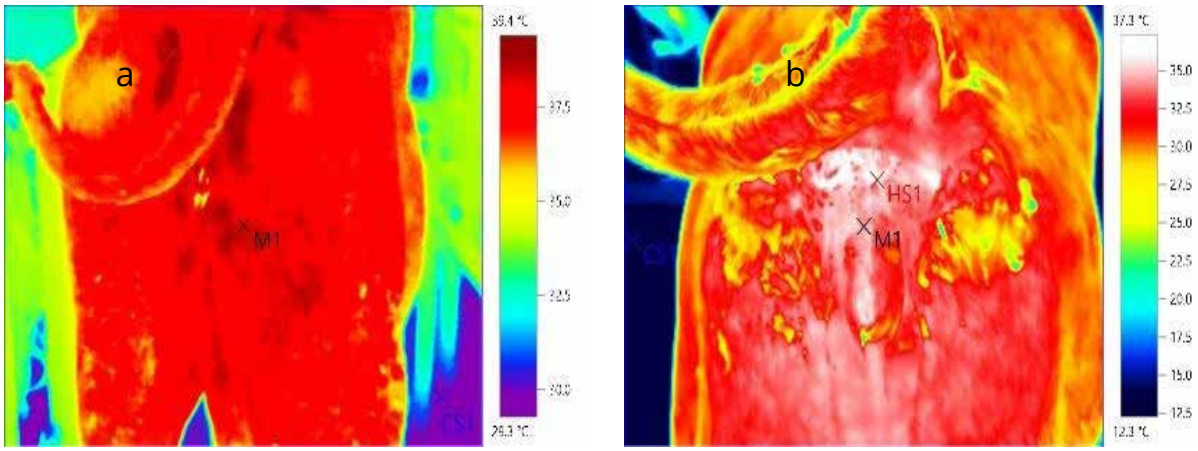
ICAR-Network Programme on Precision Agriculture (NePPA): Developing precision livestock farming systems using sensors and artificial intelligence

This study evaluated behavioral, physiological, and hormonal changes in Murrah buffaloes under two prepartum bedding systems (straw vs. rubber mats). Thirty animals were monitored 10 days before calving using CCTV and daily physiological recordings. Lying time declined by ~15.5–15.7% on calving day but remained higher in straw-bedded animals. Lying bouts increased sharply (87.6% straw; 105.9% rubber), along with head-to-abdomen and tail-raising frequencies (>140–200%), indicating imminent parturition. Feeding and rumination times decreased (up to ~38% and 30%), while standing time increased (~21–23%). Physiological changes such as sacrosciatic ligament relaxation and teat engorgement peaked on calving day. Overall, straw bedding improved welfare, with higher lying, feeding, and rumination times and lower stress (cortisol), compared to rubber mats.

Recording of behavioural parameters of buffaloes using CCTV

Identification of estrus using infrared thermography in crossbred cows

This study evaluated infrared thermography (IRT) as a non-invasive method for estrus detection in crossbred cattle using 110 estrus cycles. Estrus was confirmed through behavioral signs, cervicovaginal mucus, and progesterone assays. IRT images of the eye, muzzle, and vulvar surface were recorded, with vulvar images used to train a CNN model. Temperatures were highest during estrus: rectal (101.27°F) and vulvar (101.83°F), while IRT readings for eye (99.77°F), muzzle (91.21°F), and vulva (100.91°F) exceeded non-estrus values. Threshold temperatures for estrus detection were established. The CNN model based on vulvar IRT achieved 91.49% precision in identifying estrus. Overall, IRT combined with deep learning provides an accurate, non-invasive approach for estrus detection in dairy cattle.



Infrared thermography images of vulavar surface during estrus phase (a) and non-estrus phase (b)

Behavioural indicators for prediction of parturition in Sahiwal cows

Accurate prediction of onset of calving in dairy cows is crucial for providing appropriate care and management interventions to the cow and the calf. Behavioural indicators play a crucial role in predicting ensuing parturition in cows, as they provide early, non-invasive signals of the onset of calving. Therefore, behabioural analysis during prepartum period was carried out in Sahiwal cows. It revealed significant changes in lying bouts, standing bouts, tail raising, turning head towards abdomen, rumination time and eating time as calving advanced. Lying bouts, standing bouts and tail raising frequency significantly increased from 96 hours before calving and showed high accuracy (>90%) for prediction of calving within 24, 6 and 1hour.

Biochemical indicators for prediction of parturition in Sahiwal cows

Serum biochemical parameters can serve as reliable physiological markers for predicting impending parturition in cows, as they reflect the endocrine, metabolic, and electrolyte changes associated with the onset of calving. Therefore, biochemical parameters including hormones such as progesterone, glucose and Chloride ion were estimated in serum samples in relation to calving in Sahiwal cows. Serum progesterone concentration significantly reduced from day 5 to day of calving and optimal concentration was 1.615 ng/ml to predict calving within 12 hours in Sahiwal with 100%, accuracy & sensitivity and 63.33% specificity. Serum glucose concentration progressively increased in serum as parturition advanced and significantly higher levels reached on the day of calving and optimal concentration was >73.9 mg/dL to predict calving within 12 hours in Sahiwal cows with >90% accuracy, sensitivity and specificity. Similarly, serum chloride (Cl^-) concentration showed an increasing trend as parturition approached and highest level was observed on the day of calving and optimal conc. was ≥106.5 mmol/l to predict calving within 12 hours with accuracy 91%, sensitivity of 100 % and specificity of 72.5 % in Sahiwal cows.

Effect of Moringa and Chaya mixed pellets on the growth performance and haematological parameters of Barbari kids

Twenty-four Barbari kids were randomly assigned to three groups: T0 (control, 100% concentrate), T1 (8% concentrate replaced with Moringa–Chaya pellets at 4:4), and T2 (12% replacement at 6:6). Dry matter intake (DMI) increased significantly ($p<0.05$) with supplementation (T0: 409.1; T1: 426.5; T2: 458.2 g/day), with higher DMI per 100 kg body weight in T2. Final body weight was highest in T2 (10.01 kg), ~12% above control. Improved performance in T2 was attributed to better digestibility, intake, and rumen fermentation. Hemoglobin and erythrocyte counts were significantly higher in T1 and T2, while leucocyte count declined with increasing supplementation. Packed cell volume (PCV) also increased significantly over time, with the highest values in T2, indicating significant effects of diet, duration, and their interaction.



Moringa leaves (a) and Chaya leaves (b) preparation for pellet preparation (c)

Effect of heat stress on semen attributes

Study revealed that there was no significant difference in semen volume in experimental bulls. The volume of semen was lower in affected bulls (2.7±0.049 ml) in comparison to unaffected bulls (3.4±0.68 ml). The volume of comfortable bulls was 3.4±0.92 ml in winter season, which was similar to unaffected bull (summer season). Concentration (10^6/ml) was higher in comfortable bulls (1521.00±273.7) in comparison to unaffected bulls (1082.40±188.2), however, difference was non-significant. There was no significant difference in affected (1068.40±209.9) and unaffected bulls (1082.40±188.2). Mass activity ranged from 2.6±018 (affected and unaffected bulls) to 2.8±0.12 (comfortable bulls). Progressive motility (%) also non-significant and ranged from79.0±3.31 (affected bulls) to 85.0±3.87 (comfortable bulls). HOST (%) was lower in affected bulls (78.2±1.85) in comparison to unaffected bulls (80.1±3.84) and comfortable bulls (83.8±3.08). Acrosome Integrity (%) was significantly lower ($p<0.05$) in unaffected bulls (80.7±2.55) as compared to affected bulls (87.8±1.15). Acrosome integrity (%) was significantly higher in comfortable bulls (88.0±0.93) as compared to unaffected bulls (80.7±2.55).

Proteomic profiling of seminal plasma

Proteomic analysis of seminal plasma revealed a total of 1222 protein and 8375 peptides across the three bull groups. Notably, 1171 proteins were detected in heat-stress affected bulls (77 unique), 1068 proteins in unaffected bulls (8 unique), and 1112 proteins in bulls from the comfort season (38 unique). This highlight both shared and distinct proteomic signatures associated with thermal stress conditions. The venn diagram analysis revealed 78, 8 and 39 proteins uniquely expressed in heat stress affected, unaffected and comfort groups, respectively. In affected vs comfort groups; some of the important proteins upregulated between 3.8 to 1.5 log fold change were NAGA, GIPC2, PLCZ1, PRKAR1B, SPADH1, IZUMO4, ANXA1. In unaffected vs comfort groups; some of the important proteins upregulated between 2.4 to 2.2 log fold change were; DEFB122A, PABPC1L, PRCP, LYZL6, ACRV1.

Automated individual identification of dairy animals using computer vision and deep learning approach

A large muzzle image dataset of Sahiwal cows (n=500) comprising 10,000 annotated images was developed using smartphone images captured under natural conditions. Data were split into 80% training and 20% testing. The YOLOv8n model achieved high detection performance (mAP@50: 0.995; mAP@50–95: 0.759) for muzzle localization. For individual identification, three CNN backbones—VGG16_BN, Wide_ResNet50_2, and ViT-B_16—were used, with only custom classification layers trained. Testing accuracies were 98.14%, 98.67%, and 99.15%, respectively. Real-time testing showed >95% accuracy across models in open-set conditions. A hybrid mobile application, "Bovine Biometrics," integrating all three models was developed, demonstrating a scalable, non-invasive, tamper-proof system for permanent cow identification, supporting precision livestock management, traceability, and insurance applications.

(a) (b)

Collected muzzle images (a) raw images (b) labelled images of Sahiwal cows

A machine learning approach to assess gait kinematics for prediction of lameness in crossbred cattle

Linear mixed model analyses were performed to evaluate the effects of lameness, age group, and limb category on gait kinematics in crossbred cattle, with repeated fortnightly measurements and individual animals included as random effects. Middle-aged cattle exhibited the greatest stride length, followed by older and young animals. Significant interactions between age and mobility status were observed for step length ($p=0.025$) and overlap ($p<0.001$), indicating age-dependent alterations in gait among lame animals. Lameness increased step length in middle-aged cattle but slightly reduced it in older cattle. Similarly, lameness reduced overlap in middle-aged cattle but markedly increased it in older cattle. Age group ($p<0.001$) and mobility status ($p=0.025$) significantly influenced step width, with older and lame cattle showing wider steps, reflecting compensatory locomotor adjustments. Step angle was significantly lower in older cattle compared to young and middle-aged animals ($p<0.05$). These findings highlight the influence of age and lameness on gait dynamics and provide critical baseline information for developing objective lameness detection and welfare assessment protocols in crossbred cattle.

Assessment of N-acetylcysteine-amoxicillin combination therapy against bovine mastitis pathogens: *in vitro* and *in vivo* findings

The synergistic efficacy of N-acetylcysteine (NAC) in combination with amoxicillin was evaluated through both *in vitro* and *in vivo*. The *in vitro* antibacterial activity against major mastitis pathogens *Staphylococcus aureus* and *Escherichia coli* was determined using the minimum inhibitory concentration assay, and synergism between NAC and amoxicillin was confirmed by the checkerboard method. A reduction of 25-75% in the effective amoxicillin dose was observed in combination with NAC. *In vivo* evaluation was performed in Holstein Friesian cows diagnosed with mastitis. The control group received conventional amoxicillin therapy, while the treatment group was administered (intra muscular) a 25% reduced dose of amoxicillin in combination with NAC (4.5 mg/kg body weight), on the basis of *in vitro* findings. The combined therapy effectively mitigated clinical signs of mastitis and exhibited an enhanced antibacterial response. Furthermore, analysis of milk parameters, including solids-not-fat, protein, and fat content, Electoral conductivity revealed favourable improvements in the treatment group, indicating that the combination regimen was therapeutically efficacious.

In vitro and *in vivo* evaluation selenium (Se)-curcumin nano conjugate in subclinical mastitis (SCM)-affected cows

Se–curcumin nano conjugate was synthesized using a chemical reduction method and characterized by SEM-EDX, DLS, UV spectroscopy, FTIR, and XRD. SEM revealed an average particle size of ~112 nm, while EDX, FTIR, and XRD confirmed the presence of selenium and curcumin. The nano conjugate showed higher stability (zeta potential −33.74 mV) compared to raw curcumin (−12.58 mV). Although raw curcumin exhibited higher in vitro antioxidant activity, the nano conjugate demonstrated superior anti-inflammatory and antimicrobial properties. In SCM-affected cows, supplementation with curcumin, sodium selenite, and the nano conjugate for 28 days significantly ($P<0.01$) reduced CMT scores, milk somatic cell count, and bacterial load compared to control. Additionally, sodium selenite and nano conjugate groups showed increased blood selenium and glutathione peroxidase (GPx) levels, upregulation of selenoprotein P and GPx, and downregulation of inflammatory genes (NF-κB and IL-1β) in the mammary gland. Overall, the Se–curcumin nano conjugate exhibited enhanced stability and superior therapeutic efficacy compared to curcumin in managing subclinical mastitis.

ANIMAL REPRODUCTION AND FERTILITY

Development of a rapid method for diagnosis of bovine subclinical ketosis using microfluidics paper-based analytical device

Subclinical ketosis (SCK) is a common metabolic disorder in transition dairy cows, causing economic losses through reduced milk yield and impaired reproduction. Early diagnosis is essential, yet existing laboratory and cow-side tests are often slow, costly, or insufficiently accurate. This study developed and validated a low-cost microfluidics paper-based analytical device (µPAD) for rapid on-farm detection of acetoacetate in bovine plasma. The cellulose-based µPAD generated a visible colorimetric response within 1–2 minutes, showing excellent agreement with a commercial assay ($r \approx 0.99$). Diagnostic evaluation of 1247 samples demonstrated high sensitivity (96.9%) and specificity (99.1%). Costing only ₹1.08 per test, the µPAD provides a simple, reliable tool for early SCK diagnosis.

Development of microfluidics sperm sorter device (MFSS) for enrichment of healthy bovine spermatozoa

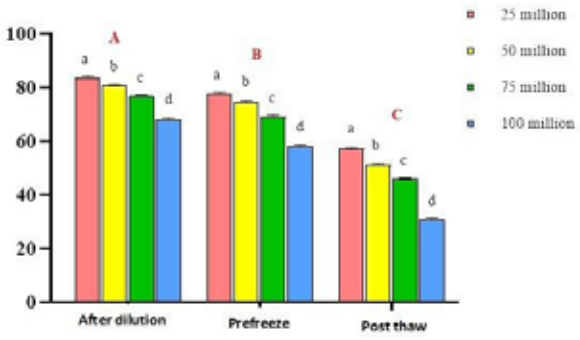
A microfluidics sperm sorter device (MFSS) was developed to enrich healthy bovine spermatozoa. Three-dimensional MFSSs with four zigzag outlets connected to a single inlet were fabricated using soft lithography and 3D printing. Polydimethylsiloxane (PDMS) channels were cast, cured, and plasma-bonded to glass slides. Fluorescently stained semen (8 µL) was incubated at 37 °C for 30 minutes. Post-incubation analysis showed superior sperm quality in outlets, with 92% motility and 1.2% abnormalities, compared with 70% motility and 10.6% abnormalities at the inlet.

Designing, synthesis and efficiency of novel bovine specific KP-10 analogues

Four bovine-specific kisspeptin-10 (bKP-10) analogues were rationally designed using structural modification and *in silico* modeling and subsequently synthesized. Their efficacy was evaluated against human KP-10 and GnRH analogues based on endogenous gonadotropin release. Bovine-specific KP-10 induced superior LH responses compared with hKP-10 and GnRH analogues. In crossbred cows, one analogue at 0.50 µg/kg body weight produced a prolonged (>8 h) and higher-amplitude LH response than natural bKP- 10, highlighting its potential for fertility enhancement in livestock. A low-cost, sensitive and user-friendly microfluidics paper-based analytical device (µPAD) integrated in web app based on bovine plasma acetoacetate for rapid on-farm detection of subclinical ketosis has been developed. A microfluidics sperm sorter device (MFSS) for enrichment of healthy bovine spermatozoa has been developed.

Reproductive management in dairy cows

Artificial insemination (AI) in small ruminants requires optimization of sperm dose due to limited semen volume and cervical deposition. This study evaluated 25, 50, 75, and 100 × 10^6 sperm/dose in Bengal goats using 144 ejaculates. Post-thaw sperm quality declined with increasing concentration; the 25 × 10^6 group showed the best motility, membrane integrity, and lowest oxidative stress. However, field fertility (400 does, 60-day non-return) was lowest at 25 × 10^6 (35.55%) and highest at 100 × 10^6 (67.34%). Thus, despite better in vitro quality at lower doses, 100 × 10^6 sperm/dose is recommended for higher conception rates with single cervical AI.

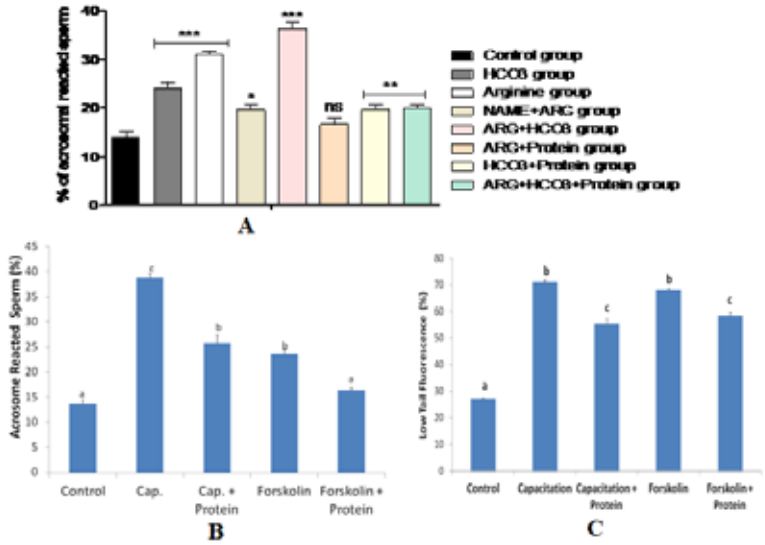


Sperm motility at various stages of cryopreservation in Black Bengal buck preserved with different sperm concentrations per dose

Effect of buffalo CRISP-1 on sperm capacitation signaling

Sperm capacitation was assessed by acrosome reaction (AR) using Giemsa staining. Capacitation was successfully induced in buffalo sperm by L-arginine and HCO_3-. Inhibition of nitric oxide synthase with

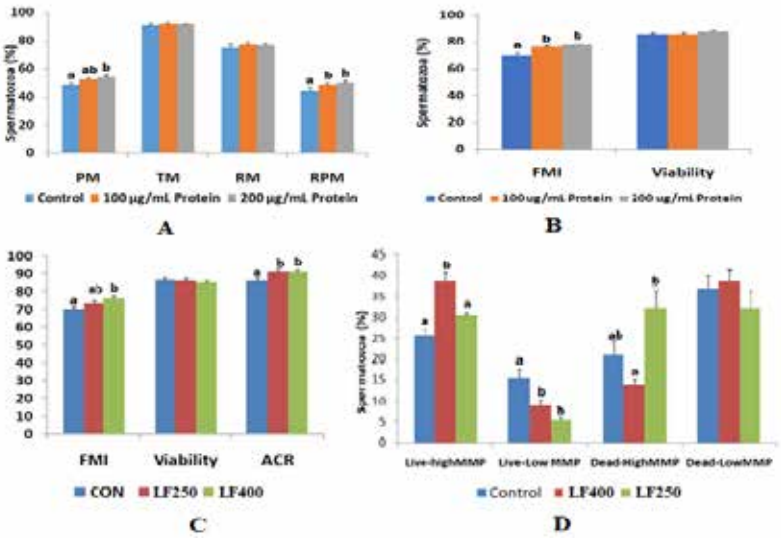
L-NAME significantly reduced ($P < 0.05$) L-arginine-mediated capacitation. Recombinant buffalo CRISP-1 significantly reduced ($P < 0.05$) sperm capacitation induced by L-arginine, HCO_{3-}, or their combination. Intracellular Ca^{2+} levels were measured using Fura-2 fluorescence. CRISP-1 increased fluorescence intensity in the sperm tail in HCO_{3-}/L-arginine- and forskolin-treated samples compared with treatments alone, indicating altered Ca^{2+} dynamics during capacitation. The percentage of acrosome-reacted sperm increased significantly in capacitation medium and in the presence of 10 µM forskolin compared to control (spTALP). However, addition of CRISP-1 peptide significantly reduced acrosome reaction in both capacitation and forskolin-treated samples, suggesting inhibition of the adenylyl cyclase/cAMP pathway.



Effect of recombinant buffalo CRISP-1 protein on capacitation-associated cell signaling; A: L-Arg/HCO_3^- mediated capacitation, B: Adenylyl Cyclase/cAMP signaling and C: Ca^{2+} signaling; Sperm capacitation was induced either by 10mM L-arginine or 25 mM $NaHCO_3$ or both in presence or absence of 20µg/mL recombinant buffalo CRISP-1 peptide; Control: capacitation media; L-NAME: specific inhibitor of nitric oxide synthase; Forskolin: 10 µM Forskolin in spTALP; Forskolin + protein: 20µg/mL CRISP-1 peptide and 10 µM Forskolin in spTALP

Effect of lactotransferrin on liquid preservation of buffalo semen

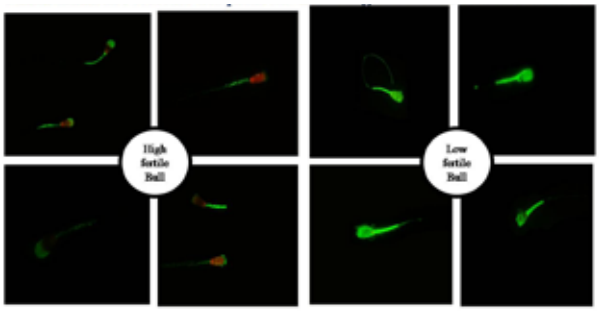
Buffalo cauda epididymal origin lactoferrin (LF) was purified and tested at 100µg/mL in semen extender during liquid preservation of buffalo semen. LF significantly increased both progressive motility and functional integrity of sperm membrane following liquid-preservation of buffalo semen. Then lactoferrin purified from cow milk was also assessed in liquid preservation of buffalo semen. A significant increase in acrosomal integrity (ACR), functional membrane integrity (FMI) and live sperm having high mitochondrial membrane potential (live-high MMP) was observed in presence of 400 µg/mL milk lactoferrin.



Effect of lactoferrin (LF) on liquid preservation of buffalo semen, effect of epididymal origin LF on A: sperm motility and B: functional membrane integrity (FMI) & viability; effect of bovine milk LF on C: sperm viability, acrosome (ACR), FMI and D: mitochondrial membrane potential (MMP)

Quantification of PDC-109 protein in seminal plasma of bulls with differential freezability, fertility and with respect to seasonal changes using in-house developed sandwich ELISA

PDC-109, a major seminal plasma protein, regulates sperm function but exerts negative effects at higher concentrations. This study quantified PDC-109 in Sahiwal and KF bulls and assessed its association with semen freezability, season, and fertility. PDC-109 levels differed significantly ($P<0.05$) between good and poor freezable ejaculates, across seasons, and between high- and low-fertility bulls. Poor freezable semen consistently showed higher PDC-109 levels than good freezable semen in both breeds, with markedly higher concentrations in winter than summer. Similarly, low-fertility bulls exhibited substantially higher PDC-109 concentrations compared to high-fertility bulls. ROC analysis established threshold values for semen quality: ≤2.23 (winter) and ≤0.73 mg/ml (summer) in Sahiwal, and ≤1.862 (winter) and ≤0.23 mg/ml (summer) in KF bulls, with high accuracy and sensitivity. Fertility cut-offs were ≤139.7 µg/ml (KF) and ≤80.74 µg/ml (Sahiwal), both showing 100% accuracy, sensitivity, and specificity. Immunofluorescence revealed distinct localization patterns: in high-fertility bulls, PDC-109 was mainly localized to the midpiece and acrosomal region, whereas in low-fertility bulls it showed broader and more intense binding, including post-acrosomal regions, indicating loss of spatial specificity. Overall, elevated PDC-109 concentration and altered localization are associated with poor semen quality and reduced fertility, supporting its use as a reliable biomarker in bulls.



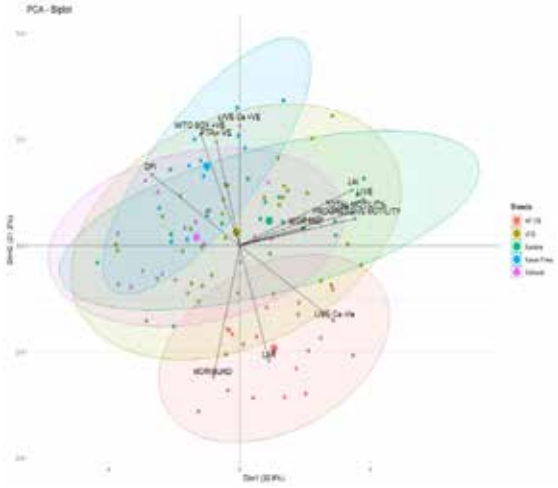
Localisation of PDC-109 on sperm surface using indirect immunofluorescence

Unveiling the reproductive risks of PFOS: testicular proteome disruption and hormonal imbalance in male rats

Male infertility has been linked with exposure to endocrine-disrupting chemicals, including exposure to the PFAS compound PFOS was evaluated in pre-pubertal male rats to understand its effects on male reproduction. Rats exposed to 10 and 50 µg/mL PFOS for 21 days showed no visible changes in testicular histology, but serum testosterone was significantly reduced at the higher dose ($P<0.05$). Proteomic analysis identified substantial alterations, with dose-dependent changes in protein expression (more pronounced at 50 µg/mL). Differentially expressed proteins were enriched in key reproductive processes such as chromatin organization, nucleosome assembly, translation, and spermatogenesis. Overall, PFOS disrupts testicular protein expression and reduces testosterone, potentially impairing male fertility despite no histological changes.

Sperm phenome-based fertility prediction models for zebu (*Bos indicus*) and crossbred (*Bos taurus* X *Bos indicus*) cattle bulls

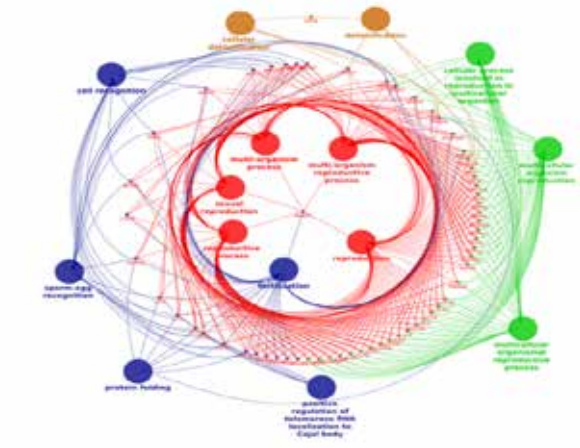
This study evaluated sperm quality parameters in 106 bulls of different breeds to identify fertility predictors. Results showed that relationships between sperm traits and fertility are breed-specific. Multivariate analysis revealed distinct clustering of indigenous and crossbred cattle. Key predictors varied by breed: Holstein Friesian crossbred (91% accuracy), Jersey crossbred (61%), Sahiwal (89%), Karan Fries (86%), and Kankrej (41%). Overall, different sperm parameters explain fertility across breeds, and breed-specific models can effectively distinguish high- and low-fertility bulls.



Principal Component Analysis for the sperm quality parameters across indigenous and crossbred cattle

Comprehensive proteomic profiling and functional network analyses of indigenous Zebu (*Bos indicus*) cattle spermatozoa

This study characterized the sperm proteome of indigenous Deoni (Bos indicus) bulls using high-throughput mass spectrometry, identifying 1441 proteins, of which 12% were secretory. Key abundant proteins associated with fertility were detected. Functional analysis showed involvement in spermatogenesis, motility, capacitation, and sperm–egg interaction, with enrichment in metabolic and oxidative phosphorylation pathways. Overall, the study provides a comprehensive proteomic reference for understanding fertility mechanisms and conserving zebu cattle genetic diversity.



Functional network analyses of indigenous Zebu (Bos indicus) cattle spermatozoa

Letrozole: a non-steroidal aromatase inhibitor on ovarian function in buffaloes

This study evaluated a Letrozole-based estrus synchronization protocol in multiparous Murrah buffalo. Letrozole treatment significantly increased dominant follicle growth and preovulatory follicle size, with no effect on hormone levels or estrus intensity. Ovulation (85.7% vs 57.1%) and pregnancy rates (57.1% vs 14.3%) were higher in treated animals compared to controls. Overall, the Letrozole+$PGF_2\alpha$+GnRH protocol shows promise for improving reproductive efficiency, though larger field validation is needed.

Series of transvaginal ultrasonographic images showing dominant follicle growth to till ovulation in Letrozole (aromatase inhibitor) treated buffaloes

Validation of progesterone loaded nanofiber based polyurethane sponge system for estrus synchronization in dairy cattle

This study developed an electrospun zein nanofiber system for intravaginal delivery of progesterone (P4) to improve its bioavailability and controlled release. In vivo evaluation in Deoni and HF crossbred cattle (n=22) using 0.7 g P4-loaded PU sponges showed high retention (83–88%), clear cervical mucus, and effective estrus behaviour. Estrus synchronization/induction efficiency and AI coverage reached 100%, comparable to CIDR. The results indicate that nanofiber-based P4 delivery is a safe, cost-effective, and promising alternative for reproductive management in cattle.

Application of intra-vaginal progesterone sponges and estrus signs in treated cattle

Effect of feed supplement mixture in mitigating vaccination stress on semen quality of Buffalo bulls

Present study was conducted to evaluate the effects of feed supplement mixture on seminal and biochemical attributes of FMD vaccinated buffalo bulls. Experimental feeding in both control and supplemented group was done for total l2 weeks duration. Supplemented group was provided with feed supplement mixture containing Vitamin E, Curcumin, Betaine, Zn and Flaxseed along with basal diet. After one months of experimental feeding, both groups were vaccinated with RAKSHA-OVAC TRIVALENT vaccine. Results of the present study indicated that sperm concentration, mass activity, individual motility, post thaw motility, sperm viability, plasma membrane integrity and mitochondrial membrane potential of semen were significantly ($P<0.05$) higher in supplemented group of bulls compared to control. It can be concluded that the feed supplement mixture ameliorates the adverse effects of vaccination stress in animals and could be a beneficial and novel strategy particularly for animals during vaccination stress.

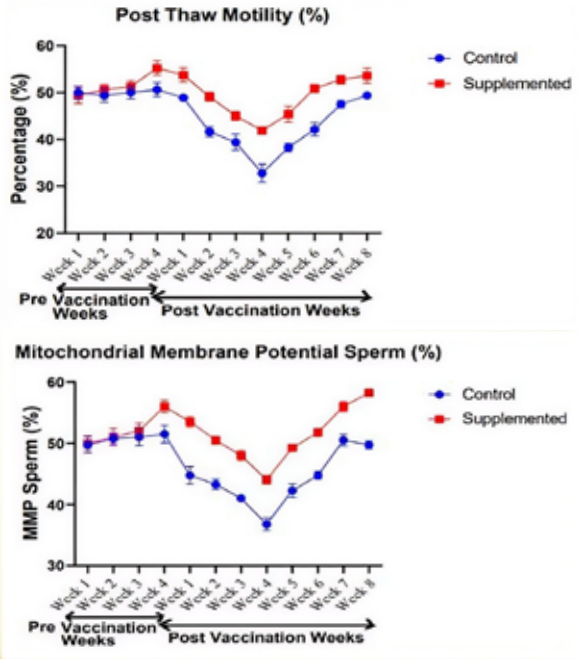
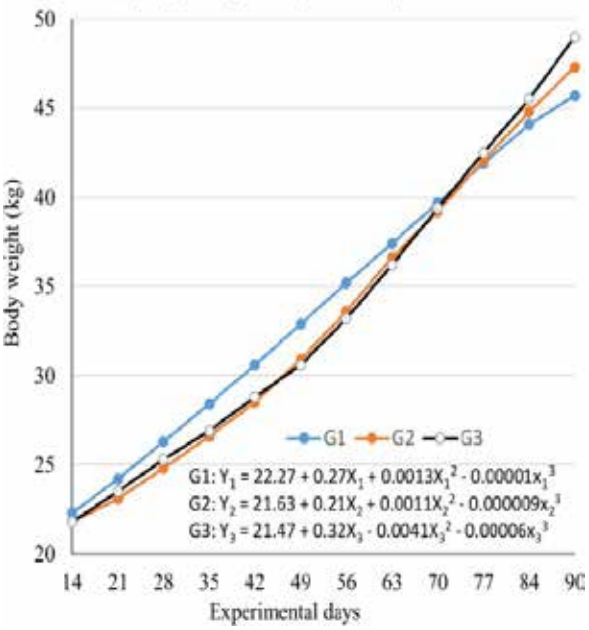


Figure Post thaw motility (%) and mitochondrial membrane potential (%) of frozen semen of experimental groups of bulls

FEED, FODDER AND ANIMAL PRODUCTIVITY

Formulation of a novel feed supplement to promote early rumen development for improving animal productivity

Dietary manipulation to promote early rumen development is crucial for improving growth and future productivity in pre-weaner calves. This study evaluated tributyrin supplementation in calf starter at 0.5% and 1.0% levels. Results showed that tributyrin enhanced nutrient digestibility, rumen enzyme activities (cellulase, xylanase, β-glucosidase), and overall plane of nutrition. The 1% supplementation significantly improved DCP and TDN content of the diet compared to 0.5%. Pre-weaning performance improved markedly, with a 15.8% increase in daily body weight gain and 5.1% improvement in feed conversion efficiency in calves receiving 1% tributyrin. Feed intake and nutrient utilization were also higher in supplemented groups. Importantly, the benefits extended beyond weaning, with improved post-weaning growth rate and feed efficiency in calves previously supplemented with 1% tributyrin. Overall, supplementation at 1% level proved superior to 0.5% and can be recommended as an effective strategy to enhance rumen development, growth performance, and feed efficiency in growing crossbred calves.



Body weight changes of experimental pre-weaner calves

Assessing the potential of conch (*Turbinella pyrum*) shell powder as source of minerals on growth performance in Black Bengal kids

This study evaluated conch (*Turbinella pyrum*) shell powder (CSP) as an alternative calcium source in Black Bengal goats through physico-chemical characterization and a 7-month feeding trial. CSP was rich in calcium (34–36%) and trace minerals, with calcination enhancing mineral availability. In vivo results showed that CSP supplementation improved dry matter and crude protein intake, digestibility (CP and NDF), energy availability, calcium digestibility, and plasma calcium levels ($p<0.05$), along with better feed efficiency. However, no significant effects were observed on average daily gain or blood biochemical parameters. Overall, CSP proved to be a viable alternative to dicalcium phosphate, capable of partially or fully replacing it in mineral mixtures to improve calcium utilization in growing goats.

Anatomical parts of the Conch shell being used in the experiment

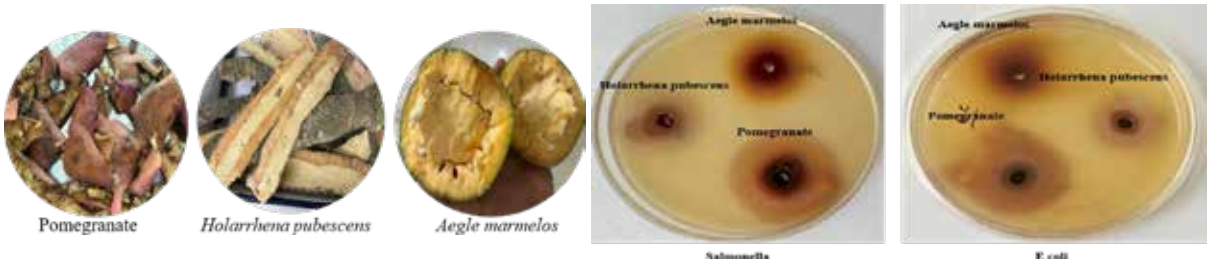
Effect of feeding nutrient enriched rice straw (NERS) to lactating jersey crossbred cows on in intake and productive parameters

The Feeding Nutrient Enriched Rice Straw (NERS) improved its nutritional quality over untreated straw and remained stable for up to three months. In a 105-day trial with Jersey crossbred cows, NERS increased DM and CP intake and significantly enhanced milk protein, SNF, TS yield, as well as FCM and ECM. Blood metabolites (glucose, total protein, urea) improved

without affecting liver enzymes. Feed and protein conversion efficiencies were also higher. Overall, NERS improved milk performance and nutrient utilization without adverse health effects.

Host-adapted probiotics *Lactobacillus reuteri* and some medicinal herbs as prophylaxis against neonatal calf diarrhea

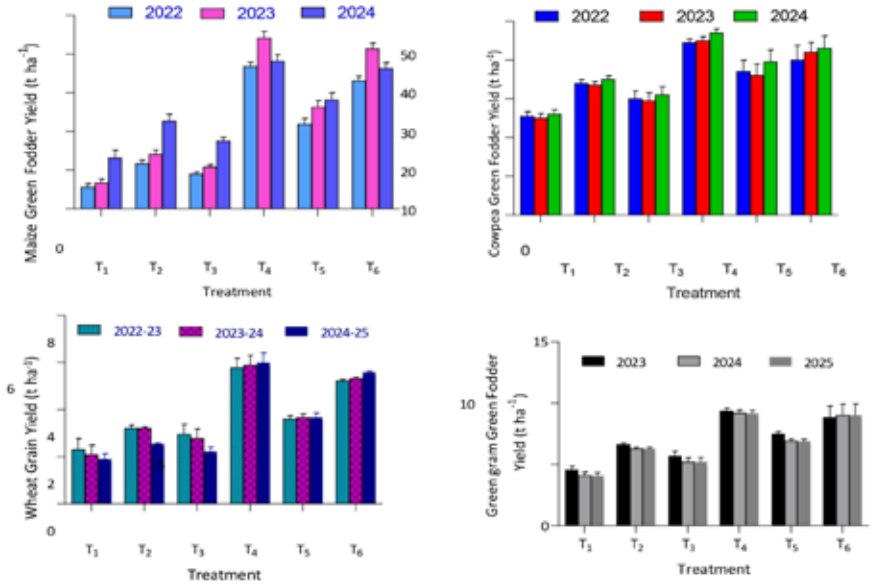
This study aimed to isolate a potent probiotic from Jersey crossbred calves and identify herbal prophylactics against calf diarrhea. *Limosilactobacillus reuteri* (JCB32) was selected based on probiotic characteristics. Medicinal herbs—pomegranate peel, Holarrhena pubescens, and Aegle marmelos—were chosen for their antimicrobial and anti-inflammatory properties. In silico analysis identified key targets (AKT1, TNF, IL6, CASP3, TP53) involved in diarrhea pathways. Overall, both the host-adapted probiotic and selected herbs show potential as effective prophylactic agents against neonatal calf diarrhea.



Efficacy of herbs depicted on petri plates

Development of integrated organic nutrient management practices for fodder – food- based cropping systems

An experiment was started during *kharif* 2022 in a fodder-based cropping system with six treatments and six replications. The highest yields were recorded under treatment T4 (recommended dose of fertilizers) in the maize + cowpea–wheat–green gram cropping system. Among the organic treatments, application of PGPR along with 100% RDN through farmyard manure and panchagavya sprays at 25, 35, and 45 DAS (T6) significantly enhanced yields across all crops. Furthermore, treatment T6 also resulted in significantly higher available soil nutrients, recording 202.4 kg ha^{-1} nitrogen, 28.9 kg ha^{-1} phosphorus, and 214.4 kg ha^{-1} potassium compared to the other treatments.



Effect of Integrated organic nutrient management practices on yield of different crops on fodder-food based cropping system

Effect of sewage water on Berseem–Maize cropping system

A long-term (since 2021–22) split-plot study evaluated irrigation sources (tube well, mixed, treated sewage water) and fertilizer levels (0, 50%, 75%, 100% RDF) in a berseem–maize system. Results (2024–25) showed that treated sewage water significantly enhanced berseem growth, fodder yield, nutrient uptake, and quality across cuts compared to tube well irrigation. Applying 75% RDF achieved yields and quality comparable to 100% RDF, indicating potential fertilizer savings. The highest productivity occurred with treated sewage water + 100% RDF. Sewage water also

improved soil nutrient status and biological activity, though berseem seed yield declined under this irrigation. Overall, treated sewage water can reduce fertilizer use by 25–50% while improving soil health, but long-term, multi-location studies are needed to assess risks such as salt buildup and impacts on soil structure.

Development and characterization of Moringa-Napier pellets

Nine fodder pellet formulations were evaluated in a Randomized Block Design with three replications to assess pellet quality and digestibility for livestock feeding during lean periods. Forage pelleting proved to be an effective conservation technique, improving forage quality, digestibility, and durability, with successful pelleting achieved at 12–18% moisture. Pellet quality and durability increased with higher moringa proportions, and inclusion of 5% molasses produced the most stable pellets. Treatment T6 (NBH 60% + moringa 40% + molasses) recorded the highest net gas production (30.3 ml per 200 mg per 24 h) and *in vitro* dry matter digestibility (74.7%). Antinutritional factors, including tannins (0.21–0.35%) and oxalates (1.23–1.60%), remained within permissible limits, confirming the suitability of the pellets for livestock feeding.

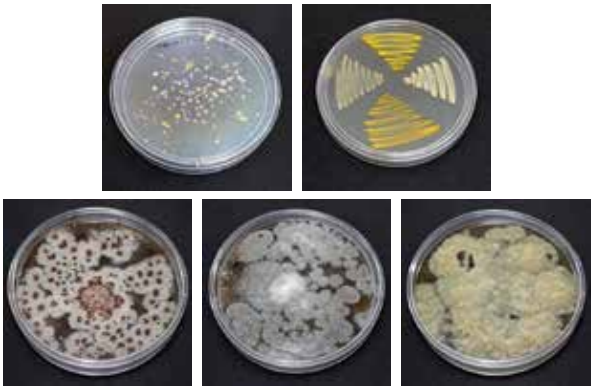
Pellets of Moringa and Napier for animal feed with different combinations

Study on land configuration and nutrient doses on crop productivity under fodder-based cropping system

During the first year (2025), fodder maize (var. J-1006) was sown on 28 July 2025 and harvested on 1 October 2025 (63 days after sowing). Growth parameters, namely plant height, stem girth, and number of leaves, did not differ significantly among treatments at 30 DAS. However, green fodder yield differed significantly due to land configuration and nutrient doses. The interaction effect between land configuration and nutrient doses was non-significant. The highest green fodder yield was recorded under the ridge and furrow system with 125% recommended dose of fertilizers (RDF) compared to other treatments.

Isolation and characterization of cold-adapted microorganisms for enhanced decomposition in cold-arid regions

Organic waste decomposition in cold-arid regions like Ladakh is constrained by low temperature, moisture, and nutrient availability. This study isolated cold-adapted microbes from farmyard manure (Stakna and Khaltsi). A total of 64 bacterial and 18 fungal isolates were screened at 4 °C and 25 °C, with several showing strong cellulase, amylase, protease, esterase, laccase, and phosphatase activities. Nine bacterial and four fungal isolates with superior performance were selected. Identified bacteria included *Nitratireductor aestuarii*, *Bacillus zhangzhouensis*, *Stutzerimonas xanthomarina*, *Bacillus pumilus*, *Bacillus tequilensis*, and *Bacillus velezensis*. Compatible strains were combined into a microbial consortium.These findings highlight the potential of indigenous cold-adapted microbial consortia as a sustainable solution for enhancing organic waste degradation and nutrient recycling in cold-arid ecosystems.



Isolated bacteria from farmyard manure samples of Ladakh

Isolated fungus from FYM samples of Ladakh

Development and evaluation of continuous rumen bio-reactor for estimation of methane emissions

A Continuous Rumen Bioreactor (CRB) system was developed and standardized at ICAR-NDRI to simulate rumen fermentation under controlled in vitro conditions. The system—comprising temperature-controlled bioreactors, artificial saliva infusion, motility simulation, and sampling units—maintained stable conditions (39 ± 0.5 °C). Validation against the in vitro gas production technique showed comparable dry matter digestibility across major fodders (berseem, oats, maize, sorghum). The CRB was applied to assess methane mitigation strategies, revealing differential effects of garlic, neem, sodium nitrate, and Ascophyllum nodosum. Metagenomic analysis indicated significant microbial shifts during prolonged incubation, confirming system stability. Overall, CRB is a cost-effective and robust platform for studying rumen fermentation, microbial interactions, nutrient degradation, and methane mitigation.

Estimation of methane emission from dung of Tharparkar, cross-bred cattle and Murrah buffaloes

The study estimated methane emissions from dung of Tharparkar, Karan Fries, and Murrah (lactating and non-lactating) using the conventional pit method and gas chromatography. Lactating Murrah buffaloes showed the highest emissions, followed by lactating Karan Fries and Tharparkar, while non-lactating Tharparkar had the lowest. Across species, lactating animals emitted significantly more methane than non-lactating ones ($P<0.05$). Overall emissions ranked as Murrah > Karan Fries > Tharparkar, with crossbred cattle dung emitting more methane than indigenous cattle. Seasonal effects indicated higher emissions during summer and rainy seasons, positively associated with rainfall and humidity, while temperature showed no clear influence.

Evaluation of bovine faeces and rumen microbial media in replacing rumen liquor in continuous rumen bioreactor

Bovine faecal liquor was evaluated as a sustainable alternative to rumen liquor for in vitro rumen fermentation. Four inocula—rumen liquor (control) and faecal liquor at 200, 300, and 400 g/L—were tested on concentrate, oats, and TMR substrates. Faecal liquor at 300 g/L showed fermentation responses comparable to rumen liquor, with similar IVDMD, IVOMD, gas production, NH_3–N, and TVFA, while 200 g/L was suboptimal. In Continuous Rumen Bioreactor trials, the 300 g/L treatment maintained stable fermentation over 20 days, supporting its use in long-term studies. Additionally, white clover-based microbial media improved microbial colonization and metabolite synchrony. Overall, 300 g/L faecal liquor (~17% DM) is a cost-effective, non-invasive alternative for in vitro rumen modelling.

Influence of feeding aflatoxin B_1 contaminated feed alongwith its ameliorative agent on haematology of lactating Karan Fries cattle

The study evaluated the effects of dietary aflatoxin B1 (AFB1) and the ameliorative role of mannan-oligosaccharide (MOS) on hematology in early lactating Karan Fries cows (n=25) over 150 days. Increasing AFB1 levels (35–55 ppb) significantly reduced haemoglobin (Hb), total leukocyte count (TLC), and lymphocyte percentage, while increasing neutrophil count, indicating immunosuppression. The highest AFB1 group showed the most pronounced decline in Hb and TLC. Supplementation with MOS (2% of concentrate; ~15–20 g/day) improved Hb, restored TLC, and increased lymphocyte levels, suggesting a protective effect against aflatoxin toxicity. Overall, AFB1 adversely affected hematological parameters, while MOS supplementation mitigated these effects and improved immune status in lactating Karan Fries cows.

Influence of supplementing nano-copper on haematological parameters in Alpine × Beetal male kids

The study evaluated nano-copper supplementation on hematological parameters in Alpine × Beetal male kids (n=30) across five groups. Control animals received a basal diet, while treatments included 10 ppm $CuSO_4$ and nano-Cu at 1, 5, and 10 ppm. Results showed significantly higher ($P<0.05$) haemoglobin, RBC, and WBC counts in all supplemented groups compared to control. PCV% was also higher in groups receiving 10 ppm $CuSO_4$ and 5–10 ppm nano-Cu. Overall, 5 ppm nano-Cu produced effects comparable to 10 ppm $CuSO_4$, indicating improved efficiency of nano-copper supplementation in enhancing hematological parameters.

Influence of supplementation of nano copper on feed intake, nutrient utilization and growth in Karan fries calves

Twenty-five Karan Fries calves (≈81 kg, 4.9 months) were assigned to five groups to evaluate Cu supplementation (0, 10 ppm $CuSO_4$, and 1, 5, 10 ppm nano-Cu). All were fed a basal diet (concentrate : maize fodder = 40:60). Dietary Cu ranged from 8.38 to 20.07 ppm DM. Results showed no significant effect of Cu supplementation on feed intake (2.9–3.1 kg/100 kg BW), nutrient digestibility (DM, OM, CP, EE, NDF, ADF), nitrogen balance, average daily gain (425–450 g), or feed conversion ratio (7.5–7.8). Overall, supplementation with $CuSO_4$ or nano-Cu did not influence growth performance or nutrient utilization in Karan Fries calves under the given dietary conditions.

Evaluation of nutritive value of selected concentrate feeds used in ruminant feeding utilising near infrared spectroscopy

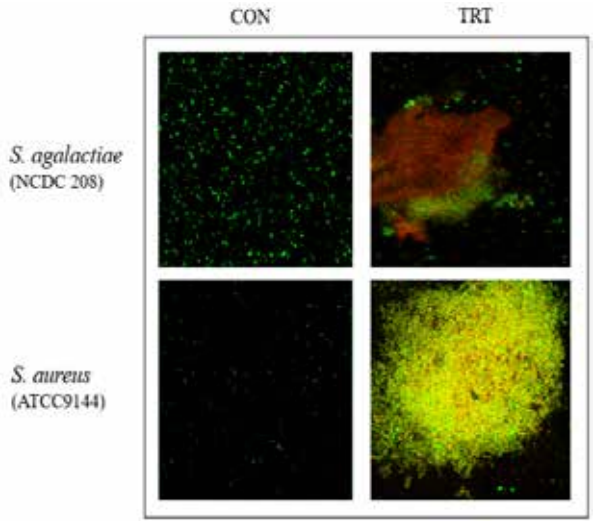
A total of 240 concentrate feed samples (8 types; 30 each) from 10 Indian states were evaluated using wet chemistry and Near Infrared Spectroscopy (NIRS) for nutrient composition, digestibility (TDMD, TOMD), gas production (IVGP), and metabolizable energy (ME). Nutritional composition varied across regions. CP and EE showed positive correlations with IVGP, digestibility, and ME, while fibre fractions (CF, NDF, ADF) were negatively associated with these parameters. NIRS calibration showed high accuracy for key traits, including ME in maize (R^2=0.94), TDMD in barley (R^2=0.98), and CP in soybean meal (R^2=0.93). Good predictions were also obtained for NDF, ADF, and ME across feeds, whereas CF and ash showed lower accuracy. Overall, NIRS proved reliable (R^2>0.80 for most traits) for rapid nutritive evaluation

of concentrate feeds, though continuous dataset expansion is needed to improve model robustness.

Analysis of feed samples using NIRS

Aloe vera enriched postbiotic formulation developed to ameliorate subclinical mastitis in dairy cattle

The study developed and evaluated an Aloe vera–enriched postbiotic (AVEP) formulation using four probiotic strains (*Lactobacillus helveticus*, *L. rhamnosus*, *Weissella confusa*, and *Pediococcus acidilactici*) for managing subclinical mastitis (SCM) in dairy cattle. A 5% Aloe vera inclusion showed effective inhibition of mastitis pathogens while preserving beneficial microbes. In vivo application as a teat spray (twice daily) significantly reduced somatic cell count (SCC) from ~459 to 114 ×10³ cells/mL over 21 days, with no effect on milk yield or composition. Cytokine profiling indicated reduced pro-inflammatory markers (IL-6, TNF-α) and increased anti-inflammatory IL-10, demonstrating immunomodulation. Microbiome analysis showed enrichment of beneficial bacteria in treated cows. Overall, AVEP is a promising non-antibiotic strategy with antimicrobial and immunomodulatory potential for SCM management.



Impact of using aloe vera enriched postbiotic formulation for amelioration of subclinical mastitis in dairy cattle

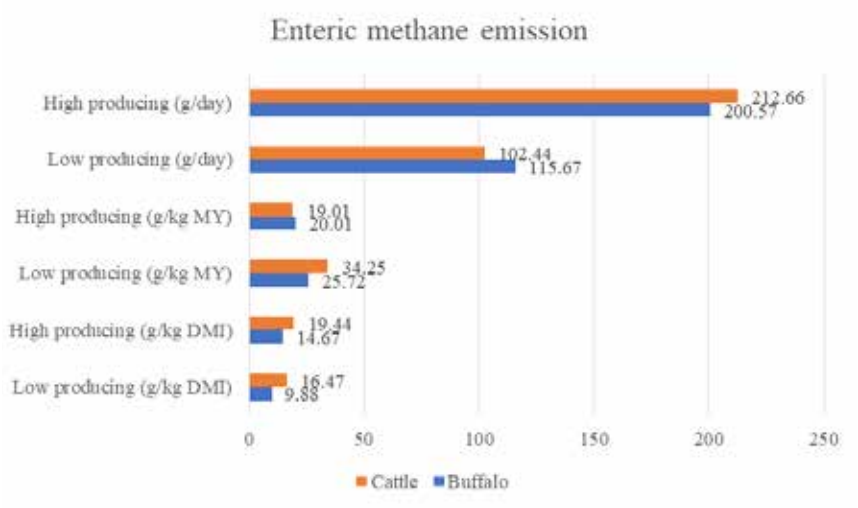
Preparation of paddy strawlage with microbial additives and evaluation of its effect on nutrient utilisation in indigenous calves

The study evaluated rice straw–based silage (strawlage) treated with xylanase, thermotolerant Lactobacillus spp., and Saccharomyces cerevisiae in Sahiwal calves. Selected LAB strains showed acid, bile, and temperature tolerance, and were identified via 16S rDNA. Additives improved silage quality by increasing lactic, acetic, and propionic acids, protein content, LAB counts, digestibility, and reducing methane production. In vitro, treatments T2 and T5 showed higher digestibility and lower methane. Feeding trials (120 days; n=24 calves) revealed comparable growth (0.50–0.56 kg/day), feed efficiency, nutrient digestibility, and rumen fermentation across treatments. However, enteric methane emissions decreased by ~35% in silage-fed groups compared to green fodder. Overall, combining fibrolytic LAB and yeast improved strawlage quality and reduced methane emissions without affecting calf performance.

Pictorial presentation for reparation of paddy strawlage with microbial additives

Comparative enteric methane emission in low and high producing crossbred cows and buffaloes

Low- and high-producing dairy animals differ markedly in methane emissions. In Karan Fries cows, high producers (>12 kg milk/day) emitted more methane daily (212.66 g/d) than low producers (<8 kg/day; 102.44 g/d) and also had higher emissions per unit of feed intake. However, methane per kg of milk was lower in high producers (19.01 g/kg) than in low producers (34.25 g/kg). A similar trend was observed in buffaloes: high producers emitted more methane per day (200.57 g vs. 115.67 g) and per unit DMI, but less per kg of milk (20.01 vs. 25.72 g/kg). Overall, higher-producing animals generate greater absolute methane emissions, but are more efficient, emitting less methane per unit of milk produced.



Comparison of methane production in high versus low producing ruminants

Reduction of aflatoxin M1 (AFM1) in milk using aflatoxin detoxifying agents in dairy animals

In vitro screening of ten aflatoxin detoxifying agents (ADA) using AFB1-contaminated TMR (31 ppb) showed highest efficacy for Saccharomyces cerevisiae, followed by MOS and HSCAS. Based on this, an in vivo trial in 20 lactating Sahiwal cows demonstrated that *S. cerevisiae* supplementation (especially 0.1%) improved feed intake, milk yield, and reduced aflatoxin carryover in milk (0.84% to 0.54%). It also alleviated adverse effects on blood biochemical and hematological parameters. In a parallel goat study (n=28), MOS and sodium bentonite (SB) were evaluated under varying AFB1 levels (30–45 ppb). Both improved milk yield and reduced aflatoxin M1 carryover, with MOS showing superior efficacy. Aflatoxin negatively affected hematobiochemical traits, which were mitigated by both additives. Cottonseed cake could be safely replaced with DDGS up to 15% in contaminated diets.

Effect of environmental and feeding stress on the total discomfort of dairy animals and their performance

An anti-stress supplement comprising Moringa leaf meal (60 g/d), minerals (588 mg/d), and vitamin B complex (10 mL/d) was evaluated in heifers under heat stress (THI: 83.3–80.0). Dry matter and crude protein intake increased in Phase II, with ME ranging from 8.84–10.09 Mcal/d. Residual feed intake remained negative across treatments, indicating efficiency. Cortisol decreased and SOD increased in Phase II, reflecting improved stress response. Body weight, BCS, and ADG improved, with T3 showing a 75% gain increase. A composite stress index (61 parameters) declined notably in Phase II, especially in T1. Stress was highest in dry fodder diets and lowest in green fodder diets. Overall, the supplement effectively reduced stress and improved performance, particularly under dry and mixed fodder systems.

Members of QRT visiting Fodder Farm at ICAR-NDRI on January 14, 2025

NOVEL APPROACHES IN VALUE ADDITION AND FUNCTIONAL FOODS

Isolation, characterization and preservation of indigenous lactic acid bacteria from traditional curd samples

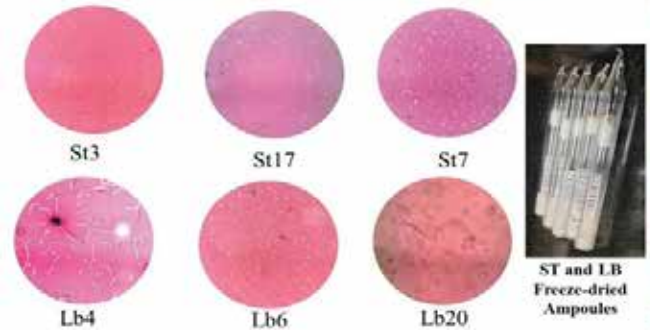
A total of sixteen curd samples were collected from Karnal town and Chandigarh city for the isolation and identification of lactic acid bacteria and were identified through phenotypic assays along with molecular characterization by 16S rRNA sequencing. From these samples, a total of twenty-seven lactic acid bacteria (LAB) cultures were successfully isolated and purified. The pure LAB isolates were further subjected to detailed phenotypic characterization and molecular identification using 16S rRNA gene sequencing. Based on the combined phenotypic and genotypic analyses, the isolates were identified as *Lactococcus lactis*, *Lactobacillus helveticus*, *Lactobacillus delbrueckii* subsp. *lactis*, *Lactobacillus delbrueckii* subsp. *indicus*, *Lacticaseibacillus rhamnosus*, *Leuconostoc mesenteroides* subsp. *dextranicum*, *Limosilactobacillus reuteri*, *Streptococcus thermophilus*, and *Lacticaseibacillus plantarum*. All the identified LAB isolates were deposited at the National Centre for Veterinary Type Cultures (NCVTC) and were assigned accession numbers ranging from VTCC DM0000846B to VTCC DM0000895B.

Development of thermophilic starter culture blends for dahi and yoghurt

A total of sixty-nine lactic acid bacteria cultures were obtained from eighty-nine milk and curd samples collected from nearby villages and towns, of which forty-six isolates comprising *Streptococcus thermophilus* and *Lactobacillus delbrueckii* subsp. *bulgaricus* were identified by 16S rRNA sequencing and their partial sequences were submitted to the NCBI database. RAPD analysis confirmed the genetic distinctness of the strains, and technological evaluation identified *S. thermophilus* (St3, St7, St17) and *L. delbrueckii* subsp. *bulgaricus* (Lb4, Lb6, Lb20) as fast-acidifying, compatible, and promising for curd production. Selected strains were formulated into blends, among which dahi blends D1, D2, and D3 and yoghurt blends Y14 and Y15 showed rapid acidification, good gel strength, low syneresis, and superior sensory quality comparable to commercial DVS cultures. RAPD and microbiological analyses confirmed the presence of blended strains in required proportions, with viable lactic counts above 8 log cfu/g and absence of coliforms, yeasts, and moulds in fresh products.

Proportion of ST strains for *dahi* blend

Sl. No.	ST strains	Proportion	Blend Code
1	St3:St7:St17	1:1:1	D1
2	St3:St7:St17	1:0.5:0.5	D2
3	St3:St7:St17	0.5:0.5:1	D3
4	St3:St7:St17	0.5:1:0.5	D4



Proportion of ST and LB strains for *yoghurt* blend

Sl. No.	ST and LB strains	Proportion	Blend Code
1	St3:Lb4	1:1	Y1
2	St3:Lb4	1.5:0.5	Y2
3	St3:Lb20	1:1	Y3
4	St3:Lb20	1.5:0.5	Y4
5	St3:Lb6	1:1	Y5
6	St3:Lb6	1.5:0.5	Y6
7	St17:Lb4	1:1	Y7
8	St17:Lb4	1.5:0.5	Y8
9	St17:Lb20	1:1	Y9
10	St17:Lb20	1.5:0.5	Y10
11	St17:Lb6	1:1	Y11
12	St17:Lb6	1.5:0.5	Y12
13	St7:Lb4	1:1	Y13
14	St7:Lb4	1.5:0.5	Y14
15	St7:Lb20	1:1	Y15
16	St7:Lb20	1.5:0.5	Y16
17	St7:Lb6	1:1	Y17
18	St7:Lb6	1.5:0.5	Y18

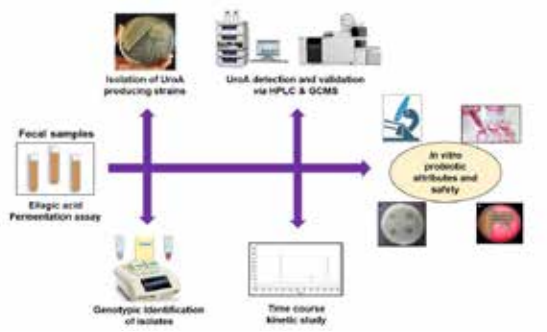
Various thermophilic starter culture blends for used for dahi and yoghurt manufacture

Development of spray dried probiotic direct vat set starters of *Lactiplantibacillus plantarum* strain(s)

Optimized spray drying process parameters *with respect to* inlet (X_{ia}-X_{it} ^{o}C) and outlet (X_{oa}-X_{ot} ^{o}C) temp., and carrier material concentration for production of probiotic DVS starters of *Lpb. plantarum* HD51 by employing response surface methodology. Spray dried probiotic DVS starters was assessed for its quality attributes *viz.,* survivability of probiotics, bulk & tap density, moisture content, water activity (a_w), hygroscopicity, solubility index, wettability, browning index etc. Observations on optimization of process parameters revealed that carrier material CM1 resulted highest probiotic survivability (91.25%), and other functional attributes as above at X_{ih} inlet and X_{oh} ^{o}C outlet temperature. Techno- functional performance and optimization of inoculum level of probiotic DVS *w.r.t.* curd setting time, pH and titratable acidity, sensory and texture attributes was assessed by preparation of *Dahi*. Inoculum level R of probiotic DVS prepared revealed shortest curd setting time and better other techno-functional attributes (pH, titratable acidity, probiotic counts, textural, and sensory). Probiotic DVS had storage stability of >12 months at – 20 ± 2c and 5 ± 1c, in packaging materials PM1.

Characterization of Urolithin A producing lactobacilli strains as functional probiotics

A total of 14 bacterial isolates demonstrated UroA production confirmed by HPLC spiking and further validated by GC–MS. Based on 16S rRNA gene sequencing, UroA- producing isolates from HF13 and J20 samples were identified as *Enterococcus faecalis* (6), *Enterococcus lactis* (3) and *Proteus mirabilias* (2). In parallel, 10 UroA and UroB positive isolates from J20 samples were confirmed as *Lactobacillus*. Based on RAPD profile, 5 *Lactobacillus* isolates were confirmed as *Lacticaseibacillus paracasei* (1) and *Lacticaseibacillus rhamnosus* (4) based on 16S rRNA sequencing. Further, *in vitro* probiotic characterization demonstrated that selected *Enterococcus* strains exhibited strong tolerance to acidic conditions and bile salts. Among them, strain RJ8 showed the highest cell surface hydrophobicity and auto-aggregation, suggesting enhanced adhesion potential. Similarly, *L. rhamnosus* RVJP15 exhibited strong hydrophobicity and aggregation properties. Cell line-based adhesion assays further demonstrated that RVJP15 adhered efficiently to intestinal epithelial cells and significantly reduced pathogen attachment during exclusion assays. Safety assessment revealed strain-specific differences. *Enterococcus* strains displayed resistance to certain antibiotics, particularly cephalosporins and tetracycline, and some exhibited gelatinase activity and harboured virulence associated genes. On the other hand, *L. rhamnosus* RVJP15 lacked gelatinase, hemolysin, and DNase activities and did not exhibit detectable virulence traits.



Schematic representation of the isolation and validation of Urolithin A producing bacteria

Characterization and bioprocess optimization for enhanced vitamin B12 production by *Limosilactobacillus reuteri* NCDC 958

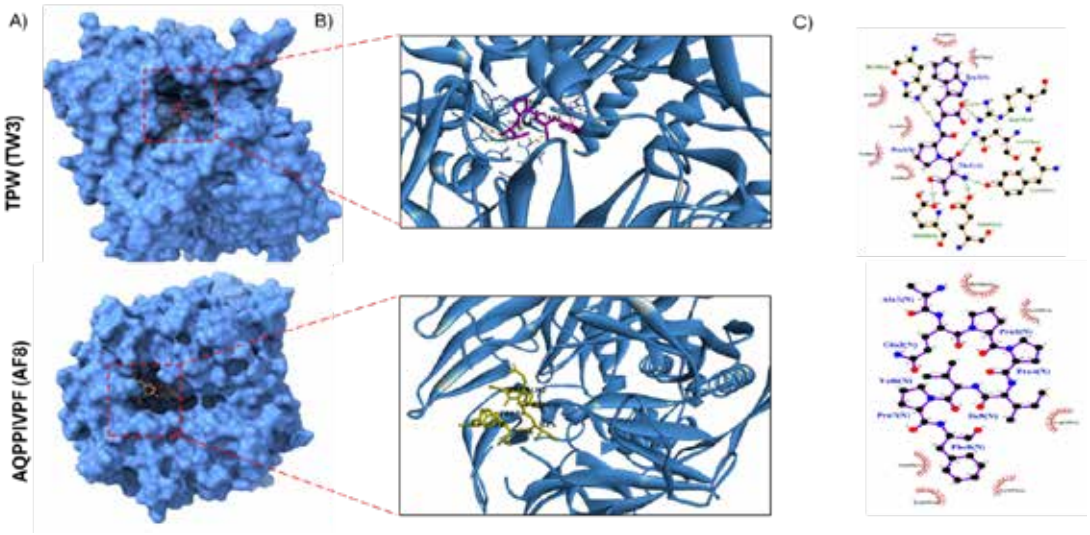
Recent advances in functional food development emphasize microbial biofortification as a sustainable strategy to address micronutrient deficiencies. *Limosilactobacillus reuteri* NCDC 958, a well-characterized probiotic strain with proven vitamin B12 biosynthetic capability, offers significant potential for value addition in dairy by-products, particularly whey. The development of a vitamin B12-enriched whey drink is further strengthened by supplementation with functional food ingredients. These ingredients not only support probiotic viability and enhance vitamin production but also improve sensory attributes and nutritional value. Such an approach transforms whey, a dairy industry by-product, into a high-value functional beverage.

Vitamin B12 bio-fortified whey drink

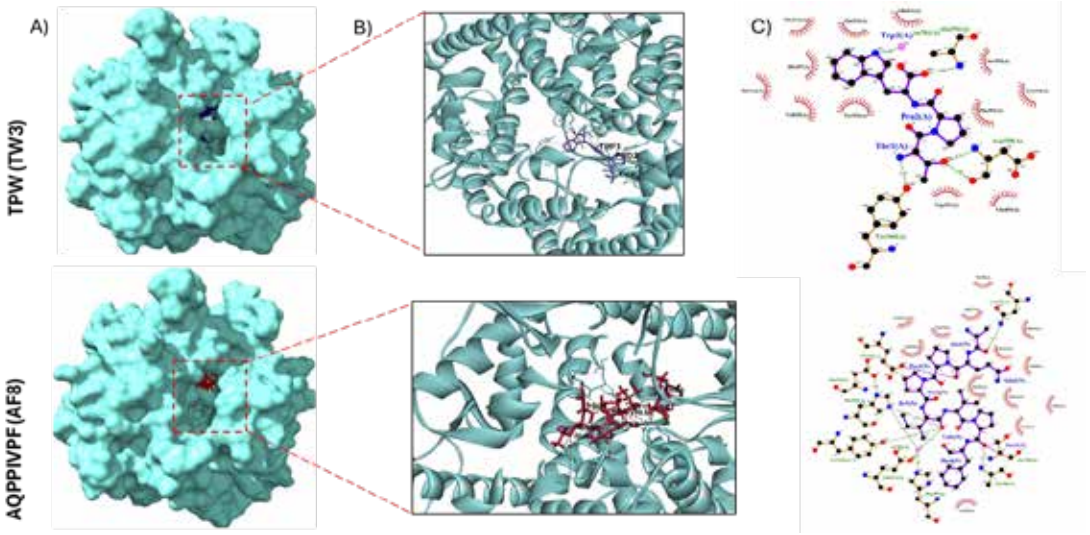
An integrated *in silico, in vitro*, and *in vivo* approach to investigate novel multifunctional bioactive peptides encrypted within donkey milk casein

Donkey milk casein sequences were retrieved from UniProtKB and subjected to *in silico* digestion, generating 150 peptides, of which 12 novel multifunctional bioactive peptides showed dual dipeptidyl peptidase-IV (DPP-IV) and angiotensin-converting enzyme (ACE) inhibitory potential.

Physicochemical analysis confirmed that all the peptides were non-toxic, predominantly hydrophobic, and had molecular weights below 1 kDa. The selected peptides viz. TPW and AQPPIVPF demonstrated strong binding interactions with DPP-IV/ACE enzymes in molecular docking while TPW showed the best hydrogen bonding potential and binding affinity. *In vitro* assays confirmed its potent inhibitory activity against DPP-IV and ACE, along with enhanced insulin secretion and improved cell survival in STZ-treated RIN5F cells. *In vivo* studies using a high-fat diet and STZ-induced metabolic syndrome rat model demonstrated improved glucose clearance, lipid regulation, and insulin function on peptide (TPW) administration. The results also showed that donkey milk possessed moderate capability for affecting blood sugar levels and lipid profiles. Network and pathway analyses identified key gene targets and pathways related to neuropeptide signaling, vascular remodeling, and the renin–angiotensin system. Overall, donkey milk-derived tripeptide showed promising antidiabetic, antihypertensive, and antioxidant properties, supporting their potential use in functional foods or nutraceuticals, though further clinical validation is needed.



(A) and (B) the 3D interactions; and (C) the 2D molecular interactions diagram of the peptides TPW, AQPPIVPF derived from donkey casein with the active site of dipeptidyl peptidase-IV (DPPIV) enzyme

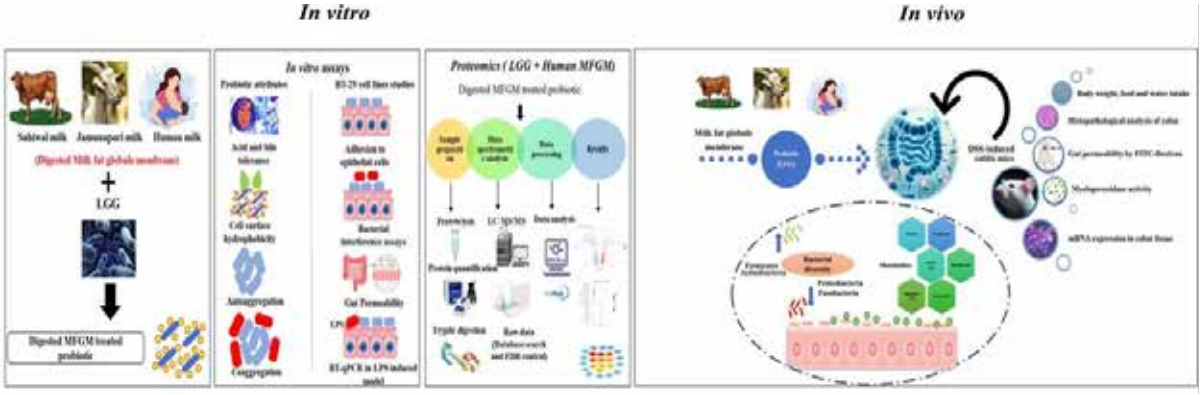


(A) and (B) the 3D interactions; and (C) the 2D molecular interactions diagram of the peptides TPW, AQPPIVPF derived from donkey casein with the active site of angiotensin-converting enzyme (ACE)

Comparative functional analysis of milk fat globule membrane from *Sahiwal* and *Jamunapari* breed in murine gut model

The present study evaluated the role of milk fat globule membrane (MFGM) derived from Sahiwal cow, Jamunapari goat and human milk in modulating gut health using integrated *in vitro* and *in vivo* murine models. *In vitro* assays demonstrated that both direct MFGM treatment and MFGM-treated *Lacticaseibacillus rhamnosus* GG (LGG) significantly enhanced probiotic adhesion to intestinal epithelial cells and reduced colonization by *Salmonella* and *Escherichia coli*. MFGM also exhibited anti- inflammatory effects in an LPS-induced inflammation model through modulation

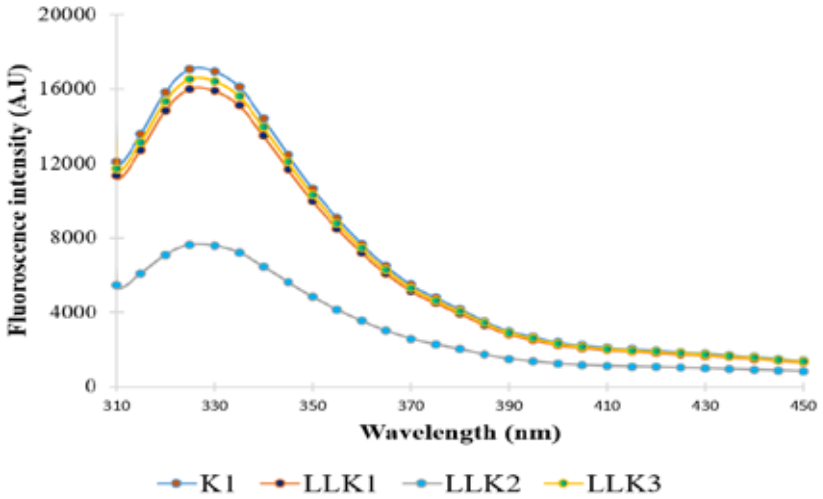
of the TLR-4/MyD88/NF-κB signaling pathway, with reduced expression of pro-inflammatory cytokines and increased anti-inflammatory markers, validated at both gene and protein levels. Further, MFGM treatment of probiotic LGG enhanced probiotic functionality, which correlated with improved probiotic surface properties, including enhanced acid and bile tolerance, increased hydrophobicity, and greater auto aggregation and coaggregation. Label-free quantitative proteomic analysis revealed that human MFGM reprogrammed LGG metabolism toward stress resilience and survivability while upregulating proteins involved in cell surface maintenance and adhesion. *In vivo* validation using a DSS- induced colitis mouse model confirmed that the MFGM–probiotic combination restored intestinal barrier integrity, reduced inflammation, and improved gut permeability. Metagenomic and metabolomic analyses further demonstrated normalization of gut microbial composition and recovery of key microbial metabolites.



Integrated in vitro and in vivo evaluation of milk fat globule membrane-treated probiotics

Low-Lactose Khoa technology developed

Low-lactose *khoa* (LLK) was developed as a suitable dairy alternative without compromising sensory quality. LLK samples were prepared through enzymatic hydrolysis and maltodextrin incorporation: **LLK1** (β-galactosidase treatment), **LLK2** (β-galactosidase + 3% maltodextrin), and **LLK3** (β-galactosidase + glucose oxidase and catalase), while buffalo milk *khoa* served as control (**K1**). The available lysine content was lowest in LLK1 and highest in control (K1). Differential scanning calorimetry (DSC) analysis revealed that glass transition temperature (Tg) was lowest in LLK1, whereas LLK2 and LLK3 containing maltodextrin and gluconic acid exhibited higher Tg values. Reduction in the number of free amino groups in LLK2 and a high degree of grafting indicated significant protein–polysaccharide interactions. Fourier transform infrared spectroscopy (FTIR) also showed higher peak intensities (O-H stretching, C-H stretching, amide I and amide II, and C-O-C-glycosidic bond) in LLK2 among all *khoa* samples. The emission spectra of *khoa* showed a decrease in Fluorescence intensity in the order of K1> LLK3>LLK1> LLK2. LLK1 had lower fluorescence intensity than LLK3 and K1, since it was more prone to browning. LLK3 had lower fluorescence intensity than K1 since the multi enzyme system effectively reduced browning. However, Fluorescence intensity in LLK2 was the lowest due to shielding effect of maltodextrin. The LLK samples were further utilized for the preparation of low-lactose chocolate *burfi* (LLCB) with reduced sugar content.



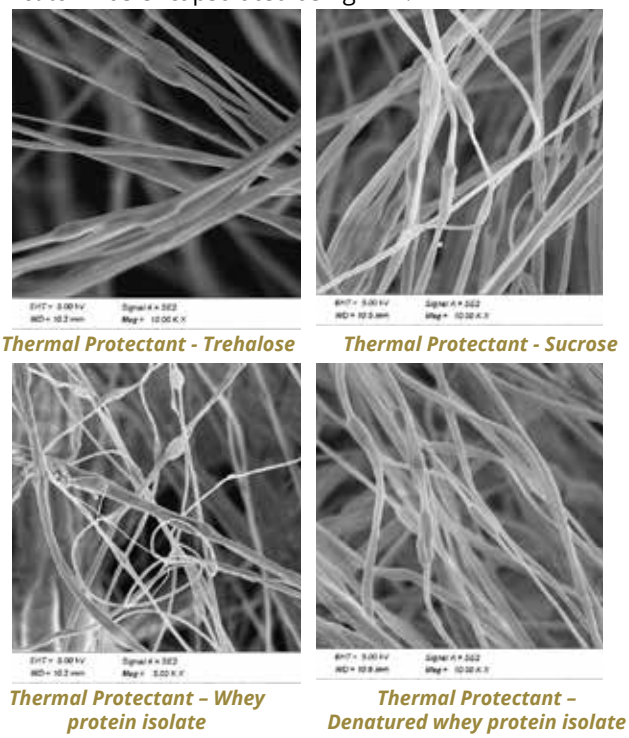
Intrinsic fluorescence spectra of various types of low lactose khoa. LLK1 (β-galactosidase treatment), LLK2 (β-galactosidase + 3% maltodextrin), and LLK3 (β-galactosidase + glucose oxidase and catalase), while buffalo milk khoa served as control (K1)

Conceptualizing functional metabolite intervention for improved quality of goat milk yoghurt

Goat milk yoghurt (GMY) often exhibits weak fermentation and poor gel structure due to the low content of αs1-casein. This study evaluated the effects of two functional metabolites, myo-inositol and N-acetyl-D-glucosamine, added individually and in combination, on fermentation kinetics, rheology, microstructure and microbial growth. Supplementation with myo-inositol at 150 mg/L significantly reduced pH after 8 h of fermentation ($P<0.05$), indicating improved acidification. N-acetyl-D-glucosamine at 235 mg/L enhanced apparent viscosity by approximately 20% and showed a stronger stimulatory effect on lactic acid bacteria than myo-inositol. Combination treatments did not show additional benefits over individual supplementation. Optimized GMY samples (GMY-M150 and GMY-N235) exhibited significantly higher firmness and denser, more homogeneous protein networks than control GMY, though still lower than cow milk yoghurt. Metabolite profiling revealed distinct changes in fermentation-associated metabolites, with GMY-N235 showing enhanced galactose metabolism. Overall, targeted metabolite supplementation effectively improved the quality attributes of goat milk yoghurt.

Encapsulation of probiotics as porous nano-microfibres by spray drying

The spray-dried encapsulates of *L. salivarius* and *L. reuteri* were whitish, porous and fibrous with very high surface area. Trehalose as thermal protectant yielded the highest population of bacteria in the encapsulates. The survival rate was 86-88.5% for *L. reuteri* and 83-87.1% for *L. salivarius*. *L. salivarius* with prebiotics and thermal protectants had 11 log CFU/g count after encapsulation as compared to 9 log CFU/g without prebiotic and 8.48 log CFU/g without prebiotic and thermal protectant. FESEM of encapsulated *L. reuteri* and *L. salivarus* revealed that the nano-in-micro matrix had fibre diameter ranging from 150 to 700 nm diameter. From the FESEM micrographs, it was also evident that the probiotics were entirely and smoothly wrapped within the nanofibres. Similarly, from FTIR and DSC results, it was confirmed that the probiotics were encapsulated within the protective matrix of wall materials during spray drying. The viability of encapsulated *L. salivarius* during storage at -20°C and 24°C was enumerated at 7-day intervals. The least reduction was observed in *L. salivarius* encapsulated using trehalose as the thermal protectant. Viability also was highly dependent on storage temperature. After long term storage, *L. salivarius* encapsulated with trehalose had viability of 9 log CFU/g after 120 d at -20^{o}C and 7.6 log CFU/g after 90 d at 25^{o}C. After encapsulation, there were subtle differences in the secondary and tertiary structures of the membrane proteins of *L. salivarius* and *L. reuteri* after encapsulation. Amongst the thermal protectants, the least changes in the proteins were observed when *L. reuteri* was encapsulated using WPI.



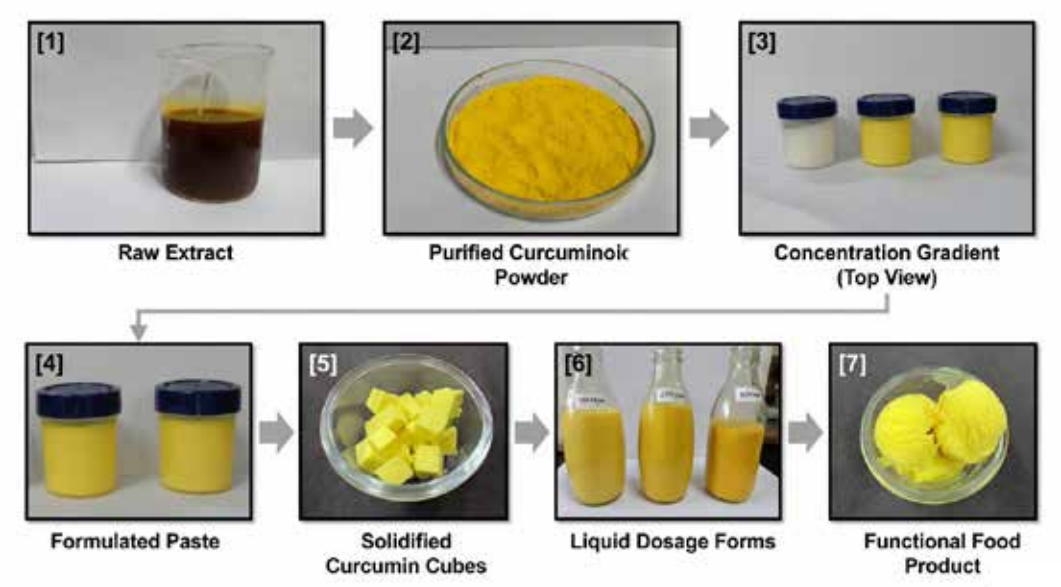
Thermal Protectant - Trehalose | *Thermal Protectant - Sucrose*

Thermal Protectant – Whey protein isolate | *Thermal Protectant – Denatured whey protein isolate*

Influence of thermal protectants on the morphology of probiotics nano-microencapsulated by spray drying

Fortification of nanoencapsulated curcuminoids in milk and milk products

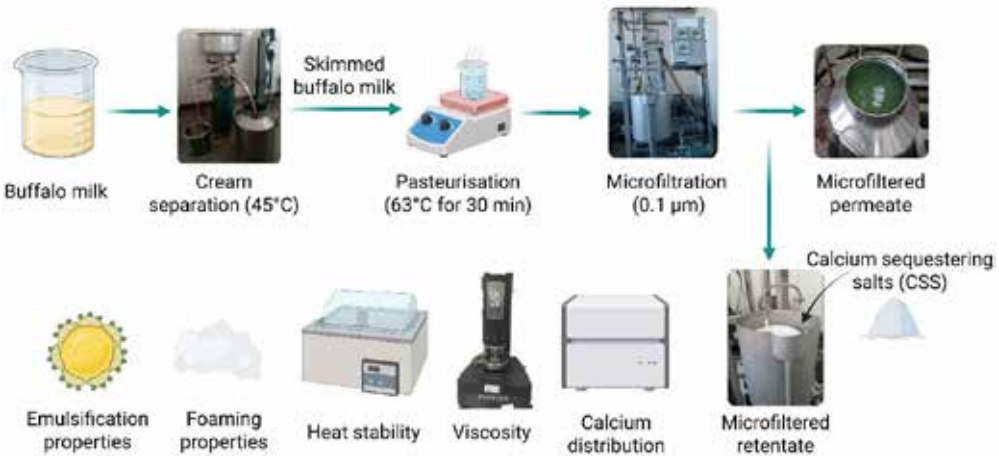
A milk-based curcuminoid delivery system was developed using a pH-driven approach in nanocomplex form and spray drying in microencapsulated form with concentrated skim milk. The developed formulation contained curcuminoids at levels ranging from 700–1500 mg/100 g. *In vitro* digestion studies of the encapsulated curcumin preparation showed nearly 75% release under simulated intestinal fluid (SIF) conditions. *In vivo* studies demonstrated that curcuminoids encapsulated in nanocomplexes and microcapsules enhanced antioxidant potential, bioavailability, and sustained biological activity. Incorporation of nanoencapsulated curcuminoids into paneer resulted in 83% retention without significantly affecting sensory, physico-chemical, rheological, or textural properties. Similarly, incorporation into ice cream ensured the highest curcumin retention (96%) with non-significant changes ($p > 0.05$) in physicochemical, textural, and sensory attributes, except for hardness and melting rate. Paneer incorporated with encapsulated curcuminoids exhibited an extended shelf life of 12 days compared to 6 days in the control sample under refrigerated storage (5 ± 1°C). Likewise, no significant changes ($p > 0.05$) were observed in the quality attributes of ice cream during two months of storage at −18 ± 1°C, except for hardness and melting rate. Curcuminoid concentration and antioxidant activity remained stable throughout the storage period.



Nanoencapsulated curcuminoid enriched milk products

Methodology for improving the functional properties and heat stability of microfiltered retentate of buffalo milk

Buffalo milk was microfiltered using a 0.1 µm membrane to obtain microfiltered retentate of skim buffalo milk (MFR-SBM) containing approximately 17% total solids, 12.8% protein and 2.2% lactose. Calcium sequestering salts (CSS), sodium hexametaphosphate (SHMP) and trisodium citrate (TSC), were added to MFR-SBM at concentrations of 0, 15, 30, and 45 mEq/kg to enhance functional properties and heat stability. SHMP and TSC both sequesters Ca ions but TSC also solubilises MCP as indicated by increased 10 kDa permeable Ca with increasing concentration of TSC. At 45 mEq/kg SHMP, the particle size distribution curve showed the presence of particles of size less than 100 nm, which could be dissociated casein micelles. SHMP has strong ability to complex Ca than TSC leading to greater dispersion of casein micelles. At 15-30 mEq/kg of CSS, SHMP exhibited higher emulsification and foaming capacity compared to TSC. The addition of SHMP and TSC in the concentration range of 0-45 mEq/kg increased the heat stability of MFR-SBM. This method has the potential to manufacture high-protein products such as micellar casein concentrate, high-protein yoghurt and processed cheese with altered functionalities from microfiltered retentate of buffalo milk.



Process flow diagram for the production of microfiltered buffalo milk retentate with improved properties

Process technology for development of whey based carbonated beverage

A process technology was developed for the conversion of liquid whey into a ready-to- drink carbonated beverage with jeera flavour through the application of micro-filtration, enabling the efficient valorization of whey. The formulated product constitutes a novel functional drink delivering multiple benefits within a single matrix, including effective hydration, a protein content of 0.35 g/100 ml, and the presence of essential minerals such as calcium (40 mg/100 ml) and magnesium (36 mg/100 ml). The incorporation of carbonation significantly enhanced the sensory attributes of the beverage by improving freshness,

mouthfeel, and overall consumer acceptability in comparison to conventional non-carbonated whey-based beverages. The shelf-life evaluation indicated that the product remained stable for up to 45 days under refrigerated storage conditions (4 ± 1°C) and 10 days under ambient conditions (27 ± 2°C).

Whey based carbonated beverage

Production of lactobionic acid in paneer whey

Lactobionic acid is a highly valuable compound, but its production is expensive due to the use of purified lactose. This study evaluated paneer whey, a dairy industry by- product, as a low-cost substrate for lactobionic acid production using *Pseudomonas taetrolens*. The effects of culture concentration (10%, 20% and 30%), feed concentration of lactose (1X, 1.5X and 2X) and culture addition strategy (Single time addition and periodic addition in a gap of 12h) were examined. Results showed that increasing feed concentration significantly enhanced lactobionic acid yield and productivity, while culture concentration had little influence. In contrast, periodic culture addition markedly improved production by sustaining active microbial growth. Overall, paneer whey proved to be an effective substrate, highlighting its potential for sustainable dairy waste valorization and improved lactobionic acid production efficiency.

Vacuum dried phospholipid-rich powder from industrial ghee residue extract

Efforts were made to extract phospholipids from industrial ghee residue, convert them into powder via vacuum drying, and characterize the product. Phospholipids were extracted using ultrasonication, and the extract was vacuum dried. Optimization of process parameters included vacuum levels (450, 550, and 650 mm Hg), amounts of drying aids (2.5% and 5%), and types (maltodextrin, whey protein concentrate, and their combination). The optimal conditions were a vacuum level of 650 mm Hg at 48°C with 5% drying aid (1:1 maltodextrin and whey protein concentrate), resulting in a moisture content of less than 5% and a yield of over 90%. The vacuum-dried sample demonstrated superior properties compared to a tray-dried control, with higher phospholipid content (7.47 ± 0.62%), emulsifying capacity (83.33 ± 0.37%), emulsion stability (74.89 ± 0.17%), and antioxidant activity (76.76 ± 0.25%). The control values were lower across all measurements. Additionally, vacuum drying reduced the drying time to 12 hours compared to 48 hours for tray drying. In conclusion, a phospholipid-rich powder was successfully developed from ghee residue, showcasing its potential as a functional ingredient.

Development of technology for milk protein supplemented jellified confections

Milk protein was supplemented into gummies to enhance their nutritional profile while maintaining desirable textural and sensory characteristics. Effect of milk protein source viz. whey protein isolate (WPI), whey protein concentrate, and Sodium caseinate on gummy characteristics was investigated. At lower levels (5% w/w) of addition, WPI imparted superior gel strength, optical clarity, and sensory acceptability to the gummies. Hydrocolloid combinations viz. Guar gum and agar-agar (GA) and κ-carrageenan and gellan gum (KG) were used at different concentrations to further improve the textural attributes. The GA blend with WPI enhanced gumminess, chewiness, cohesiveness, and sensory attributes of gummies. FTIR analysis indicated the effective interaction between proteins and hydrocolloids, contributing to improved gummy matrix stability. The optimized product had >8% (w/w) protein content.

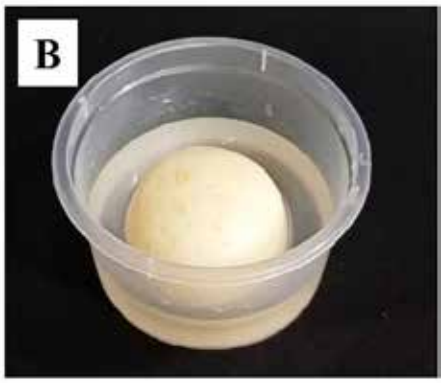
Milk Protein Supplemented Jellified Confections

Development and characterization of foxtail millet (*Setaria italica*) incorporated rasogolla, a dairy dessert

Rasogolla is one of the most sought-after traditional dairy dessert known for its sweet, spongy and delectable flavour. Millets, being rich in bioactive compounds and fibre, has gained momentum in the contemporary era as a valuable ingredient for the development of novel value-added dairy products. In this study, processed foxtail millet was incorporated into *chhana* at varying levels of 5%, 10%, and 15% (weight basis) to develop millet-enriched *rasogolla*. Among these levels, the addition of millet at 10% (FR10) yielded the product with the highest overall acceptability score (7.64 ± 0.48). Microscopic evaluation (SEM and CLSM) revealed, millet incorporation resulted in discontinuous protein network. During the FTIR spectral analysis, distinct

peaks were identified for both FR10 and control that suggests the presence of phenolic compound in millet *rasogolla*. The DSC thermograph revealed specific peak temperatures for FR10 sample at 28.34ºC while peak temperatures for control sample were observed at 28.15ºC and 40.21ºC. Furthermore, the developed product (FR10) demonstrated enhanced micronutrient content and total phenolic content (TPC) of 46.83 ± 1.56 mg GAE/100g, in comparison to control sample (10.46 ± 0.94 mg GAE/100g).

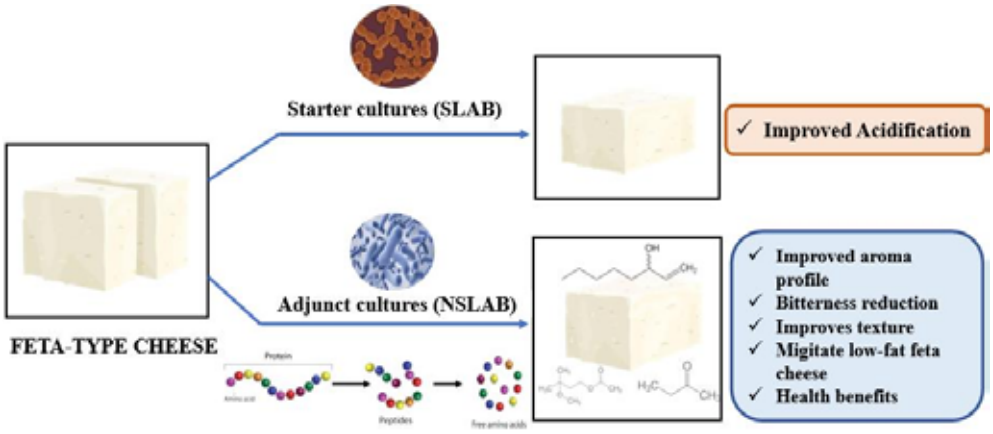
A) Control rasogolla



B) Rasogolla with 10% foxtail millet incorporation Visual comparison of control and 10% foxtail millet incorporated rasogolla

Process development for feta-type cheese from goat-cow milk admixture

Feta-type cheeses were prepared from pure goat milk, pure cow milk and their admixtures, with emphasis on a 60:40 goat-cow milk blend. The admixed cheese exhibited balanced fat and protein content, superior retention of calcium, phosphorus and potassium, moderate hardness, optimal meltability and flowability and a uniform protein- fat microstructure. Fatty acid profiling indicated an improved balance between saturated and unsaturated fatty acids, while metabolomic analysis showed a more balanced metabolic signature compared to pure milk cheeses. To enhance flavour development, proteolytic adjunct cultures (*Lactobacillus acidophilus* and *Lactobacillus helveticus*) were incorporated during ripening. Adjunct addition accelerated acidification, increased proteolysis, reduced textural firmness and improved microbial viability. Sensory evaluation revealed highest acceptability for the 1:1 adjunct culture combination. Volatile analysis confirmed increased ester and alcohol formation in adjunct-treated cheeses, contributing to enhanced aroma complexity. Overall, the integration of goat-cow milk blending with adjunct cultures significantly improved the techno-functional, sensory and flavour characteristics of Feta-type cheese.



Characteristics of Feta-type cheese from goat-cow milk admixture

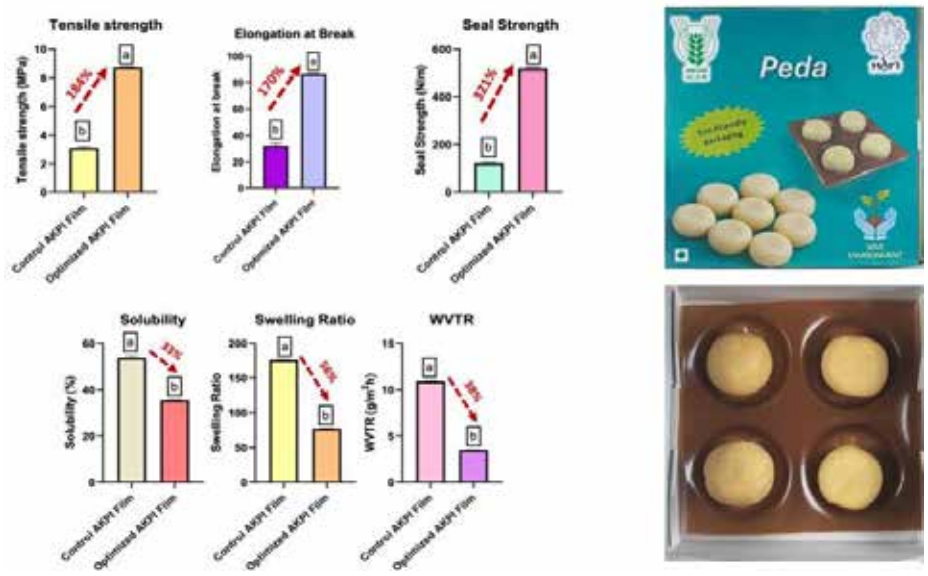
Prevention of slimy surface defect in high moisture Mozzarella cheese

High moisture mozzarella cheese was developed using an effective strategy to mitigate the occurrence of slimy surface defect. Mozzarella cheese was prepared from three different types of milk *viz*. buffalo milk, diluted buffalo milk and mixed milk. Physico- chemical changes in the covering liquid, including pH, protein, and calcium content, along with skin formation on the cheese surface, were evaluated over 15 days at five-day intervals. Based on the findings, buffalo milk was identified as the most suitable milk type for producing high-moisture Mozzarella cheese with minimal slimy

surface formation. Subsequently, high moisture Mozzarella cheese prepared from buffalo milk was stored in nine different covering liquid formulations, varying in calcium lactate concentration and initial pH, while maintaining a constant NaCl level. A significant (P<0.05) effect of calcium lactate concentration and storage duration on the protein content of covering liquid was observed, whereas changes in initial pH had no significant (P>0.05) effect. Significant (P<0.05) variations in pH, calcium content of covering liquid & the extent of slimy surface defects were observed with changes in calcium lactate concentration, initial pH and storage time. Overall, this study presented a promising approach to improve the shelf-life and quality of high-moisture Mozzarella cheese through optimization of the covering liquid composition.

Apricot kernel-based thermoformed biodegradable tray for packaging of dairy products

The present study isolated and characterized apricot kernel protein isolate (AKPI), optimized its film-forming ability, and converted it into thermoformed inserts (primary packaging) for dairy products (Peda), testing performance during storage. The isolated AKPI exhibited a high protein content of 92.72% (db) with significant reductions (p<0.05) in fat and antinutritional factors. Increasing protein and plasticizer concentrations significantly (p<0.05) increased tensile strength and elongation (%) at break. A sorbitol-plasticized film was selected over glycerol-plasticized films due to superior mechanical properties, lower solubility, and lower water vapor transmission rate (WVTR). Apricot shell powder, a crosslinking agent, and a nanoparticle were subsequently incorporated to further enhance mechanical and barrier properties. Thermal analysis revealed changes in glass transition temperature (Tg), XRD indicated a predominantly amorphous structure with a broad peak around 19–20°, and SEM revealed a denser, more compact microstructure in optimized films. Overall migration values were lower for optimized films than controls, with estimated biodegradation times of 14 and 21 days, respectively. Optimized AKPI films were successfully thermoformed into inserts at 210–230°C for 15–20 s with good dimensional stability. During storage, AKPI inserts showed increased moisture uptake from Peda with concomitant decreases in compression strength and minor color changes; however, Peda remained microbiologically safe with acceptable sensory attributes up to 18 days. The study demonstrates the potential of AKPI-based thermoformed inserts as a sustainable alternative to single-use plastics for traditional dairy product packaging.



Apricot kernel protein-based biodegradable thermoformed tray for dairy products packaging

Development and characterization of rice milling byproduct protein-based biodegradable packaging materials for dairy products

In this study, post-maltodextrin extracted broken rice (PMEBR) was utilized to fabricate biodegradable films and thermoformed inserts for packaging of a traditional Indian dairy product (Pinni). PMEBR showed high protein content (54.29%), supporting its suitability for film formation, and enzyme extraction-assisted protein concentrate (CEPC) was selected as the optimized protein source. Formulations were developed by varying protein levels, plasticizer types and levels, and crosslinking agent types and levels; 655 raw films were evaluated for thickness, moisture, tensile strength, elongation at break, solubility, and swelling ratio. Using multivariate analysis and machine learning models, the best formulation was optimized with criteria of high tensile

strength, controlled elongation (20–50%), and low solubility/swelling. Film performance was further enhanced through protein aggregation and network strengthening via heating and microwave processing. Overall migration across five food simulants and soil biodegradability were determined. The optimized film was thermoformed into inserts using a custom mould and evaluated under accelerated storage conditions against PET packaging, monitoring physicochemical, optical, textural, microbiological, and fat migration parameters alongside tray compression behaviour. Formaldehyde safety assessed via Schiff's test at 37°C and 45°C yielded negative results for both Pinni and tray samples, confirming no detectable residual formaldehyde. The study demonstrates that PMEBR can be scaled up as a sustainable packaging material and viable alternative to single-use plastics.

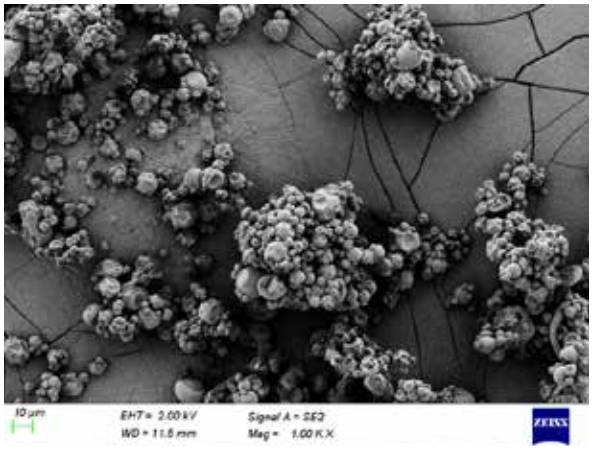
Post-maltodextrin extracted broken rice protein-based thermoformed tray for dairy products packaging

Students of ICAR-NDRI working in a laboratory

DEVELOPMENT AND VALIDATION OF HEALTH PROMOTING DAIRY FOODS

DPP-IV inhibitory (antidiabetic) peptides-rich milk protein hydrolysates: Effect of simulated digestion and safety evaluation

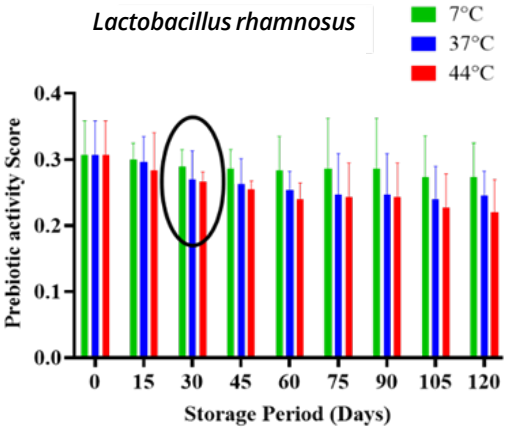
The DPP-IV inhibitory peptides-rich milk protein hydrolysate was encapsulated in a gum Arabic and maltodextrin matrix through spray drying process; the resultant powder has 150 days shelf life at ambient temperature (35°C). During the storage, not much deterioration in sensorial, chemical and microbiological quality was observed. The product has glass transition temperature of 57.1°C and crystallization temperature of 181.4°C. SEM image confirmed the encapsulation of peptides. The encapsulation helped to protect the DPP-IV inhibition activity at absorption site (in small intestine) by ~ 5.8 times. Further analysis on peptide transfer assay revealed the concentration dependent transfer of peptides across monolayer was observed. At 400 µg load around 10-13% peptides were transfer from apical to basal chamber. This confirmed the ability of peptides from the developed product to transfer across epithelial layer of small intestine.



Scanning electron micrograph of encapsulated DPP-IV inhibitory peptides

Utilization of paneer whey for the production of bioactive lactose-derived oligosaccharides

Spray dried GOS rich paneer whey powder has been characterized and evaluated for storage stability at 37ºC. During storage, GOS content remained stable, although browning index and HMF content increased due to Maillard reactions. Prebiotic activity analysis revealed that the powder supported probiotic growth, with *Lactobacillus rhamnosus* showing the highest activity, and overall performance exceeding that of inulin. In vitro digestibility studies confirmed high resistance of GOS to gastrointestinal conditions, with substantial retention even after storage of 120 days at 37ºC. Therefore, the developed product can be stored upto 120 day at 37ºC. The developed product can also be used as a functional prebiotic ingredient in various food applications.

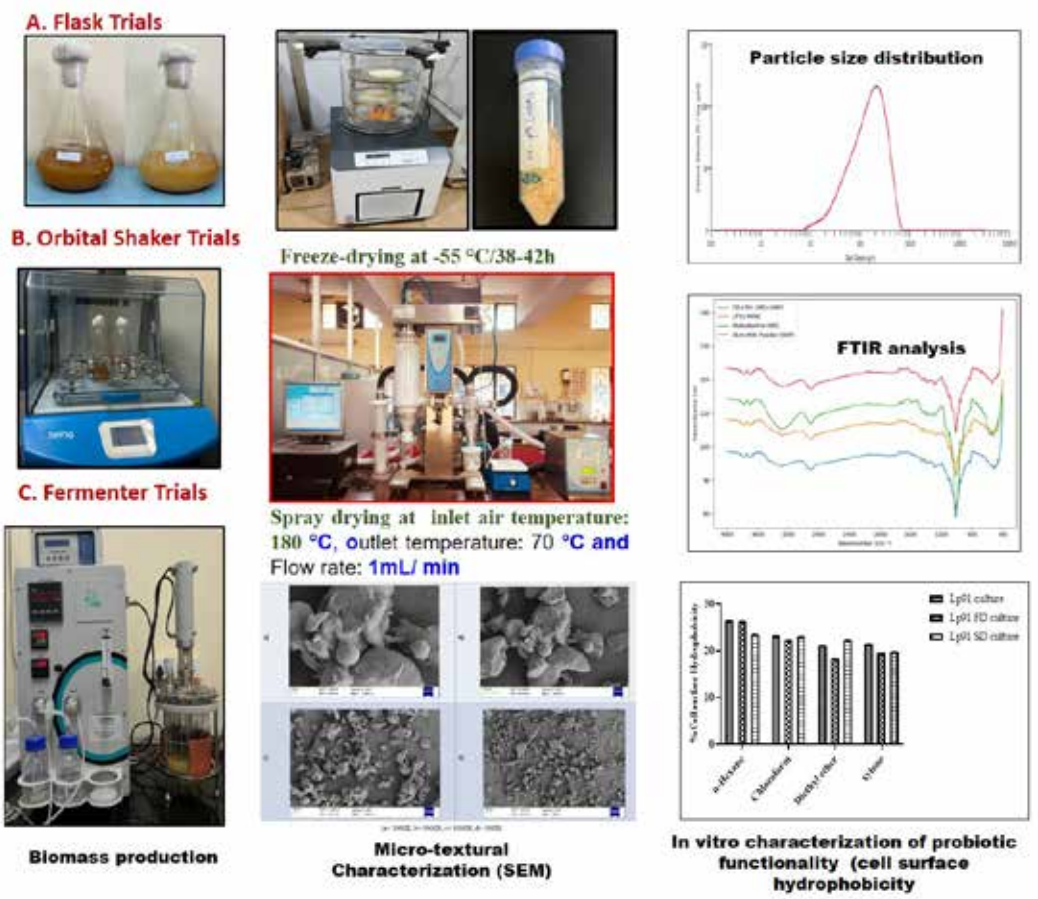


Prebiotic potential of GOS-rich paneer whey powder

Development of a probiotic formulation containing *Lactiplantibacillus plantarum* Lp91 (MTCC 5690) and its preclinical safety and efficacy study for human use

The project focused on the development and scale-up of a stable probiotic formulation of *Lactiplantibacillus plantarum* Lp91 (MTCC 5690) using sustainable and cost-effective approaches. The strain was reactivated and its identity reconfirmed through phenotypic characterization and species-specific PCR. Whey, a dairy industry by-product, was successfully optimized as a low-cost alternative growth medium by supplementing growth factors, achieving high biomass (0.74 g/100 mL) and viability (10.67 log CFU/mL). Growth kinetics in both MRS and whey-based media established 18 h as the optimal harvest time. Biomass production was sequentially scaled

from flask to orbital shaker and 2.5 L bioreactor, with optimal conditions of 34.5°C and 100 rpm yielding ~10.8 log CFU/mL. Freeze-drying was optimized using 10% maltodextrin and 4% skim milk powder, resulting in >95% survivability and 1.2 × 10^9 CFU/g of probiotic bacteria in the final formulation with compliance to microbiological standards. Physicochemical properties, SEM, FTIR, and particle size analyses confirmed structural stability and effective encapsulation. Preliminary spray-drying trials using maltodextrin–whey protein matrices achieved up to 90% survivability. The probiotic functionality of native and dried forms was reconfirmed in vitro. The study demonstrates a sustainable, scalable process for producing high-quality Lp91 probiotic formulations for functional food applications.



Development and characterization of probiotic formulation containing Lactiplantibacillus plantarum Lp91 (MTCC 5690)

Purification of galactooligosaccharides produced from paneer whey using activated charcoal and selective microbial fermentation

The double-stage activated charcoal process gives galactooligosaccharides (GOSs) recovery of 94.64 ± 0.08%. The microbial fermentation was carried out using *Saccharomyces cerevisiae* and *Kluyveromyces lactis* to enhance the purity of GOSs. *S. cerevisiae* efficiently eliminated monosaccharides (78.6 ± 0.20% reduction) within 24 h, while largely preserving GOSs and lactose. In contrast, *K. lactis* reduced monosaccharide levels by 20-60%, showed little effect on lactose, but increased GOSs content. A sequential purification strategy, involving double-stage AC treatment followed by microbial fermentation, provided synergistic benefits. This approach yielded 76.75 ± 0.06% GOSs recovery with significantly reduced monosaccharides (19.01 ± 0.35%) and lactose (26.48 ± 0.47%). The final purified sample contains 40% GOS, 29% glucose/galactose and 31% lactose (DM basis). The prebiotic potential of the purified GOSs, unpurified GOSs, and inulin was evaluated. Purified GOSs achieved the highest prebiotic score of 0.54 ± 0.001 for *Lacticaseibacillus rhamnosus*, compared with unpurified GOSs (0.47 ± 0.002) and inulin. (0.28 ± 0.002). For *Limosilactobacillus fermentum*, the prebiotic score of purified GOSs (0.38 ± 0.006) was significantly ($P<0.05$) lower than that of unpurified GOSs (0.44 ± 0.003), while no significant difference ($P>0.05$) was observed in the case of *Lactiplantibacillus plantarum*.

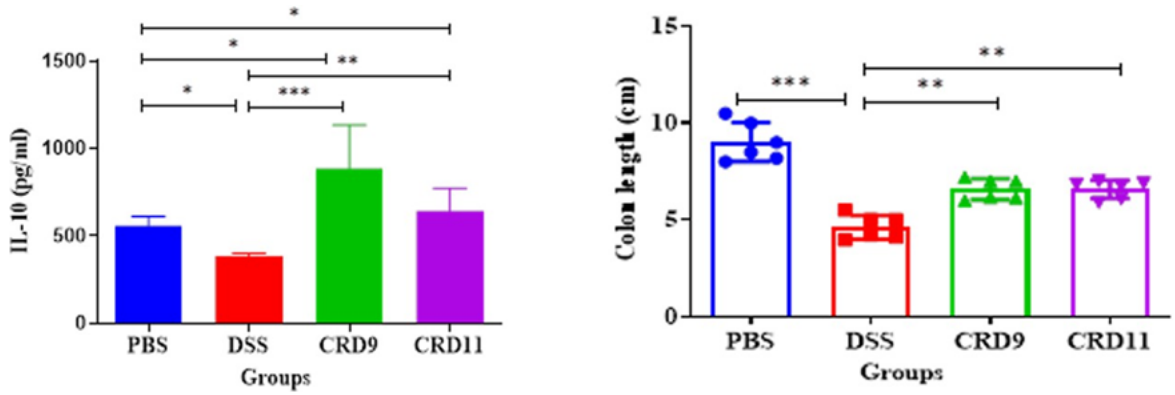
Development of *in situ* produced active vitamin B12 rich ready to use therapeutic dairy food and evaluation of its bioavailability and safety

Vitamin B12 plays a critical role in DNA synthesis and erythropoiesis and is naturally found only in

foods of animal origin, including meat, fish, eggs, and dairy products. Approximately 47% of the Indian population is at elevated risk of vitamin B12 deficiency, which may result in pernicious anaemia and neurological impairments. While synthetic cyanocobalamin is widely used for food fortification, its bioavailability is relatively low. The present study focused on developing a natural vitamin B12 rich therapeutic food via microbial fermentation using *Propionibacterium freudenreichii* subsp. *shermanii* (SC-4), a strain isolated from cheese. A milk–millet-based matrix was formulated using millet malt, legume powder, and milk solids at optimized levels of 4%, 8%, and 4%, respectively. Using d-optimal mixture design technique, Taguchi experimental design identified a 4% inoculum concentration as optimal, yielding the highest vitamin B12 content of 14 µg/100 ml. The fermented mass was spray dried with encapsulating agents such as pectin (0-1%), inulin (0-2%) and spray drying conditions were maintained at 140°C inlet temperature and 50ml/min feed flow rate with varying outlet temperature of 70 and 90°C. Dispersibility ranged from 78.84% to 94.32%, with higher values observed at an outlet temperature of 90°C. Particle size varied between 0.85 and 2.58 µm, indicating formation of fine, uniform particles. Moisture content remained low (2.36–3.95%), ensuring good storage stability, while bulk density ranged from 0.325 to 0.466 g/cm³, indicating acceptable flow properties. The vitamin B12 content of spray dried powder without drying aids was 12 µg/100 g while the spray dried powder with drying aids yielded 25 µg/100 g of powder. Overall, the spray-dried fermented milk–millet powder retained substantial vitamin B12 and 10 g of serving provides approximately 2.5 µg of vitamin B12, meeting nearly 100% of the daily recommended requirement.

Safety assessment of probiotic *Lacticaseibacillus rhamnosus* CRD9 and CRD11 strains

In vitro and *in vivo* safety and efficacy of probiotic Lacticaseibacillus rhamnosus CRD9 and CRD11 conducted to provide scientific evidence for their safety for human and animal consumption. In vitro observations revealed their safety as these were non haemolytic, non-mucolytic, absence of antibiotic resistance, virulence factors, devoid of biogenic amines (putrescine, cadaverine, histamine, and tyramine) production and non-cytotoxic. Acute, subacute, and sub-chronic results in healthy mice at 10^9 CFU/day repeated doses continuously did not reveal treatment related physical and histological changes in vital organs (kidney, liver, spleen, colon). Administration of probiotic strains maintained a dynamic balance between pro- and anti-inflammatory cytokines (decrease in IL-6, TNF-α) in healthy mice. Colitis was induced with 5% DSS in water ad-libitum as symptoms appeared. Selected probiotics when orally administered @ 10^9 CFU/day/14 days in colitis mice model demonstrated ameliorative effect on mucosal injury and inflammation, improved body weight, alleviated colonic length shortening and decreased myeloperoxidase activity, along with significant improvement in intestinal permeability indicative of improved health index. These observations confirm the safety and efficacy as well as non-toxic nature of tested probiotic *Lcb. rhamnosus* CRD9 and CRD11 strains. Therefore, these probiotics strains are safe for their incorporation in food, nutraceuticals and other bio-therapeutics applications.

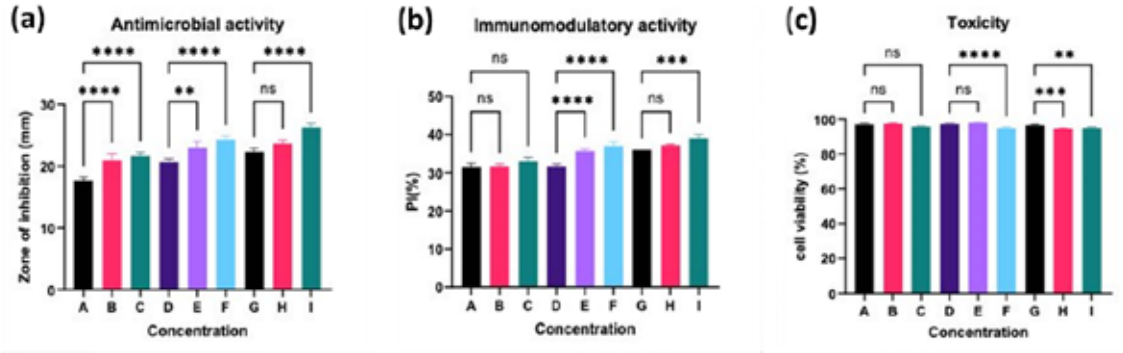


Anti-inflammatory cytokines (IL-10) levels (Left) and ameliorative efficacy (Right) of tested probiotics against colitis Immunomodulatory and therapeutic effects of probiotics in experimental colitis

Pre-clinical efficacy, safety and toxicity of colostrum whey protein derived formulations ('ProPep') in animal model (ICMRDHR-ICAR Project)

Diarrhoea is a prevalent gastrointestinal infection that poses a significant health burden globally resulting in around 1.7 billion fatalities annually particularly affecting immunocompromised populations with limited therapeutic options. In this study a natural antimicrobial formulation (ProPep) from Sahiwal bovine colostrum was developed. The >50 kDa immunoglobulin-rich proteins fraction and <10 kDa antimicrobial peptides generate by fermenting with *Lacticaseibacillus rhamnosus* showed activity against diarrheagenic Escherichia coli MTCC 723. The <10 kDa

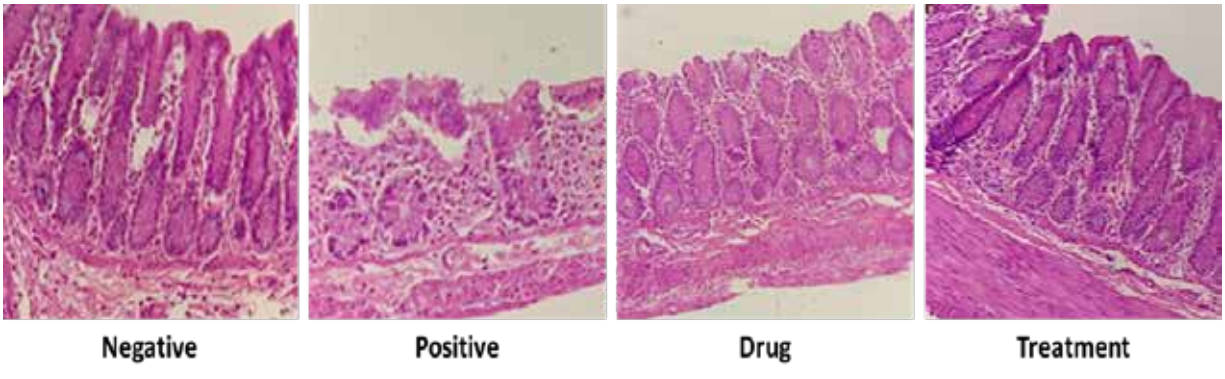
peptide fraction exhibited highest antibacterial activity (30±0.3 mm zone) against *E. coli* MTCC 723, while >50 kDa proteins showed strong immunomodulatory effects as phagocytosis index (PI) (45.75 ± 0.07% PI). MICs were 0.31 mg/mL (>50 kDa proteins) and 0.125 mg/mL (<10 kDa peptides). Cytotoxicity assays revealed excellent safety profiles, with 2.17 mg/mL protein yielding 98.5 ± 0.01% cell viability and 1.025 mg/mL peptide (9xMIC) yielding 98.0±0.01% viability. Nine formulations of different protein-to-peptide ratio were prepared on the basis of the MIC of protein fraction (ranging from 2.82 mg/mL to 5.64 mg/mL) and peptide fractions (11.28- 33.84 mg/mL) and were systematically evaluated to establish dose-response relationships and to optimize therapeutic efficacy. Combination with protein: peptide (4.34 mg: 2.25 mg) demonstrated superior antimicrobial activity (23 ± 0.00 mm), robust phagocytosis index enhancement (36 ± 0.01%) and with high cell viability (98 ± 0.02%) of HT-29 cell line via MTT assay at therapeutic concentrations for the treatment of diarrheal disease.



(a) Antimicrobial activity (b) Immunomodulatory activity (c) Toxicity of formulations
Biofunctional properties and safety evaluation of colostrum-derived formulations

Application of colostrum derived bioactive proteins and peptides for the management of *Shigella* induced diarrhoea

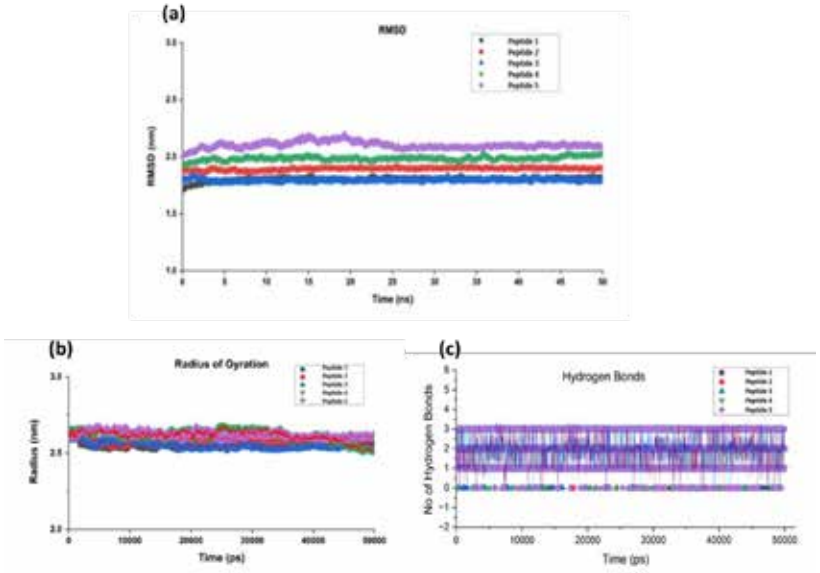
Diarrheal gastrointestinal infections cause approximately 2 billion annual fatalities, predominantly in children. Colostrum whey-derived bioactive proteins and peptides, used in combination, may boost immunity and treat diarrhoea through their antimicrobial and immunomodulatory properties. Protein fractions >50 kDa were obtained from cow colostrum whey by ultrafiltration, while peptide fractions <10 kDa were derived via fermentation using *Lacticaseibacillus rhamnosus* C25. The >50 kDa retentate showed an MIC of 0.470 mg/mL and the <10 kDa peptide fraction an MIC of 1.880 mg/mL against *Shigella dysenteriae*. An optimal combination of 5.64 mg/mL protein and 22.56 mg/mL peptide demonstrated superior efficacy, achieving a phagocytic index of 48.40 ± 8.91%, a zone of inhibition of 22.333 ± 0.333 mm against *S. dysenteriae*, and HT-29 cell viability of 95.952 ± 1.63% via MTT assay. In vivo, diarrhoea was induced in Wistar rats using *S. dysenteriae* (1×10^8 CFU/mL), followed by oral gavage administration of the formulation. Treatment significantly reduced diarrhoea rate. Histopathology of the positive control group revealed disrupted villi, asymmetrical crypts, thin lamina propria, and ulceration, whereas the treatment group showed complete restoration — intact crypts, normalized villi and lamina propria, and no inflammation or ulceration. Serum analysis confirmed decreased ALT, AST, urea, and creatinine alongside elevated IgG, IgA, and total protein levels. The combined antimicrobial and immunomodulatory activity of the bioactive protein-peptide formulation positions it as a safe, effective ingredient for functional foods, nutraceuticals, or pharmaceuticals targeting Shigella-induced diarrhoea.



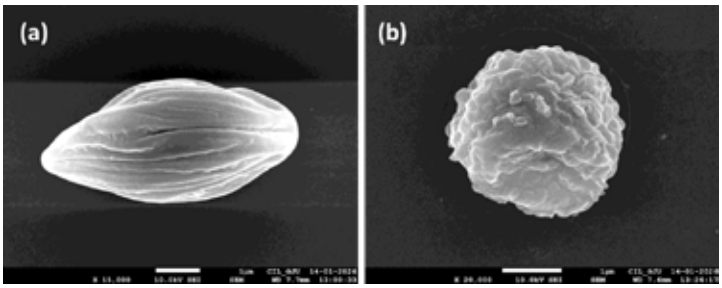
Histopathology of colon of Wistar rats (negative control group- basal diet fed; Positive group -Shigella infection induced by 1x 10^8 CFU/mL; Drug group- given ciprofloxacin and Treatment group –protein: peptide formulation (0.45 gm/mL/kg BW) fed

Antifungal potential of cow colostrum whey-derived lactoferrin rich fermentate preparations against mucormycosis causing molds

Antifungal peptides NTSV1 and NTSV2 were generated from cow colostrum whey- derived by lactobacillus fermentation method. Among the evaluated peptides, NTSV 2 exhibited superior conformational stability, as reflected by consistently low RMSD (~1.9–2.0 nm), stable radius of gyration (~2.1 nm), and persistent hydrogen bonding throughout the simulation, indicating a compact and robust binding mode. Structural superimposition of the MD-derived structures confirmed that peptide binding did not induce any significant perturbation in the global tertiary conformation of the enzyme. *In vitro* antifungal assays further validated these computational findings, with NTSV 2 displaying broad-spectrum antifungal activity and lower minimum inhibitory concentrations (MICs) across multiple pathogenic molds. The enhanced efficacy of NTSV2 is likely attributable to its optimized sequence and shorter length, facilitating stronger molecular interactions. Collectively, these results identify NTSV 2 as a promising antifungal peptide. Furthermore, FESEM analysis of *Rhizopus oryzae* NCDC 52 at the MIC of the antifungal peptide fraction showed distorted morphology and swelling of spores with localized cell wall rupture, spore swelling and leakage of intracellular material. Similarly, *Rhizopus homothallicus* MTCC 602 exhibited severe deformation, spore shrinkage, and focal bursting of the cell surface, indicating membrane damage.



Structural Stability and Compactness of Peptide–Lanosterol 14α-Demethylase Complexes Assessed by MD Simulation using GROMACS. Time evolution of RMSD, radius of gyration, and hydrogen bond number for peptide–enzyme complexes NTSV 1 to NTSV 5 over a 50 ns trajectory (a- c)



Rhizopus oryzae NCDC 52 (a) Control (b) Treated (the deformation of spore after treatments with antifungal peptide fraction)

Bio-functional attributes of extracellular components derived from probiotic lactobacilli as "postbiotics"

Extracellular components including exopolysaccharides (EPS), surface proteins (SP), and peptidoglycan (PGN) were isolated from *Lactobacillus fermentum* (MTCC-5898) and *Lactobacillus rhamnosus* (MTCC-5897) to evaluate their bio-functional potential as postbiotics. EPS purified by ion-exchange chromatography exhibited molecular weights of 96.97 kDa (LF) and 59 kDa (LR). Structural characterization using FT-IR, ^1H and ^13C NMR confirmed the polysaccharide nature and the presence of α- and β-linked sugars. HPLC analysis identified glucose, galactose, and lactose as major constituents. Surface protein profiling and LC–MS-based proteomics revealed 62 and 281 plasma membrane-associated proteins in LF and LR, respectively, with 16 proteins common to both. PGN integrity was validated by

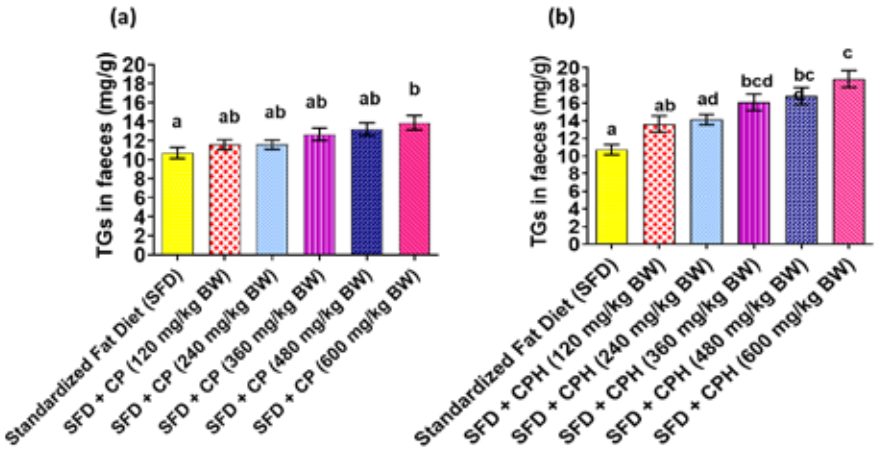
biochemical assays, with substantial glucosamine and uronic acid content. Functionally, EPS derived from LF exhibited strong concentration-dependent antioxidant activity, while EPS and SP from LR showed significant scavenging potential across multiple antioxidant assays. Immunomodulatory evaluation demonstrated suppression of splenocyte proliferation by LF-EPS, whereas LR-derived components enhanced splenocyte proliferation irrespective of dose. Both EPS and SP significantly enhanced macrophage phagocytic activity. Surface proteins played a key role in mucin adhesion, while EPS had minimal influence. LF-EPS significantly improved intestinal barrier integrity in Caco-2 cells, even following *E. coli* challenge. Under oxidative stress, EPS from both strains and LR-SP enhanced cell viability, reduced intracellular ROS, and modulated antioxidant enzyme activity. These antioxidant effects were further validated in a mouse model of ethanol-induced oxidative stress, highlighting postbiotic EPS and SP as promising functional bioactives.

Therapeutic potential of bovine and non-bovine milk

Bio-functional properties of whey and casein proteins isolated from cow, goat, and donkey milk were evaluated, wherein the potential of milk fractions (whey and casein) for inhibiting key metabolic enzymes (DPP-IV, α-glucosidase, lipase, and ACE) involved in lifestyle diseases along with comparison of their anti-oxidative capacities was made. Notably, simulated gastrointestinal digestion substantially enhances both the enzyme inhibitory and antioxidant capacities of whey and casein fractions, emphasizing the pivotal role of digestion in liberating bioactive peptides. Donkey simulated digested whey showed significantly better inhibitory activity with lowest IC_{50} of α-glucosidase and DPP-IV compared to cow and goat. However, no significant difference in inhibitory activities of both enzymes were observed for cow, goat and donkey casein hydrolysates. Likewise simulated digested donkey casein and whey inhibited pancreatic lipase most efficiently with least IC_{50} than cow and goat. On the other hand, ACE inhibition with whey and casein hydrolysates showed no significant difference among milk obtained from bovine and non-bovine species of milch animals. Anti-oxidative potential (metal chelation, ABTS and superoxide scavenging assays) of simulated digested casein and whey obtained from cow milk was observed significantly ($P \leq 0.05$) superior to goat and donkey milk. However, reduction potential of goat casein and whey was found better than cow and goat milk. Despite these beneficial effects, it is important to acknowledge that the IC_{50} values recorded for simulated digested milk fractions remained significantly higher than those of established standard agents, implying limited immediate therapeutic applicability. However, their consistent bioactivities highlight a valuable prophylactic potential.

Goat milk derived casein protein and casein protein hydrolysate exhibited pancreatic lipase inhibition potential in mice model

Pancreatic lipase is an important enzyme for the digestion of triglycerides which releases free fatty acids so that they can be absorbed in the body and stored in adipose tissues. Excessive accumulation of fat can lead to obesity. Goat casein protein was isolated from goat milk and goat casein protein (CP) was hydrolyzed pepsin, trypsin and chymotrypsin to produce casein protein hydrolysate (CPH). Thereafter, CP and CPH were fed to experimental mice and excretion of triglycerides were measured in faeces. Goat Casein Protein (600 mg/kg bw) and Casein Protein Hydrolysate (360 mg/kg body weight results in the significant inhibition of pancreatic lipase in mice thereby excreting undigested TGs in faeces. The level of TGs in faeces was significantly high as compared to control group.



Effect of different doses of (a) CP and (b) CPH consumption on the faecal TGs level. Values are expressed as mean± SEM (n=8)

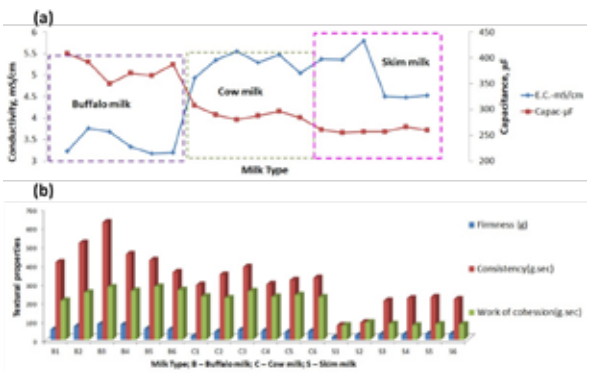
MECHANIZATION AND PROCESS ENGINEERING

Development of an isothermal bovine semen straw thawing device

Four heating elements were evaluated for their suitability for development of an isothermal bovine semen straw thawing device. Two devices were fabricated. Optimization trials using a full factorial design established operating parameters of 37 °C for 60 s and 39 °C for 50 s for the two developed devices. Performance evaluation showed no significant difference in post- thaw motility compared to the water-bath method, while the dry devices achieved operational temperatures faster (4 to 7 min vs. 12 to 15 min). The developed devices eliminate water handling, reduce contamination risk, and provide compact, battery-powered portability. Both devices were efficient, reliable, and field-adaptable alternatives to conventional thawing, with strong potential to improve AI efficiency in remote and on-farm conditions.

Monitoring and characterization of yogurt fermentation process on the basis of electrical properties

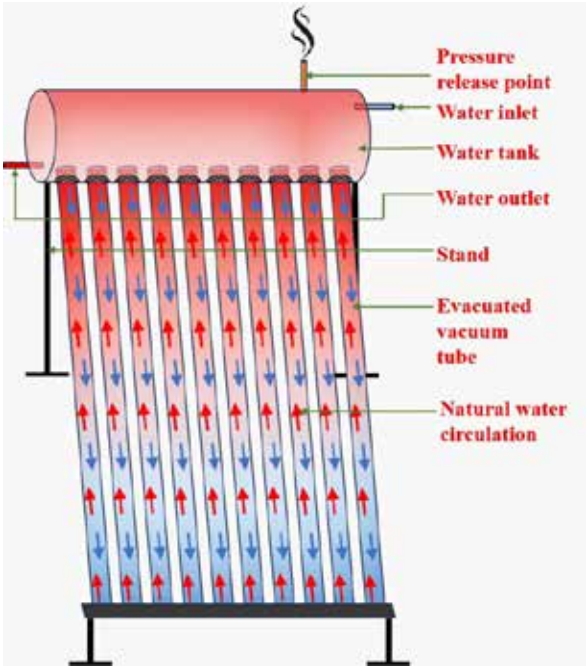
This study investigated the electrical properties of yogurt prepared from cow milk, buffalo milk, and skim milk. The electrical properties, including conductivity and dielectric capacitance, were measured and compared to identify distinct signatures for each milk source. The results showed significant differences in the electrical properties of yogurt from different milk sources. Yogurt from skim milk had the highest conductivity (5.007±0.572 mS/cm) and lowest capacitance value (259.30±3.81 µF). Yogurt from buffalo milk had the lowest conductivity (3.463±0.372 mS/cm) and highest capacitance value (379.10±20.80 µF). Textural properties showed that buffalo milk yogurt was the most firm, while skim milk yogurt was the least firm. The study demonstrates that electrical properties can be used to characterize yogurt based on the type of milk used, providing a potential tool for quality control and authentication in the dairy industry.



Comparative analysis of (a) electrical properties and (b) textural properties of yogurt prepared from various milk sources

Development and integration of automatic thermal storage module with solar fermentation unit

A thermal storage module is developed by utilising the latent heat of phase change material (PCM). To harness solar energy for the yoghurt fermentation process, an evacuated tube-type SWH will be employed. Thus, an evacuated tube-type solar water heater (SWH) is designed to supply thermal energy to PCM based energy storage module from which the energy will go to yogurt fermentation unit for incubation process. The evacuated tube-type collector



Design of evacuated tube-type solar water heater for supplying thermal energy to thermal storage module

was specifically chosen over flat plate collectors because flat plate systems require an external pump for water circulation and have been shown to exhibit lower thermal efficiency compared to evacuated tube systems in multiple studies, particularly under variable climatic conditions. The capacity of the SWH will be of a 100-liter insulated storage tank coupled with ten evacuated glass vacuum tubes. The system will be mounted on a slightly elevated platform to maximize incident solar radiation, enabling optimal heating performance throughout the day.

Scale-up and validation of magnetic induction heating unit for milk

Pre-fabrication simulation studies of the milk heating through SS pipes of variable diameters at different flow rate and induction powers was carried out. The heating power required to heat the SS pipe and the flowing milk at different flow rates is also calculated. Based on the power requirement and temperature distribution of milk through pipe, the control panel for magnetic induction heating was fabricated for varying power range. A food-grade SS sheet is modified to make it magnetic-enabled so that it would be compatible with magnetic induction heating. Then, a pipe is fabricated with the modified SS sheet, and the induction coil is wrapped around the pipe. Insulation is also provided around the coil to reduce the heat loss as well as for safety purpose.

Development of a mechanized unit for *Pinni* manufacturing

The design, drawing and detailed specification of the mechanized moulding unit for the hygienic and efficient moulding of *pinni* mix for pinni manufacturing were prepared and fabricated. It comprises a feeding hopper, a pneumatic material moving box, pneumatic pressing mechanism integrated with a mould assembly, a moving base plate and electrical control panel. It was made with aim to enhance process uniformity, reduce production time, minimize manual handling, and ensure consistent weight and shape across batches. Preliminary testing and corrections / modifications, as required, were completed for the fabricated mechanized moulding unit. The experimental trials on the fabricated mechanized moulding unit for *pinni* manufacturing are in progress for its performance evaluation.

Development of microwave assisted continuous flow heating system

The research project was undertaken to investigate the continuous heating of milk using microwave technology, with emphasis on system design, energy efficiency, and process parameters. Comparative analysis of energy consumption among different heating methods revealed that microwave heating demonstrated the lowest energy use, recorded at 0.053 ± 0.00 kWh, highlighting its potential for energy-efficient dairy processing. The study further observed that microwave efficiency depended on spatial utilization and power level, with lower power yielding better efficiency under partial space utilization and higher power performing more efficiently under full space utilization conditions. Additionally, container geometry influenced heating performance, as lower diameter containers resulted in higher heating rates due to improved energy penetration and distribution. Overall, the findings supported the feasibility of continuous microwave heating as an efficient and scalable alternative for milk processing applications.

Integration of automated heat transfer fluid recirculation system in chest freezer-based milk cooling unit

The design considerations for liquid distributor consists of a circular pipe with 6-12 equally spaced downward-facing nozzles. Heat transfer fluid (HTF) supply to the distributor ring geometry will require a centrifugal pump with a capacity range of 750–1250 liters per hour (lph). Empirical correlations were incorporated into the simulation design model to estimate key properties of the HTF, including density, and viscosity as functions of temperature. Injection velocity was determined by distributing the volumetric flow across individual nozzle cross-sections. Parametric analyses were performed to examine the influence of pump capacity and nozzle size (ranging from 0.001 m to 0.003 m) on injection velocity. Results indicate that injection velocity increases linearly with pump capacity, with smaller nozzle diameters yielding higher velocities. Comparative analysis across nozzle sizes further demonstrated that nozzle geometry critically dictates jet velocity distribution, thereby influencing wall impingement dynamics. These findings establish a basis for selecting pump–nozzle configurations that will help in maintaining controllable injection velocities, thereby aiding the operation of energy-efficient HTF distributor system for cooling.

AICRP on Mechanization of Animal Husbandry, Karnal Centre

The conceptual design and drawing of two lab models (1. Flat and pulley based and 2. Blower based) of mechanized feed distribution system have been prepared considering material handling requirements of feed and fodder and its operational constraints at farm level. The dimensional parameters such as hopper volume, cone angle, belt width, pulley diameter, and outlet height were finalized. The physical properties (angle of repose, moisture content, bulk density, coefficient of static friction on different structural surfaces) of concentrate feed mixture and its ingredients were determined. A non-invasive respiration rate monitor from IGKV, Raipur has been received at ICAR-NDRI, Karnal for conducting prototype feasibility testing (PFT) to

evaluate the efficacy of the technologies at different AICRP on MAH centers. A standardized protocol was developed to determine the physical properties of cow dung. Various setups / prototypes were made for to determine selected engineering properties of cow dung. The properties included moisture content, pH, bulk density, viscosity, angle of repose, and coefficient of friction. The Gir breed dung had moisture content ranging from 74.76 to 84.82%, corresponding to a dry matter content of 16–26%. Similarly, the Sahiwal breed dung had moisture content between 77.16 and 82.64%, with dry matter varying from 17–24%. The pH of cow dung samples of both Gir and Sahiwal breeds were also determined. The angle of repose of cattle dung was determined to evaluate its flow and handling characteristics. The coefficient of friction of cow dung varied with surface material and season.

Development of nutricereals based ready to reconstitute payasam mixes

The two samples of previously optimized foxtail millet payasam dry – crystallized mix formulated by replacing refined sugar with (a) coconut sugar CS-FPM (at ~ 70 % replacement) and (b) Jaggery powder JP-FPM (at 50 % replacement) were packed in Aluminium laminates and stored at 25°C for shelf life evaluation. The physico-chemical, microbial and sensory quality of the mix and reconstituted products were monitored at frequent intervals to access acceptability and spoilage. The dry mixes consistently maintained acceptable sensory scores and its microbiological parameters were within the permissible limits throughout storage (90 days) at 25±2°C. The moisture content of both mixes remained below 4% throughout storage. The effect of incorporation of foxtail millet flour and finger millet flour, along with the addition of skimmed milk powder (SMP) in the traditional rice based *ada payasam* formulation was evaluated. The impact of this reformulation was evaluated in terms of physico – chemical parameters, such as viscosity and textural properties, colour properties and sensory attributes. The formulation was optimized based on data recorded over 22 runs of experiments using Mixture Design analysis and the optimized *ada* formulation was obtained as 42.20% foxtail millet flour, 25% finger millet flour, 22.80%, rice flour, and 10% SMP. *Palada payasam* was prepared using the reformulated *ada* flakes (fresh and dried) as well as rice *ada* (control) and subjected to sensory evaluation through a fuzzy logic approach. A fourth sample was prepared by reconstituting a dry crystallized mix with reformulated *ada* flakes. The analysis revealed that the experimental samples were comparable to control *payasam* for its acceptability; reconstituted dry crystallized sample had greater acceptability.

Densification of cattle dung-based composite torrefied biomass for bioenergy

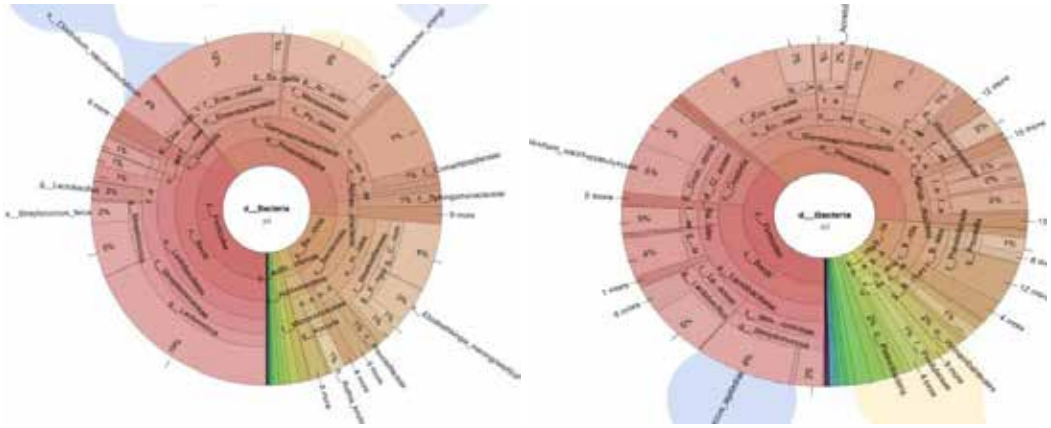
Thermal decomposition kinetics of cattle dung, coconut shell, and pongamia oil seed cake were studied through thermogravimetric analysis. The TGA profiles exhibited stepwise mass loss, corresponding to the degradation of specific structural components such as hemicellulose, pectin, cellulose, and lignin, indicating their distinct thermal stability and decomposition behaviour. The maximum DTG values were observed in the temperature range from 272.71°C to 395.75°C, 267.16°C to 361.28°C and 256.97°C – 345.69°C for cattle dung, coconut shell and pongamia oil seed cake respectively. Torrefaction experiments were conducted to evaluate the performance of the developed equipment and establish suitable processing parameters. The results indicated that a temperature range of 300–400°C and a residence time of 45–135 minutes are optimal for effective biomass conversion. Ultimate analysis of torrefied cow dung showed a 40–45% increase in carbon content and a 39–40% reduction in volatile matter compared to dried dung. The temperature profile during the burning experiment was recorded using a thermal imaging camera. The cow dung torrefied pellets achieved a maximum combustion temperature of 660°C, which gradually decreased to 356°C after 25 minutes and further to 240°C after 35 minutes, demonstrating improved thermal performance, sustained combustion, and good potential as a solid biofuel for thermal energy applications.

Torrefied cattle dung pellets for generation of bioenergy

RISK ASSESSMENT AND NEW GENERATION METHODS TO ASSESS THE QUALITY AND SAFETY OF MILK AND MILK PRODUCTS

Metabolomic and metagenomic profiling of milk from selected breeds of indigenous cattle

A total of 74 milk samples from Sahiwal cows were evaluated for compositional parameters. The average fat, SNF, and protein contents were recorded as 4.74 ± 0.91%, 8.87 ± 0.41%, and 3.70 ± 0.35%, respectively. Metabolite profiling of milk from Sahiwal, Tharparkar, and Karan Fries cattle across different seasons revealed 57.2% variability in metabolite composition. Further, two pooled metagenomic milk samples, each comprising samples from four Holstein Friesian cows, were subjected to 16S rRNA gene sequencing. Rarefaction-based diversity analysis revealed significantly higher species richness in HF-2 compared to HF-1. At the phylum level, Firmicutes (38.86% and 36.96%) and Proteobacteria (37.23% and 38.32%) showed comparable abundance in both samples. At the genus level, HF-1 was dominated by Lactococcus (18.68%), Enterobacteriaceae (11.55%), and Acinetobacter (10.16%), whereas HF-2 exhibited higher abundance of Enterobacteriaceae (8.51%), Streptococcus agalactiae (7.64%), and Aeromonas (6.55%).



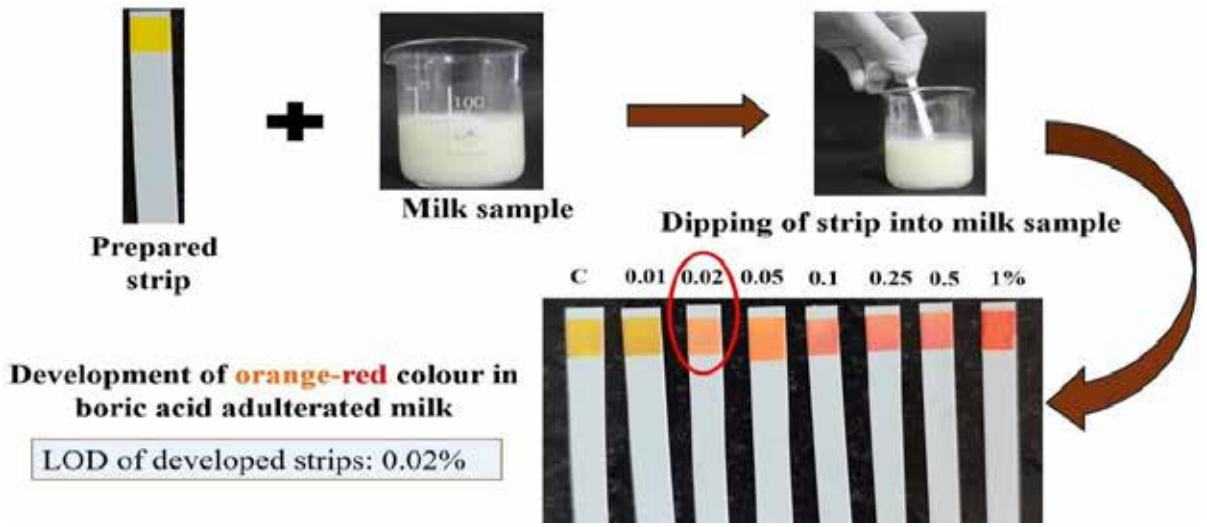
Bacterial distribution in HF-1 sample *Bacterial distribution in HF-2 sample*

Metagenomic profiling of raw milk bacterial communities in Holstein Friesian (HF) cattle

Paper-based assay for detection of boric acid in milk

Boric acid is sometimes illegally added to milk by unscrupulous market players to inhibit microbial growth and extend shelf life. Although it acts as a preservative by suppressing yeasts, moulds, and bacteria, its addition poses significant risks to human health and has been reported in several surveillance studies. The FSSAI Manual recommends a conventional wet-chemistry method for detection of boric acid; however, the method requires laboratory infrastructure, corrosive reagents, and may produce ambiguous results, limiting its field applicability. To address these limitations, a paper-based strip assay was developed for rapid and user-friendly detection of boric acid in milk. The assay was validated according to AOAC Guidelines (Appendix F) and demonstrated improved sensitivity, low cost, and ease of adaptability for field applications. The developed strip test provides results within 8 minutes, requires only a small quantity of milk, and does not require any instrumentation, as detection is based on a simple colour change. The assay exhibited high sensitivity and accuracy, with a detection limit of 0.02% and 100% accuracy without false-positive or false-negative results. No interference was observed from common adulterants such as glucose, maltodextrin, sucrose, hydrogen peroxide, neutralizers, ammonium compounds, urea, and detergents. The assay was also effective in acidic and alkaline milk and suitable for boiled, pasteurized, and sterilized milk samples. In addition, the strips

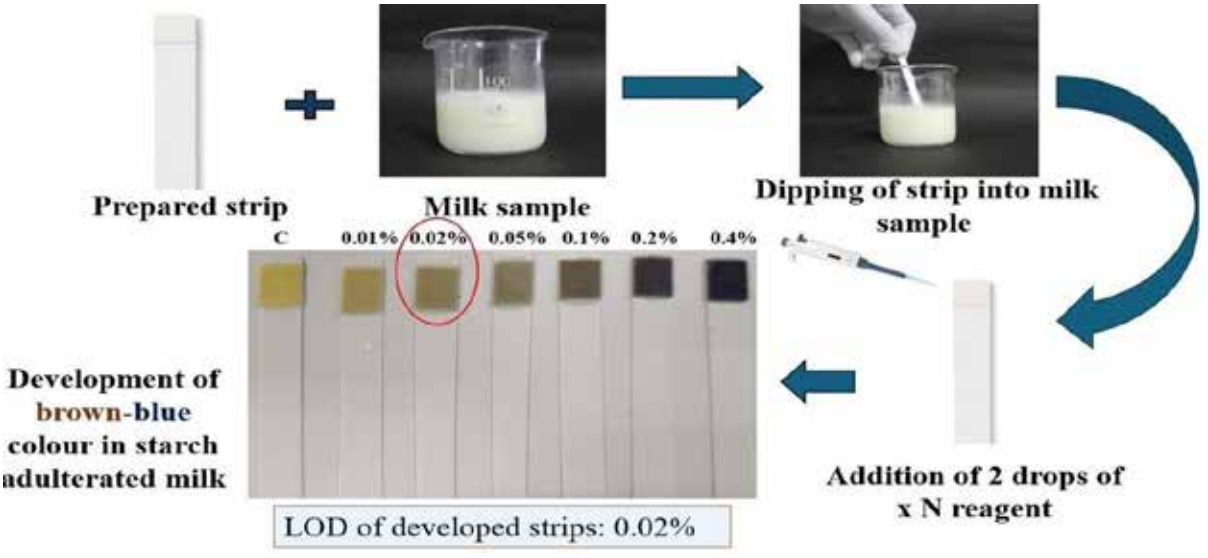
demonstrated ease of handling and a shelf life of four months under both room temperature (25–30°C) and refrigerated (0–4°C) storage conditions, making them suitable for on-site application without the need for skilled personnel.



Working of paper-based strips for the detection of boric acid in milk

Paper-based strip assay for detection of starch in milk

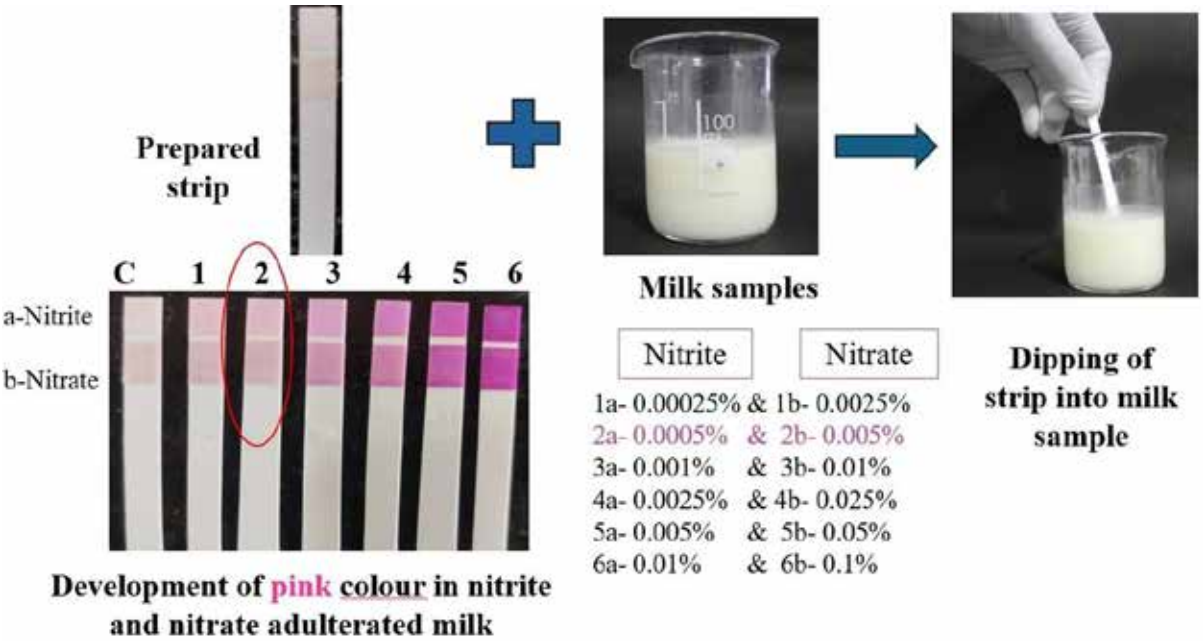
Starch is illegally added to milk to increase total solids and mask dilution with water, adversely affecting milk quality and processing characteristics. Conventional FSSAI wet-chemistry methods require laboratory infrastructure, corrosive reagents, and skilled personnel, while advanced techniques such as HPLC and spectrophotometry are costly and unsuitable for field applications. To address these limitations, a rapid paper-based strip assay was developed and validated according to AOAC Guidelines (Appendix F) for on-site starch detection in milk. The assay provides results within 2 minutes through a simple colour change without requiring instrumentation. It demonstrated high sensitivity with a detection limit of 0.02% and achieved 100% accuracy without false-positive or false-negative results. No interference was observed from common adulterants including glucose, maltodextrin, sucrose, hydrogen peroxide, neutralizers, ammonium compounds, urea, and detergents. The assay was effective in acidic and alkaline milk and suitable for boiled, pasteurized, and sterilized milk samples. The developed strips exhibited easy handling and remained stable for four months under both room temperature (25–30°C) and refrigerated (0–4°C) storage conditions, making them suitable for rapid field-level screening without the need for skilled personnel.



Working of paper-based strips for the detection of starch in milk

Paper-based strip assay for simultaneous detection of nitrites and nitrates in milk

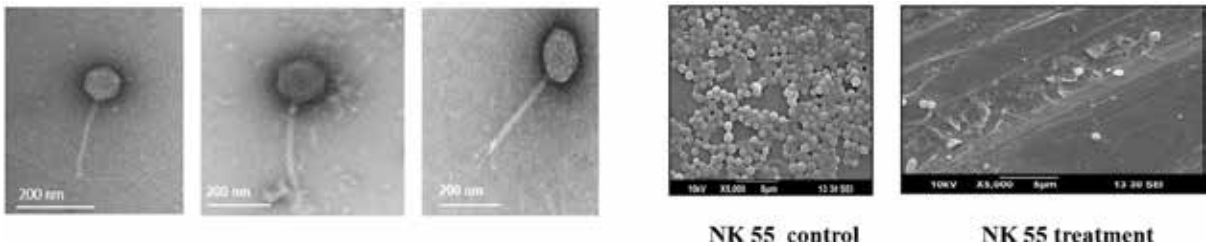
The presence of nitrites and nitrates in milk may indicate adulteration with pond water, which is sometimes added by unscrupulous individuals to increase milk volume. Pond water is generally denser than tap water and may contain nitrites and nitrates originating from agricultural fertilizers. The FSSAI Manual recommends a conventional wet-chemistry method for nitrate detection; however, the method requires laboratory infrastructure, corrosive reagents, and may produce ambiguous results, thereby limiting its field applicability. To address these limitations, a paper-based strip assay was developed for simultaneous detection of nitrites and nitrates in milk and validated according to AOAC Guidelines (Appendix F). The developed assay provides rapid results within 2 minutes, requires only a small quantity of milk, and does not require any instrumentation, as detection is based on a simple colour change. The assay demonstrated high sensitivity and accuracy, with detection limits of 0.0005% for nitrite and 0.005% for nitrate, achieving 100% accuracy without false-positive or false-negative results**.** No interference was observed from common adulterants such as glucose, maltodextrin, sucrose, hydrogen peroxide, neutralizers, ammonium compounds, urea, and detergents. The assay was effective in acidic and alkaline milk and suitable for boiled, pasteurized, and sterilized milk samples. In addition, the strips offered ease of handling and a shelf life of four months under refrigerated storage (0–4°C)**,** making them suitable for field-level applications without the requirement for skilled personnel.



Working of paper-based strips for the detection of nitrites and nitrates in milk

Bacteriophage-based antimicrobial therapy for biocontrol of multidrug-resistant (MDR) zoonotic dairy pathogens

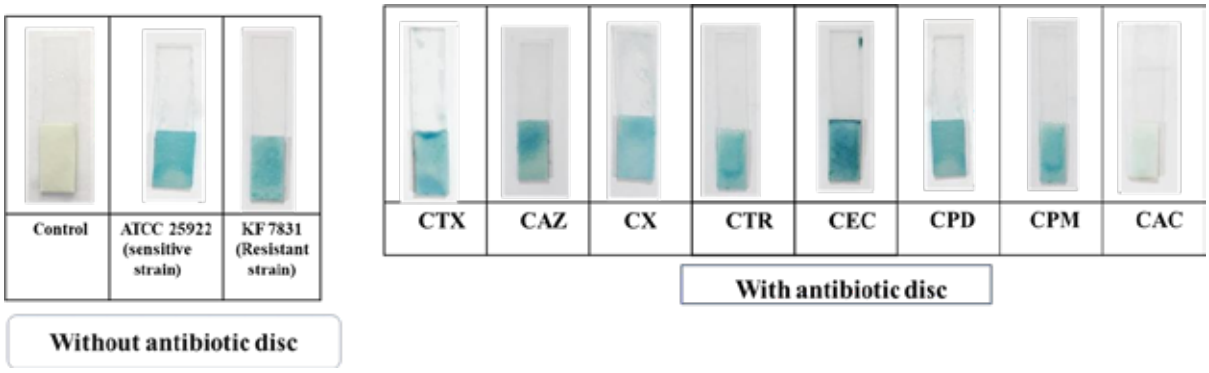
This study demonstrated the strong potential of bacteriophages and metal-based antimicrobials for controlling multidrug-resistant (MDR) bacterial pathogens. A total of 12 lytic bacteriophages were isolated and characterized, among which BSA1, BSA3, BSA7, and BSA12 exhibited high lytic efficiency and significant therapeutic potential. Phage cocktails showed enhanced antibacterial efficacy by broadening the host range, reducing the development of bacterial resistance, and exhibiting greater effectiveness than individual phages against both planktonic cells and biofilms, particularly in MDR *Staphylococcus aureus*. Mature biofilms were efficiently disrupted, as confirmed through confocal laser scanning microscopy and scanning electron microscopy, which revealed extensive biofilm degradation and cellular disruption. Metal ions demonstrated antimicrobial activity in the order of Ag > Au > Zn > Cu**,** with silver exhibiting the lowest minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC) values, along with severe membrane damage to bacterial cells. Synergistic antimicrobial effects were observed for combinations of Ag/Zn and Ag/Cu**,** while silver and gold were also effective in reducing biofilms formed on stainless steel surfaces. Overall, the study established that the combined application of bacteriophages and metal-based antimicrobials offers a robust and complementary strategy for controlling MDR and biofilm-forming bacterial pathogens in dairy systems.



Bacteriophage and metal use in reduction of Biofilm on equipment surfaces

Development of novel strategies for detection and control of antimicrobial-resistant (AMR) mastitis pathogens in dairy animals and the environment using nanotechnology

A rapid paper-strip sensor was developed and evaluated for detection of ESBL-resistant *Escherichia coli* using 641 field samples**,** including milk samples, rectal swabs from cattle, buffaloes, and goats, and poultry cloacal swabs collected across Haryana. Based on strip testing in combination with the California Mastitis Test (CMT) and somatic cell count (SCC), samples were categorized as normal, subclinical mastitis, and clinical mastitis, with *E. coli* detected within 8 hours**.** Overall, the sensor detected *E. coli* in 368 samples within 6–12 hours at 37°C**,** including 73 ESBL-producing isolates from multiple sources. The results showed strong concordance with conventional antimicrobial susceptibility testing, double-disc diffusion assay, chromogenic media, and molecular methods. Third-party validation confirmed high specificity and good sensitivity, with minimal false-positive and false-negative results in both inclusive and exclusive validation studies. In addition, paper-strip sensors were developed for rapid visual detection of vancomycin-resistant *Enterococcus* and methicillin-resistant *Staphylococcus* in milk using selective media and distinct colourimetric responses. Furthermore, <10 kDa peptides and ZnO nanoparticle conjugates (ZnONPCs) demonstrated potent antimicrobial activity, particularly against *Staphylococcus aureus* and *Streptococcus agalactiae*, achieving nearly 6 log bacterial reduction within 5 minutes**.** These formulations also exhibited reduced haemolytic activity and confirmed biocompatibility, highlighting their potential as alternative antimicrobial agents for controlling AMR mastitis pathogens.



Paper strip sensor for detection of antimicrobial-resistant (AMR) E. coli in milk

One Health perspective on antimicrobial resistance in *Escherichia coli* and *Staphylococcus aureus* from dairy livestock and poultry

Concerning trends in antimicrobial resistance (AMR) were observed among *Escherichia coli* and *Staphylococcus aureus* isolates obtained from cow and buffalo milk, rectal swabs of cattle, buffaloes, and goats, and poultry cloacal swabs. Notably, the emergence of multidrug-resistant (MDR) bacterial strains was recorded. Among *E. coli* isolates, high resistance to cefoxitin (FOX; 64.6%) and ampicillin (AMP; 87%) indicated broad β-lactam resistance and possible AmpC-mediated resistance mechanisms. Detection of resistance genes including blaTEM, blaSHV, blaOXA, blaCTXM-1, blaCTXM-2, blaCTXM-9, and blaCTXM-8/25 strongly confirmed the presence of extended-spectrum β-lactamase (ESBL)-producing strains. This was further supported by moderate resistance to third-generation cephalosporins such as cefotaxime (CTX), ceftazidime (CAZ), and ceftriaxone (CRO)**,** with resistance levels ranging from approximately 20–25%**.** However, high susceptibility to amoxicillin-clavulanic acid (AMC; 83.5%)**,** imipenem (IMP; 93.3%)**,** chloramphenicol (CHL; 94.7%)**,** and aztreonam (ATM; 89.5%) suggested that these antibiotics remain effective therapeutic options. In *S. aureus* isolates, extremely high resistance to cefoxitin (FOX) and penicillin (PEN) suggested β-lactamase

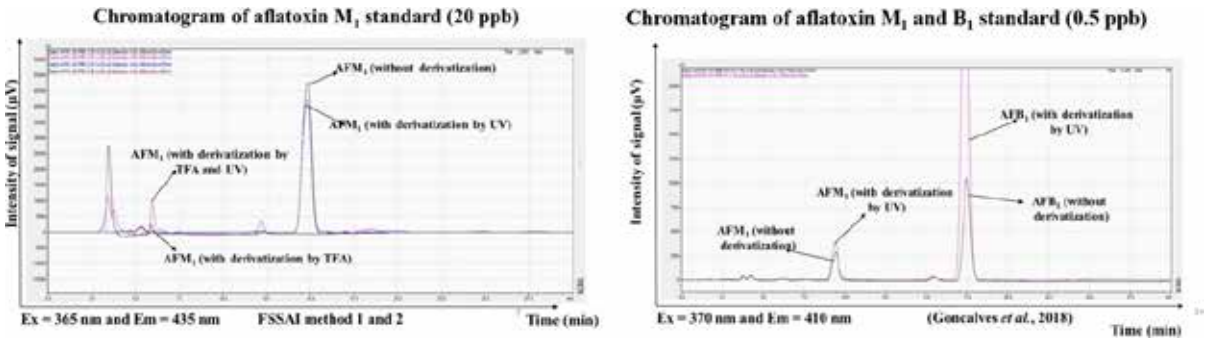
activity and possible methicillin-resistant *S. aureus* (MRSA), likely associated with the mecA gene. of particular concern was the emergence of resistance to the last-resort antibiotic linezolid (LNZ), highlighting the need to investigate underlying resistance mechanisms such as 23S rRNA mutations or the cfr gene. Among the antibiotics tested, gentamicin (GEN; 96.4%), trimethoprim-sulfamethoxazole (STX; 88.4%), and ciprofloxacin (CIP; 80.4%) were found to be the most effective against *S. aureus* isolates.

Surveillance of veterinary antimicrobial residues in raw milk by LC-MS and HPLC: A food safety assessment

During 2024–2025, a total of 225 milk samples (cow and buffalo milk) were screened using LC-MS and HPLC techniques for detection of veterinary drug residues. LC-MS analysis revealed that seven samples tested positive for tetracycline, 10 samples for trimethoprim, five samples for streptomycin, and eight samples for enrofloxacin. However, all detected residue levels were within the permissible limits prescribed by the FSSAI and Codex Alimentarius. An HPLC-based analytical method was also developed for extraction and quantification of sulphaquinoxaline, enrofloxacin, and oxytetracycline in raw milk samples. HPLC analysis for sulphaquinoxaline showed that five out of 225 samples, all originating from Rajasthan, tested positive with residue concentrations ranging from 1.846 to 2.035 ppb, which were well below the permissible maximum residue limit (MRL) of 10 ppb prescribed by the FSSAI. For enrofloxacin, 10 out of 225 samples collected from Haryana and Rajasthan tested positive, with concentrations ranging from 0.104 to 8.737 ppb, which were substantially lower than the prescribed MRL of 100 ppb. Similarly, for oxytetracycline, 10 out of 225 samples from Haryana and Rajasthan tested positive, with residue levels ranging from 1.405 to 17.37 ppb, remaining well within the permissible MRL of 100 ppb established by the FSSAI.

Occurrence, stability, and partitioning of aflatoxin M1 in milk and dairy products: an HPLC-FLD-based investigation

An HPLC–fluorescence detection (HPLC-FLD) method was optimized and validated for sensitive detection of aflatoxin M1 (AFM1) in milk and dairy products. Three chromatographic methods were evaluated, all demonstrating excellent linearity ($R^2 \geq 0.994$) over a concentration range of 0.5–100 ppb. Among these, FSSAI Method 2 enabled rapid and high-throughput analysis with a shorter retention time (5.8 min), whereas FSSAI Method 1 provided high precision without the need for derivatization. Validation using immunoaffinity column clean-up demonstrated excellent analytical performance in milk samples, with high recovery values (88.89–101.14%), low relative standard deviation (RSD ≤ 1.46%), and very low limits of detection (LOD: 0.0045 ppb) and quantification (LOQ: 0.0135 ppb). Heat treatments including boiling, pasteurization, and sterilization had no significant effect on AFM1 concentration, confirming the thermal stability of the toxin. For paneer and channa samples, extraction using 55% methanol and saturated saline solution yielded optimal recovery values (87.89–97.52%). AFM1 was found to preferentially concentrate approximately 2–3 fold in curd and paneer compared to milk, whereas whey contained the lowest toxin levels. The toxin also remained stable during refrigerated storage, highlighting the importance of stringent control measures at the raw milk procurement stage.

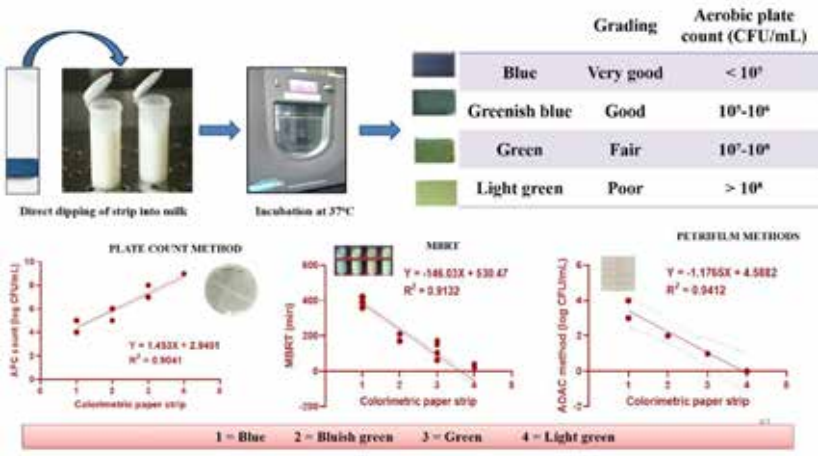


Detection and quantification of aflatoxin M1 in milk using HPLC based methods

Evaluation of PANI–PEC paper strip sensor for detection of total plate count in milk and milk products

A rapid colorimetric paper-strip sensor was developed for estimation of aerobic plate count (APC) in milk as an alternative to laborious conventional methods and costly advanced analytical techniques. The assay was based on pH and conductivity changes caused by bacterial metabolism, resulting in a visible colour transition from blue to green due to conversion of polyaniline–pectin nanoparticles (PANI–PEC) from emeraldine base to emeraldine salt form. The sensor was optimized using glucose-activated PANI–PEC particles and growth medium immobilized on Whatman filter paper, enabling bacterial detection within 20 minutes at 37 ± 2°C using 500 µL milk samples. Nanoparticles were characterized using FE-

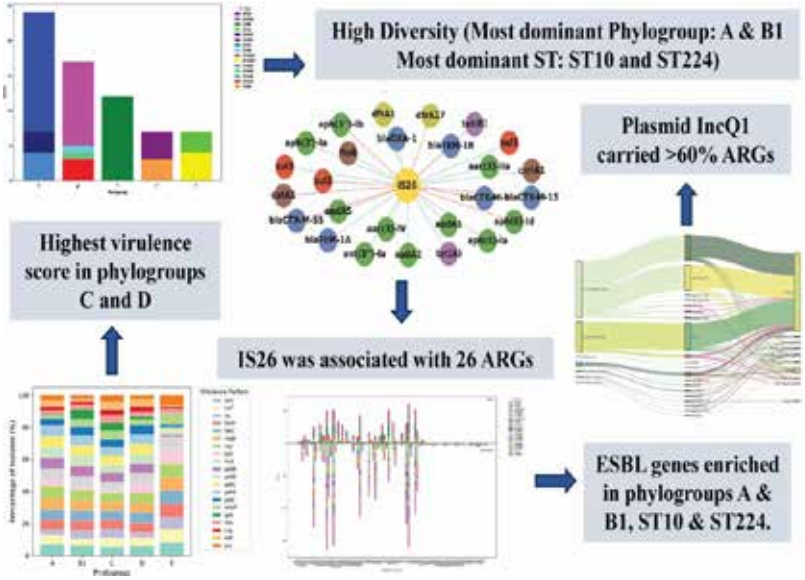
SEM, TEM, EDS, FTIR, XRD, and UV–visible spectroscopy. The assay showed consistent performance against Gram-positive, Gram-negative, fermentative, spore-forming, and psychrotrophic bacteria, although thermophilic bacteria exhibited relatively longer response times. Formalin and hydrogen peroxide inhibited sensor response, whereas detergents showed no significant interference. Validation using 360 milk samples demonstrated strong agreement with IS 5402:2021 and the methylene blue reduction test (MBRT), satisfying ISO 16140-2:2016 criteria. The assay exhibited 93–94% sensitivity, high specificity, near-perfect agreement (κ = 0.90–0.93), and strong correlation (r > 0.90) with reference methods.



Evaluation and validation of paper strip sensor for detection of microbial quality of raw milk

Genetic comparison of virulence and resistance factors in phylogenetically diverse *Escherichia coli* from dairy cattle

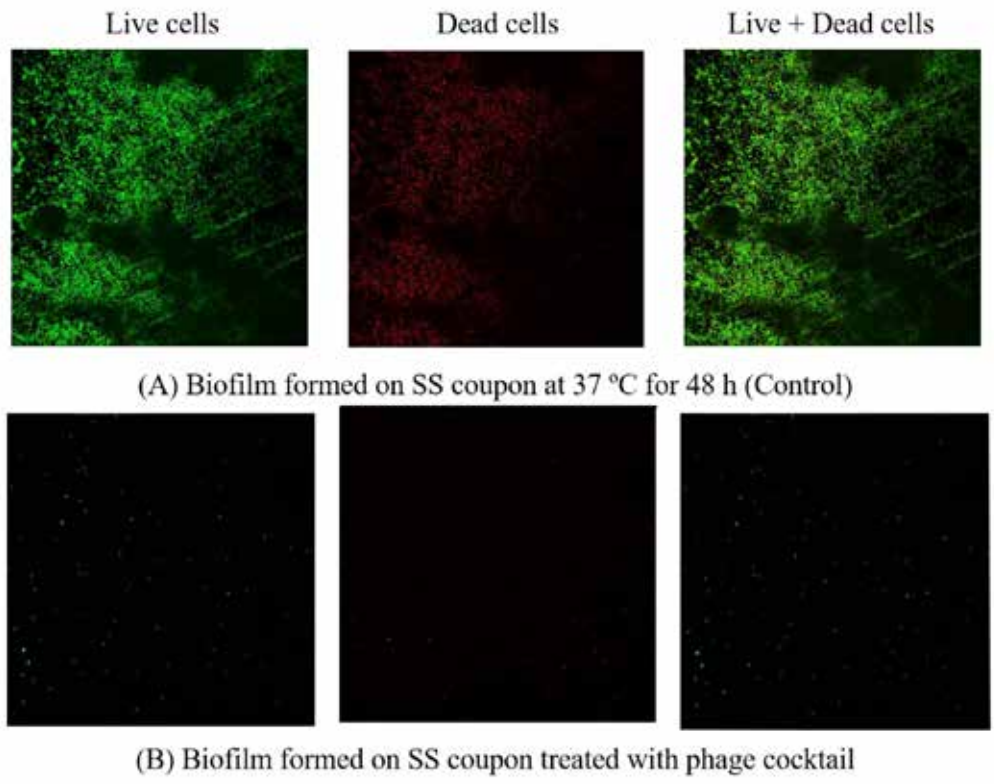
A comprehensive whole-genome sequence analysis was conducted on 172 phylogenetically diverse *Escherichia coli* strains isolated from dairy cattle across seven countries to investigate antimicrobial resistance genes (ARGs), virulence factors, and mobile genetic elements (MGEs) in ESBL-producing (n = 63) and non-ESBL (n = 109) isolates. Phylogroups A (34.88%) and B1 (34.30%) predominated, with ST10 and ST224 identified as the major sequence types. A total of 86 ARGs conferring resistance to nine antibiotic classes were detected, with *sul2, aph(3')-Ib, aph(6)-Id, tetA,* and *blaTEM-1B* being the most prevalent. ESBL-associated genes such as *blaCTX-M-1* and *blaCTX-M-15* were enriched in ESBL isolates, whereas non-ESBL isolates showed greater ARG diversity. Additionally, 163 virulence genes were identified, with *terC, fdeC,* and *nlpI* being the most common, while phylogroups C and D exhibited the highest virulence scores. Mobile genetic elements played a major role in ARG dissemination, particularly IS26 and ISVsa3, along with transposons (*Tn2, Tn1721,* and *Tn6205*) and class 1 integrons (*intI1* detected in 67.44% isolates). IncQ1 plasmids carried nearly 62% of plasmid-associated ARGs, highlighting their significance in antimicrobial resistance transfer.



Diverse virulence and resistance factors in E. coli from dairy cattle

Phage-based therapy for the biocontrol of methicillin-resistant *Staphylococcus aureus*

Methicillin-resistant *Staphylococcus aureus* (MRSA) poses a serious challenge to the dairy industry due to its multidrug resistance and strong biofilm-forming ability on dairy processing surfaces, which reduces the effectiveness of conventional sanitizers. This study focused on the isolation and characterization of MRSA-specific bacteriophages and evaluation of their antibiofilm efficacy on stainless steel surfaces under dairy-relevant conditions. A total of 12 lytic bacteriophages (BSA1–BSA12) were isolated and demonstrated lytic activity against *S. aureus* strains NK109, 6011, and NK23, with high titres ranging from 10^7 to 10^9 PFU/mL. Several phages exhibited broad host-range lytic activity, high thermal and pH stability, short latent periods (20–40 minutes), and large burst sizes (100–440 PFU/cell). Transmission electron microscopy (TEM) classified the phages into the families *Podoviridae, Siphoviridae,* and *Myoviridae*. Biofilm assays revealed strong biofilm formation by strains NK109 and 6011, which were significantly reduced following phage treatment. The phages achieved approximately 2–4 log reduction in biofilm biomass and effectively prevented new biofilm formation within 1 hour of treatment. Microscopic analyses further confirmed extensive disruption and degradation of the biofilm architecture. Overall, the study demonstrated the strong potential of bacteriophages as eco-friendly and targeted biocontrol agents for management of MRSA biofilms in dairy processing environments.

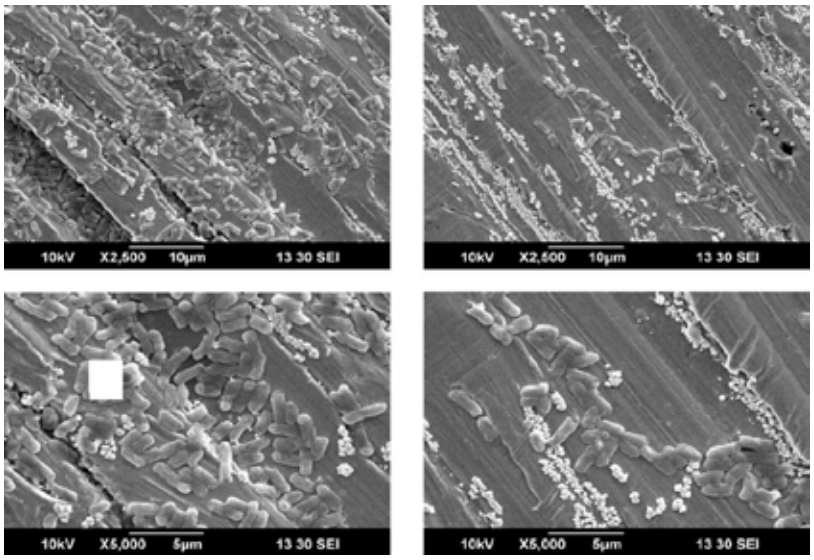


***Staphylococcus aureus* NK 109 Biofilm reduction on stainless steel surfaces by *S. aureus* phages**

Metal- and nanoparticle-based antimicrobials for control of multidrug-resistant (MDR) pathogens

The rapid escalation of antimicrobial resistance (AMR) has intensified the threat posed by multidrug-resistant (MDR) pathogens such as extended-spectrum β-lactamase (ESBL)-producing *Escherichia coli*, methicillin-resistant *Staphylococcus aureus* (MRSA), and vancomycin-resistant *Enterococci* (VRE), which are capable of forming persistent biofilms in dairy and other industrial environments. This study evaluated the antibacterial and antibiofilm efficacy of selected metal ions (Al, Cu, Au, Ag, and Zn) and their nanoparticles against these MDR pathogens. Among the tested metals, silver and gold exhibited strong antibacterial activity even at low concentrations, with silver showing the lowest minimum inhibitory concentration (MIC: 0.078 mM) and rapid bactericidal action. Zinc and copper demonstrated moderate antibacterial effects, whereas aluminium showed limited antimicrobial activity. Synergistic antimicrobial interactions were observed for combinations of Cu–Au, Zn–Cu, and Zn–Ag. In contrast, synthesized silver and gold

nanoparticles exhibited negligible antimicrobial activity, likely due to particle aggregation and reduced ion release. Antibiofilm studies demonstrated that silver was the most effective agent, achieving more than 60% biofilm eradication on stainless steel surfaces, followed by gold. Confocal microscopy further confirmed significant disruption of biofilm architecture following treatment. Overall, the study demonstrated that metallic ions, particularly silver and gold, possess strong potential as effective antibiofilm agents for industrial surface decontamination and control of MDR pathogens.



Scanning Electron Microscopy images of Silver nitrate treatment on stainless steel coupon biofilms of ESBL E coli.

Combating AMR mastitis pathogens in dairy animals and the environment using peptide–nanoparticle conjugates

Mastitis caused by antimicrobial-resistant (AMR) pathogens remains a major challenge in dairy farming. In this study, zinc oxide nanoparticle–peptide conjugates (ZnONPCs) were developed using <10 kDa whey-derived peptides to enhance antimicrobial efficacy against mastitis-associated pathogens. Physicochemical characterization confirmed successful peptide conjugation through UV–Vis spectroscopy, XRD, FTIR, SEM, EDX, zeta potential, and particle size analysis. Conjugation increased hydrodynamic diameter from 52.63 nm to 159 nm and altered zeta potential from −18.6 mV to −1.8 mV. The ZnONPCs exhibited superior antimicrobial activity compared to ZnONPs or peptides alone, with MIC and MBC values of 7–8 µg/mL against *Staphylococcus aureus* and *Streptococcus agalactiae*, and 15–20 µg/mL against *Escherichia coli* and *Klebsiella pneumoniae*. Reduced haemolytic activity indicated improved biocompatibility. Field application of ZnONPCs (2 mg/mL) on milking floor samples achieved nearly 6-log bacterial reduction within 5 minutes using 500 µL of formulation, demonstrating strong potential as rapid and effective disinfectants for controlling AMR mastitis pathogens in dairy environments.

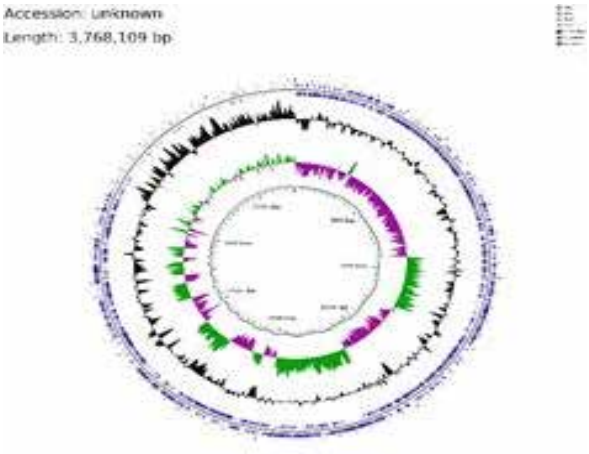
<10kDa peptide fractions (@5mg/mL) *E. coli ATCC 25922(ZnOPC)* *ESBL E.coli FcW5 (ZnOPC)*

Antimicrobial activity of peptide-nanoparticle conjugates

Genome Sequence of *Lacticaseibacillus rhamnosus* RL-4

Lacticaseibacillus rhamnosus RL-4 is a lactic acid bacterium with potential bioactive properties, particularly peptide-mediated inhibition of α-glucosidase and dipeptidyl peptidase-IV (DPP-IV). The genome of RL-4 was sequenced using the Illumina NovaSeq 6000 platform with 469× coverage and assembled de novo using SPAdes. Taxonomic identity was confirmed through the Type (Strain) Genome Server (TYGS), while structural and functional annotations were performed using Prokka and Recognizer against Pfam, COG, and CDD databases. Secondary metabolite clusters were identified using antiSMASH 7.1.0. The draft genome

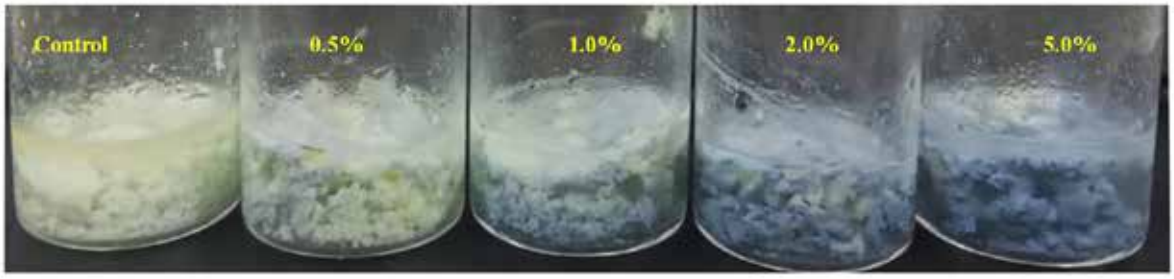
assembly comprised 410 contigs containing 3,148 genes, including 3,010 protein-coding sequences. Phylogenomic analysis confirmed species identity with a digital DNA–DNA hybridization (dDDH) value of 91.8% against the type strain JCM 1136^{T}. Genome mining revealed a robust proteolytic system, including S8/S1C serine peptidases, X-Pro dipeptidyl peptidase (PepX), and Opp oligopeptide transporter clusters. Glycoside hydrolases such as α-glucosidase and 6-phospho-α-glucosidase, along with multiple sugar phosphotransferase system (PTS) operons and putative bacteriocin biosynthetic gene clusters, were also identified, indicating strong potential for carbohydrate metabolism and bioactive peptide production.



Circular view of Lacticaseibacillus rhamnosus RL4 Genome

Qualitative test method for detection of milk powder in paneer

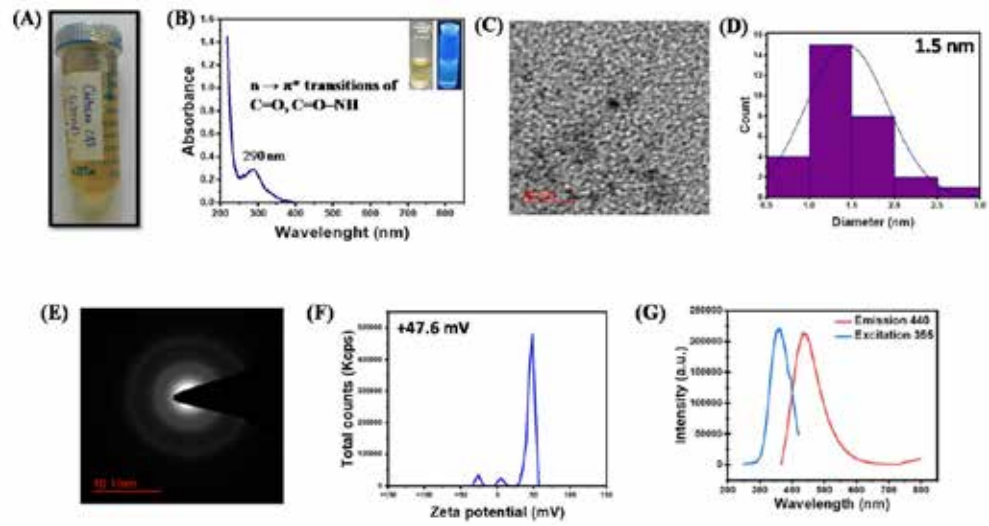
Paneer is a traditional Indian dairy product prepared from heat-treated milk using permitted acidulants. Increasing market demand has raised concerns regarding the use of low-quality or expired milk powders in paneer manufacture while marketing the product as prepared from fresh milk. To address this issue, a qualitative detection method based on the phosphomolybdic acid test was developed for identifying skim milk powder (SMP) in paneer. The assay produced clear concentration-dependent colour changes, with a visual limit of detection (LOD) of 1.0% SMP reconstitution in paneer and demonstrated consistent reproducibility across replicates. The method was unaffected by the presence of 11 common adulterants and preservatives and remained effective in paneer prepared using permitted coagulants such as citric acid, acetic acid, and glucono delta-lactone. The assay was also capable of detecting whole milk powder with similar sensitivity. The developed method provides a rapid, simple, and reliable tool for detecting milk powder adulteration in paneer, thereby supporting regulatory monitoring, quality assurance, and consumer safety.



Qualitative test showing the limit of detection for skim milk powder in paneer

Carbon Quantum Dot (CQD)-based antimicrobial formulation for mastitis prevention in dairy animals

Methicillin-resistant *Staphylococcus aureus* (MRSA) and extended-spectrum β-lactamase (ESBL)-producing *Escherichia coli* are major antimicrobial-resistant pathogens associated with bovine mastitis, necessitating development of alternative therapeutic strategies. In this study, super-cationic carbon quantum dots (CQDs) were synthesized through a one-step hydrothermal method using chitosan as the carbon source and dopant. The synthesized CQDs exhibited a high positive zeta potential (+47.60 mV) and were characterized using HR-TEM, DLS, UV–Vis spectroscopy, photoluminescence, ATR-FTIR, XRD, XPS, AFM, and Raman spectroscopy. The CQDs were quasi-spherical, semi-crystalline, and had an average diameter of approximately 1.5 nm. They demonstrated strong antibacterial activity against MRSA and ESBL *E. coli*, with MIC and MBC values of 83.98 µg/mL and 167.96 µg/mL, respectively, achieving complete bacterial inhibition within 4–6 h. Mechanistic studies indicated enhanced intracellular ROS generation, membrane pore formation, and leakage of proteins, reducing sugars, and nucleic acids, suggesting oxidative stress-mediated membrane disruption. The CQDs also exhibited dose-dependent antibiofilm activity along with significant *in vitro* antioxidant and anti-inflammatory properties. Further, they were non-hemolytic and showed excellent biocompatibility with eukaryotic cells, highlighting their potential as a safe, antibiotic-free nanotherapeutic strategy for management of MDR bovine mastitis.



Structural and optical properties of chitosan derived carbon quantum dots. (A). Light brown colour of CQDs. (B) UV-vis spectra (C) HR-TEM micrograph (D) Histogram representing the size of CQDs (E) SAED pattern (F) Zeta potential/ charge (G) Photoluminescent spectroscopy

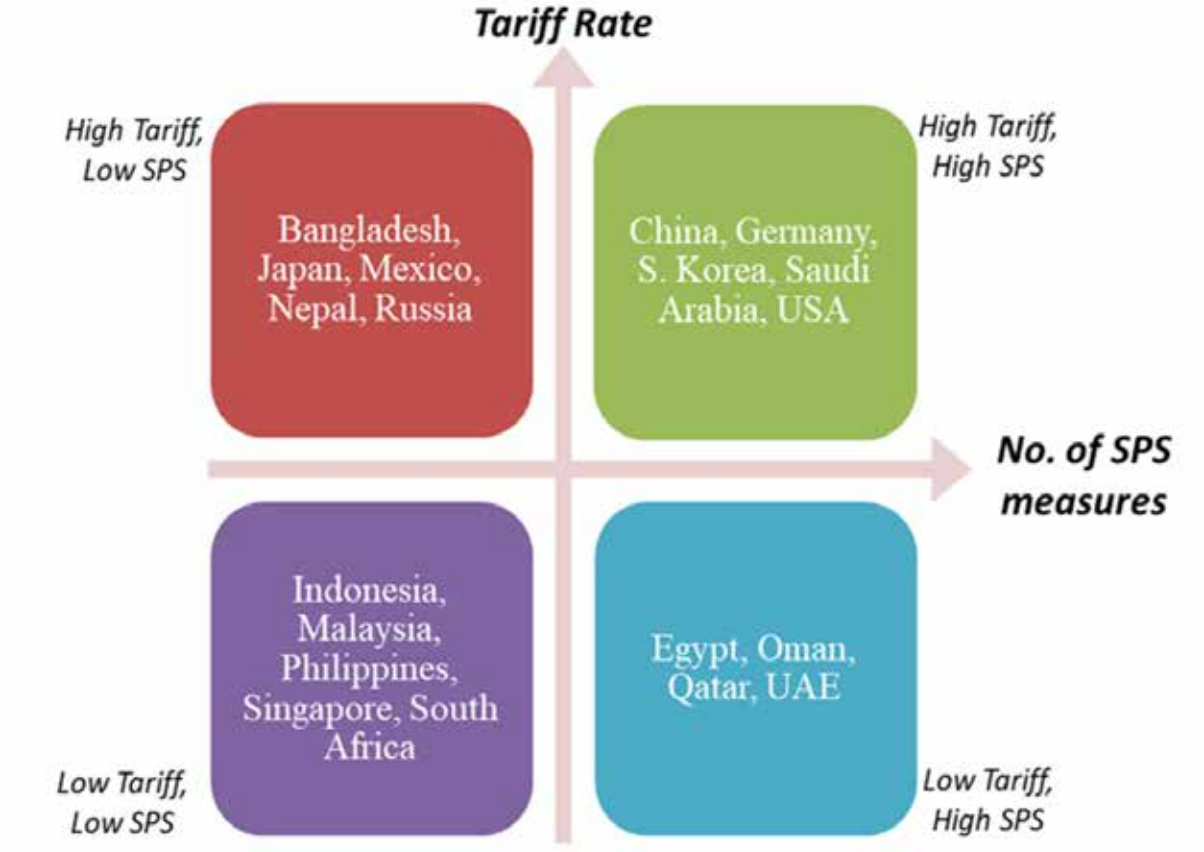
Padma Bhushan Dr. R. S. Paroda, Chairman, TAAS, Former Secretary, DARE and DG ICAR, New Delhi witnessing NDRI technologies during 12th National Seminar on Globalization of Indian Dairy Industry held on September 20, 2025

Dr. M. L. Jat Secretary (DARE) and Director General, ICAR, New Delhi visiting cloned calf, Shravani at Livestock Research Complex, ICAR-NDRI

DAIRY DEVELOPMENT: POLICY ANALYSIS, STRENGTHENING DATABASE AND IMPACT ASSESSMENT

Assessment of competitiveness and performance of Indian dairy exports

A comprehensive assessment of the performance, competitiveness and market access conditions of Indian dairy exports was undertaken using international trade databases. The study revealed that dairy exports have grown steadily over the past two decades, with Asia emerging as the dominant destination, accounting for nearly 64% of total exports. However, the high concentration of exports in a few regions increases vulnerability to demand fluctuations and policy changes. There is a gradual shift in India's export basket towards processed and industrial-use products such as concentrated milk, casein, lactose and dairy fats. Nevertheless, exports of high-value consumer-oriented dairy products remain limited. Export growth has largely been driven by extensive margins, i.e., entry into new products and markets, rather than by strengthening competitiveness in existing ones. Sanitary and Phytosanitary (SPS) measures and Technical Barriers to Trade (TBT) accounted for the majority of non-tariff barriers faced by Indian dairy exports. Labelling errors constituted the single most important cause of rejection of Indian dairy consignments in international markets. The study further identified substantial untapped export potential, estimated at around USD 161 million, particularly in products such as low-fat milk powder, dairy fats (ghee/butteroil), and casein. The findings highlight the need to strengthen SPS compliance, address labelling-related deficiencies and promote value-added dairy products in diversified export markets to enhance the competitiveness and global market share of Indian dairy exports.

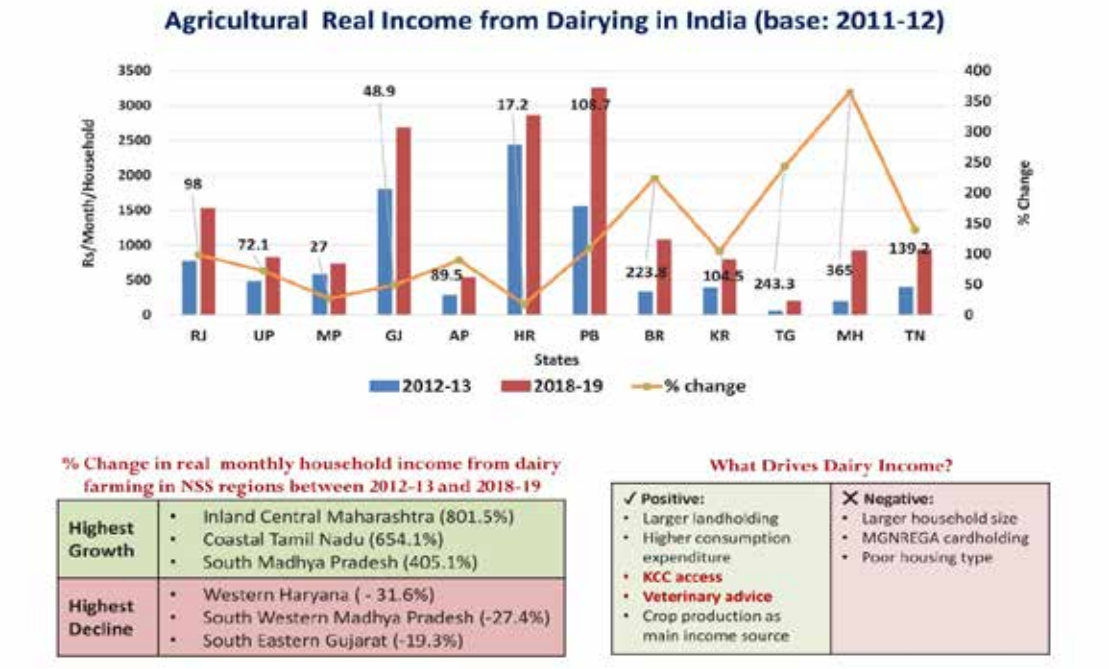


Market segmentation based on SPS measures and tariff imposed on Indian dairy exports

Distribution of export rejections of HS04 group (dairy, honey and eggs) by cause of non-compliance, 2010–2024

Levels and trends in income from dairy of agricultural households in major dairy states of India

The relevance of dairy as a source of income for agricultural households in India was analyzed along with the changes in dairy expenses between 2013 and 2019 for all major dairy states in the country, based on the survey data of 70th (2012-13) and 77th (2018-19) NSSO SAS rounds. The income of agricultural households from farming of animals and from dairy was estimated across the different NSSO state-regions, landsize categories and social groups in each state. The nominal income estimates from both the time-points were brought to the common base of 2011 prices for comparison in real terms. Real dairy incomes have more than doubled in the NSS regions of South Madhya Pradesh, Dry areas in Gujarat, Northern Bihar, Coastal & Ghats of Karnataka, Inland north-western Telangana, all regions of Maharashtra, and Coastal Tamil Nadu. Real dairy incomes have increased for the scheduled groups in Rajasthan, Madhya Pradesh, Andhra Pradesh, Punjab, Karnataka, Telangana, Maharashtra and Tamil Nadu. The analyses of real growth in expenses in dairy production for different landsize categories shows that expenses have gone down for marginal, small and medium land classes in the states of Rajasthan, Uttar Pradesh, Gujarat, Punjab and Maharashtra. The same have increased for the marginal and small farmers in Tamil Nadu, for medium farmers in Telangana and Bihar, for small and medium farmers in Haryana, for small farmers in Madhya Pradesh, and for all categories in Andhra Pradesh.

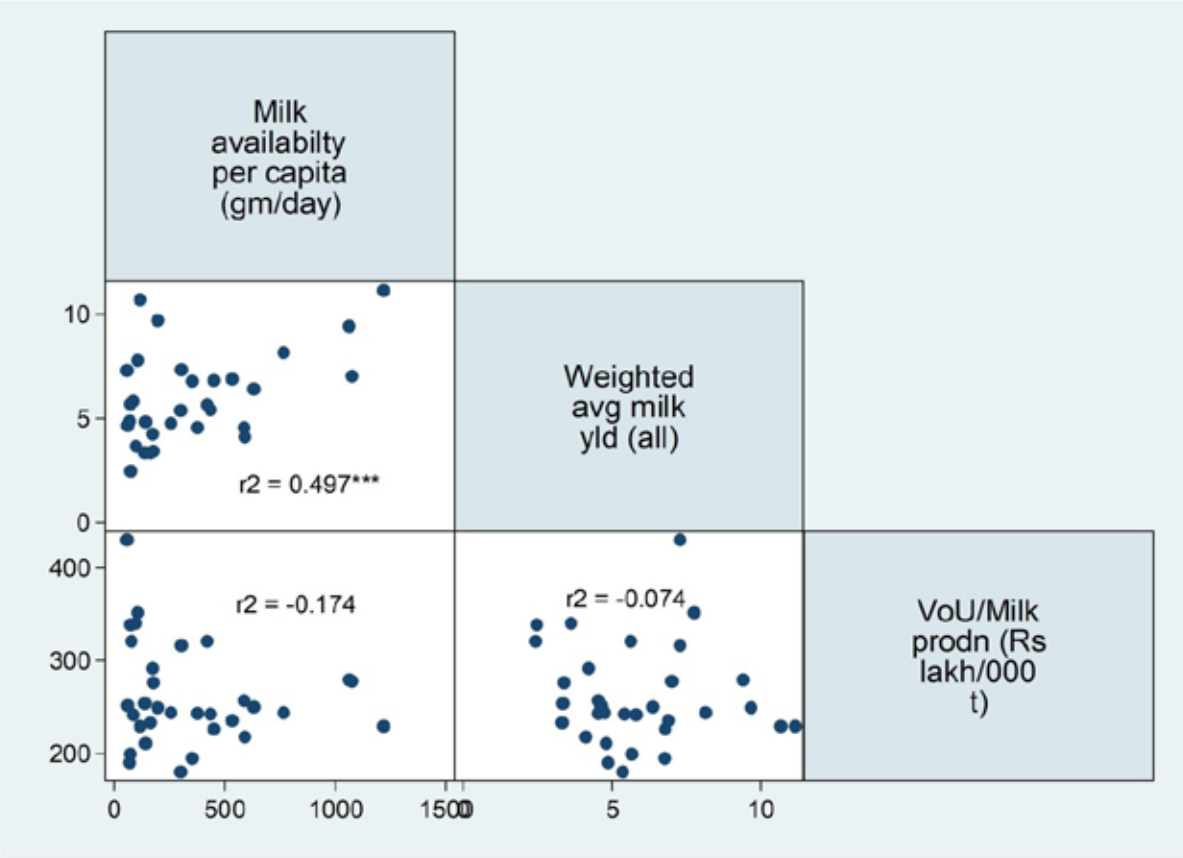


Trends in dairy income of agricultural households in India (2013–2019)

Developing dairy development index of India – framework and determinants

In the context of dairy productivity analysis, the concept of yield gap provides a quantitative assessment of the difference between actual yields realized at the farm level and benchmarks that reflect either potential or attainable productivity. Yield gap decomposition across different states of India reveals significant allocative inefficiency, with large inter-state disparities in crossbred (21-65%), indigenous (20-85%), and buffalo (25-69%) milk yields reflecting uneven optimization of resources such as genetic improvement, feeding management, and access to veterinary services. Panel regression highlights technological adoption, artificial insemination, and veterinary infrastructure, which are the primary driver of productivity growth, in line with endogenous growth theory, while herd expansion shows minimal effect.

Relationship between increase in milk production and value of output created by milk was assessed across different states. A mismatch was observed between biological productivity and value creation of milk. High-yield states like Punjab (₹229 lakh/000t of milk), Haryana (₹278 lakh/000t), and Kerala (₹249/000t) do not always achieve the highest value of output per unit of milk produced, whereas low-yield states such as Mizoram (₹425 lakh/000t) and Goa (₹350 lakh/000t) report higher value, calls for the need of market segmentation, reduce cost differences, and increase transmission of supply gains to producer incomes. The monthly per capita consumption (MPC) of milk in urban households has a large, positive, and highly significant effect on per-capita milk availability, showing that rising urban milk demand strongly drives production and distribution. However, rate of urbanization is contributing negatively (and significantly) to milk production. Demand-side forces further dominate, with per-capita milk availability strongly influenced by urban consumption patterns, but depressing milk production by higher rate of urbanization.



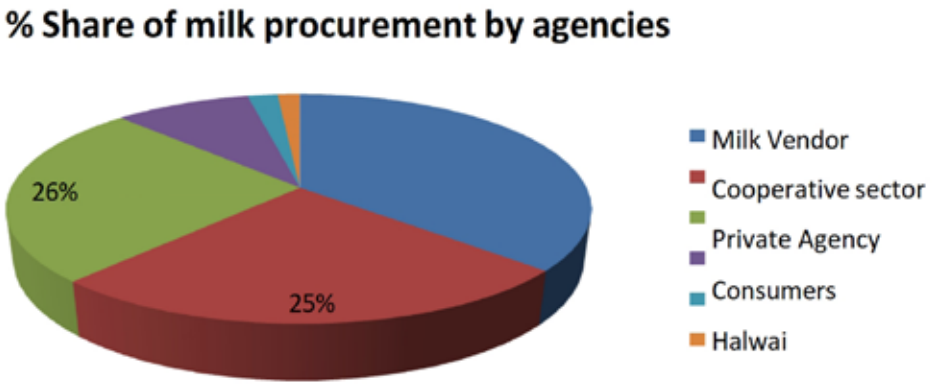
Relationship among average milk yield, value of output/milk production and milk availability across Indian states

Estimation of production and utilization pattern of milk and milk products in India

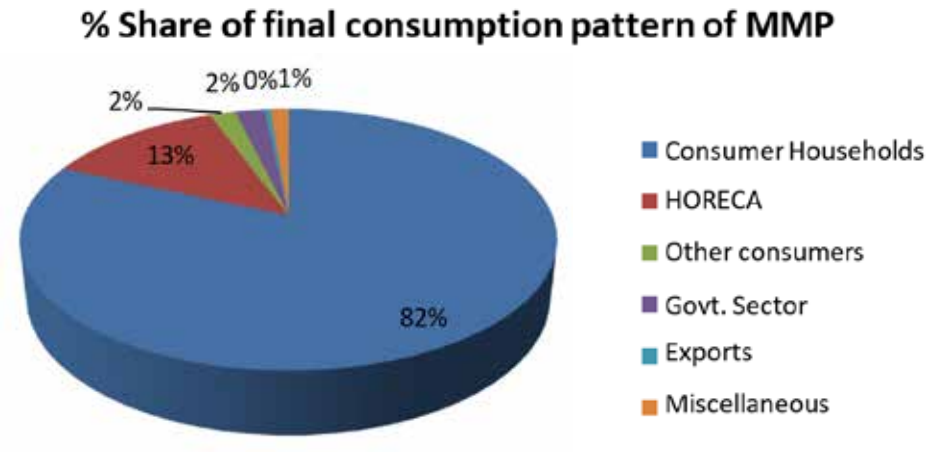
The study approximated that of the total milk production, 88.98% is coming from Farmer-Producers and rest 11.02% from Commercial Dairy Farms (CDFs). The farmer-producers retain 24.80% of the total milk produced for home consumption and donation, while CDFs retain only 2.13% of their total production. Using these ratios, the marketed surplus has been worked out at 75.605% of national production level. The marketed surplus is either converted into milk products or consumed as liquid. Overall, 40.86% of the total marketed surplus is converted into milk products and rest is marketed as liquid (57.81%). Adding Army, NSG and Para military force, total utilization of MMPs in Government sector in India comes out to be 1.67%. Overall, the consumer households, HORECA (hotel, restaurants and catering services) along with 'others' consumers receive 96.156% of total marketed surplus in the country. Besides, government sector receives 2.89%. About 0.423% of marketed surplus is exported. Remaining 1.332% is attributed to the use by non-profit organization (NPOs), home retention by various agents and losses incurred by these intermediaries in the supply chain. The shares of marketed surplus (%) quantity of milk handled by different procuring agencies as well as final consumption were estimated (see Table & Figures). Around 36% of the milk (marketed surplus) was procured by milk vendors, followed by private agencies and cooperatives. The final consumption pattern of the milk and milk products was dominated by consumer households (82%) followed by HORECA (13%), Govt. sector (2%) and others.

Share of marketable surplus milk procured by different agencies and utilization by final consumers

Procurement Agencies	% Share	Final Consumption	% Share
Milk Vendor	36.46	Consumer Households	81.51
Private Agency	25.71	HORECA	12.78
Cooperative sector	25.43	Govt. Sector	2.09
Consumers	8.97	Other consumers	1.86
Halwai	1.97	Exports	0.42
Others	1.47	Miscellaneous	1.33
Overall	100	Overall	100



Share of marketable surplus milk procured by different agencies



Share of marketable surplus milk procured by different agencies and utilization by final consumers

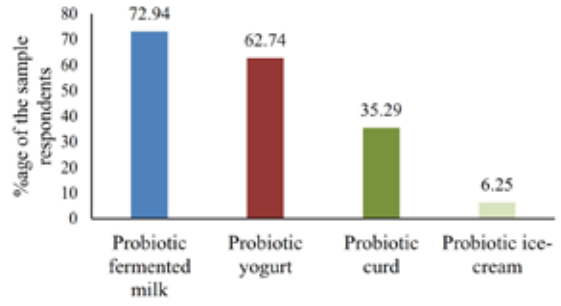
Determination of sample size and covariance structure for animal studies involving linear mixed-effects models

The objectives of the study were to i) determine the optimal sample size required for linear mixed modelling (LMM) under different settings and ii) suggest choice of covariance matrix in estimating the paramters of LMM. Optimal sample size estimation was done based on data-based effect size (observed) for 80% power at 5% level of significance using 1000 simulations. (1) Modelling monthly body weight of dairy animals measured up to 20 weeks across 3 treatment groups indicate that a minimum of 140 animals is required to compare 3 treatment groups. (2) Fat%, SNF and protein were measured in dairy animals belonging to 2 breeds in 3 seasons. Optimal sample size required for this comparison is about 70 animals, 20 animals, 48 animals respectively. (3) Eye temperature and udder surface temperature were measured in dairy animals at 5 different time points leading up to parturition. The objective was to compare the temperatures across these time intervals. Optimal sample size required to meet this is about 20 animals. (4) Two level clustered dataset (rat pup data. Each cluster (litter) was assigned to specific level of treatments and rat pups (units of analysis) were nested within litters and birthweight of pups was analysed using LMM. The optimal sample size required for each of the treatment was estimated to be about 10 litter per treatment. Covariance structure

modelling with respect to LMM was evaluated by considering selected case studies, Diagonal and Scale Identity covariance structure in residual part of LMM provided better solutions. The exercises aids to obtain reliable and accurate experimental results and avoiding wastage of resources.

Awareness, perception and consumption pattern of probiotic dairy products in urban Bengaluru of Karnataka

Growing diversification of consumers' food basket have created a market niche for probiotic dairy products as they offer potential health benefits beyond basic nutrition. The present study analysed the consumer awareness, perception, and the factors influencing consumer behaviour towards probiotic dairy products in urban Bengaluru. A primary survey was conducted during April-July 2024 in east, west, north, south, and central zones of urban Bengaluru and a total of 1112 consumers of dairy foods were interviewed. While 53% of respondents were aware of probiotic dairy products, but only 23% actively consumed probiotic dairy products. Probiotic fermented milk was the most preferred probiotic dairy product followed by probiotic yogurt and probiotic curd. Respondents in the higher age group had a significantly higher consumption of probiotic fermented milk, whereas younger respondents had significantly higher consumption of probiotic ice cream. The major reason for consuming probiotic dairy products was the health benefits beyond balanced nutrition. The consumption of probiotic dairy products increased with rise in monthly income. The study suggests to disseminate more awareness about the health benefits of the probiotic dairy products among the public particularly among lower income groups and improve their affordability to reach out to all the sections of the consumers.



Major probiotic dairy products consumed in urban Bengaluru

Assessment of market and non-market values of Deoni cattle in native tract of Karnataka

The study was undertaken with the objectives of estimating the costs and returns of rearing Deoni cattle, and assessing the non-market value of Deoni cattle among farm households. The primary data was collected from 120 Deoni cattle rearing farmers from 3 blocks of Bidar district of Karnataka using a multistage sampling design. The herd size of Deoni cattle owned by farmers ranged from 2 to 3 animals, with one in-milk animal. The average daily milk yield was reported to range from 1.89 litres to 2.50 litres. The daily maintenance cost of Deoni milch animal was about ₹113. Farmers faced losses of over ₹21/ milch animal/day. With the net annual loss of ₹58857/ pair, rearing Deoni bullocks for draught purposes was also not profitable. In contrast, rearing Deoni bulls for breeding purpose was a relatively profitable choice with an annual net return of ₹55,153. The experimental data was subjected to mixed logit analysis which revealed that the total economic value of three non-market attributes of Deoni cattle was over ₹3782 per animal per year. The preference for Deoni milk and its products accounted for the largest share (44.7%) in the non-market value, followed by its contribution to cultural values (33.5%) and soil health management (21.8%). It is evident from the study that, despite economic losses from milk production and draught use, Deoni cattle remain highly valued and conserved by farmers for a number of non-market attributes.

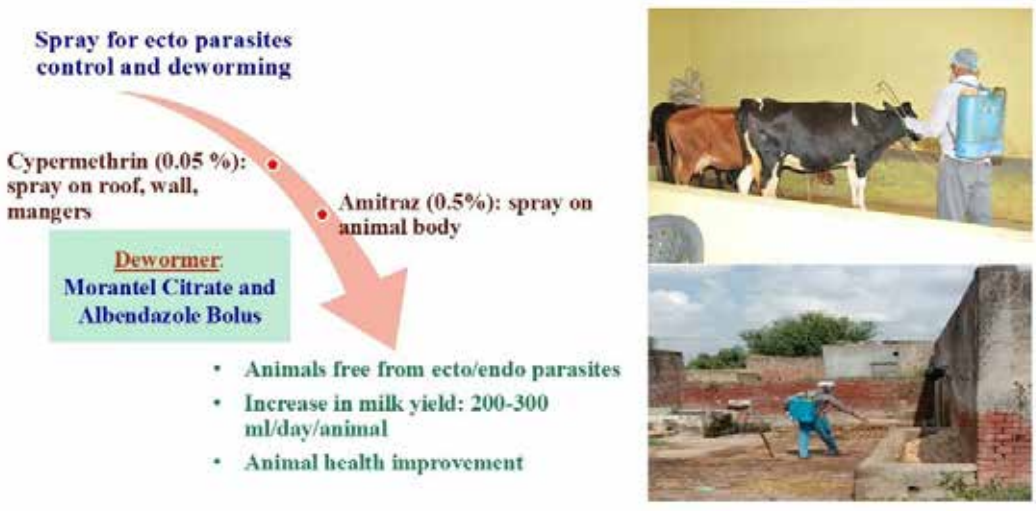
Market segmentation analysis of ghee in urban Bengaluru

The study was undertaken to analyse consumer preference for ghee and the factors influencing purchase decisions in urban Bengaluru. The information on ghee market structure was collected from three processors and 40 retailers. The primary data on consumer behaviour towards ghee was collected from 300 ghee consuming households through personal interviews. The ghee consumption in urban Bengaluru was widespread, with 32% of households consuming daily and 57% consuming weekly. Vegetarian households consumed ghee more frequently than non-vegetarians. Loose/ unbranded ghee has nearly disappeared (0.6%), reflecting consumer trust in branded product. Nandini (34.6%) and GRB (31%) were the dominant brands, followed by Amul (14%). Quality (93.6%) and flavour (82.3%) emerged as the important factors influencing purchase, followed by availability (61%) and price (49%). In packaging, plastic bottles (56.6%) and medium/large pack sizes (500ml and 1000 ml) were most preferred. Conjoint Analysis revealed that the brand value was the highly rated attribute (47%), followed by price (31%), and packaging (22%). Cluster analysis identified four consumer segments namely (1) moderately brand-oriented consumers, (2) price-sensitive consumers, (3) balanced consumers valuing brand, price, and packaging and (4) brand-conscious consumers. Overall, the branded ghee maintains a strong competitive position and there are significant opportunities for premiumisation and packaging innovation in urban Bengaluru.

EXTENSION APPROACHES FOR SOCIO-ECONOMICS UPLIFTMENT THROUGH DAIRYING

Capacity building of resource-poor farmers in paddy–wheat cum dairy production system through *Farmer FIRST* programme under irrigated agro-eco region of Haryana

The Farmer FIRST Programme (FFP) achieved notable progress during the reporting year across natural resource management, crop production, livestock management, horticulture, enterprise development, integrated farming systems, and capacity building. In natural resource management, IPM in paddy recorded yields of 54–55 q/ha, while INM and IWM in wheat achieved 61–62 q/ha and 61.5–62.5 q/ha, respectively. Wheat varietal demonstrations showed superior performance of DBW-371 (62.99 q/ha) with higher net returns, while HD-3386 and HD-2967 were also demonstrated. Crop diversification through mustard (Radhika) yielded 16.05 q/ha. Livestock interventions, including parasite control in 1,543 animals, improved health and increased milk yield by 200–300 ml per animal per day. Salivascope–based estrus detection in buffaloes recorded 66% farmer satisfaction and a projected 94% adoption rate, while Him Bloat supplementation achieved 80% recovery. Nutritional and poly-herbal supplements enhanced animal productivity and reproductive performance. Horticultural interventions promoted nutritional gardens and vegetable cultivation with encouraging returns. Enterprise development initiatives included the VIREN DAIRY unit processing 450 litres of milk daily and generating a monthly net income of ₹95,000, while wheat seed production (DBW-371) yielded 62.98 q/ha. The IFS intervention increased net returns by 21.49% and created additional employment. Capacity-building activities benefited over 1,500 farmers, enhancing productivity, income, and sustainability of the paddy–wheat–dairy farming system in Haryana.

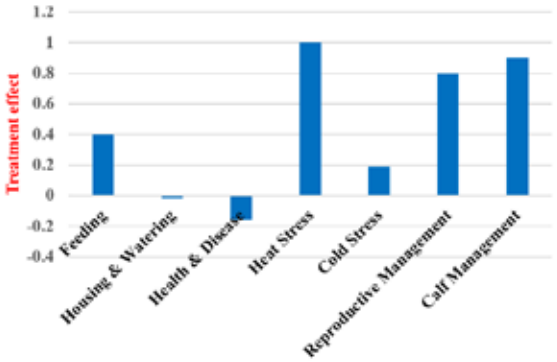


Control of ecto and endo parasites in Farmer FIRST programme

Effectiveness of THI-based NDRI climate services in enhancing climate resilience among smallholder dairy farmers in Haryana

"NDRI Climate Services" platform provides district-specific, Temperature Humidity Index (THI)-based weekly advisories designed to strengthen climate resilience in dairy production systems. The advisories focus on critical management areas, including feeding strategies, housing arrangements, water management, disease prevention, heat stress mitigation, and breeding management. This study assessed the perceived effectiveness of the application in influencing farmers' routine operational decisions using a Difference-in-Differences (DiD) quasi-experimental design. The study was conducted in

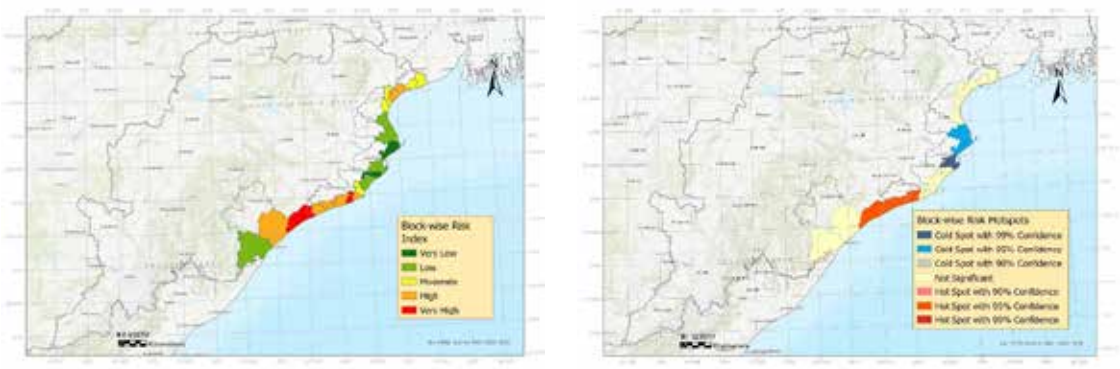
Haryana among 80 randomly selected smallholder dairy farmers from Karnal and Jind districts. The results demonstrated statistically significant improvements in heat stress management, reproductive practices, and calf care at the 1% level, confirming importance of localized, THI-based climate advisories in enhancing resilience of the smallholder dairy production system towards climate change.



Treatment effect of the NDRI climate services mobile application on the operational decision in dairy management practices of Haryana

Resilience and preparedness of smallholder livestock farmers to climate change in vulnerable coastal Odisha

During last few decades, coastal Odisha has been experiencing sea water inundation, coastal erosion and flooding, reduced fertility of soil rendering them unsuitable for cropping and grazing as well the making the state as highly vulnerable to climate change. Therefore, the present study on climate risk, resilience and preparedness among 350 smallholder livestock farmers was conducted in the coastal region of Odisha. An exclusive 'Climate Change Risk Index' was developed following the framework of Intergovernmental Panel on Climate Change to assess the extent of climate risk faced by the smallholder livestock farmers. The mean climate risk posed to the households under the study was found to be 0.480 with 31.818% of the households being in the moderate level of risk to climate change. Farmers with higher climate risk index were found to be clustered in four blocks of Puri (Krushnaprasad, Bramhagiri, Puri sadar, Gop) causing it to be climate change risk hotspot. A 'Resilience Capacity Index' was developed to measure resilience of the smallholder livestock production system of coastal Odisha to climatic changes. It was found that transformative capacity was the foremost contributing factor to the resilience of these farmers with a mean index value of 0.743 of followed by absorptive capacity and adaptive capacity with a mean index score of 0.505 and 0.489 respectively. Preparedness of the farmers towards changing climate and extreme weather events was assessed through Protection Motivation Theory and 45% the smallholder livestock farmers were having medium level of preparedness with mean index value of 0.527. The comprehensive picture drawn by the study shows that climate policy for the smallholder livestock farmers of coastal Odisha should focus on educating, training, improving their access to information regarding climate and improved production practices while focusing on infrastructure development such as road, market, shelter etc.

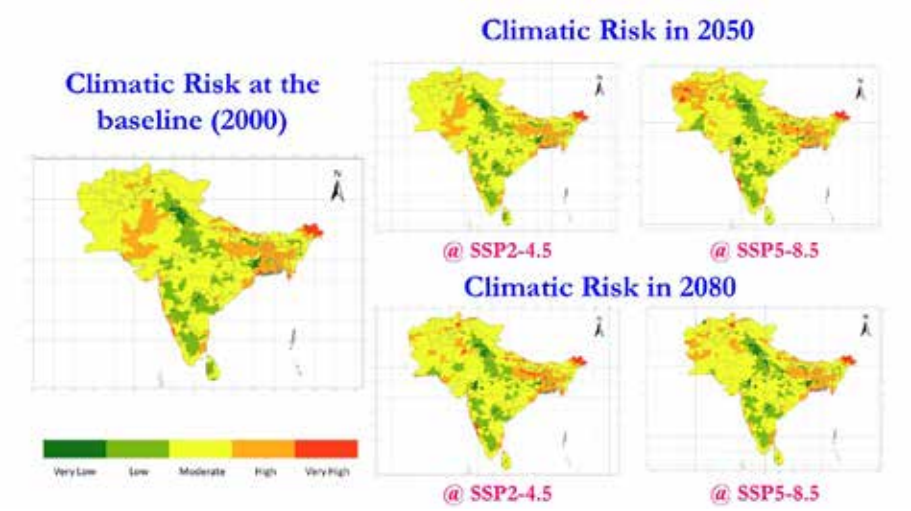


Climate risk profiling of coastal Odisha

ACASA: an e-atlas of climate risk and feasible adaptation options for dairy farming in South Asia

Dairy farming ensures regular source of income, nutritional security, and employment, especially for small and marginal households across South Asia. But, the tripartite dynamics of climate change, vulnerability of population and dairy production potential in South Asia make it of utmost dire need to open a dialogue to address the negatives of climatic risks through the development of adaptation options. Therefore, the present study attempts to quantify the climatic hazards in South Asia followed by the assessment of climate-related risk pertaining to dairy production systems and assess the adaptation options feasible for South Asia through an e-atlas namely Atlas of Climate Adaptation in South Asian Agriculture (ACASA). Composite index-based climate assessment risk and spatial hotspot analysis was in two-time frame i.e. baseline (2000s) and 2050s in two GHG emission scenarios (SSP2-4.5 and SSP5-8.5) at 0.05° x 0.05° spatial resolution. The analysis

underpins the prominent impact of climate-related hazards like heat stress, rainfall deficits, and the Temperature-Humidity Index (THI) on cattle and buffalo populations in South Asia, particularly in India, Afghanistan, and Pakistan. As global warming intensifies, the region is expected to experience increased heat stress and rising THI levels, with cold stress diminishing by 2050. This will exacerbate risks, especially in the Indo-Gangetic Plains and coastal regions of South Asia. While adaptation strategies like disease management, nutrition, and genetic modification are found to be suitable, their effectiveness varies across the region, highlighting the need for tailored approaches to mitigate climate impacts on livestock. The results suggest a need for urgent, region-specific interventions to provide protection to ensure the sustainability of livestock production systems in the face of escalating climate challenges. The study will facilitate policy makers and climate scientists in the customization of location specific adaptation strategies to combat climate change in South Asia.



Climate risk hotspots of the dairy production system of South Asia in different emission scenarios and in different time period

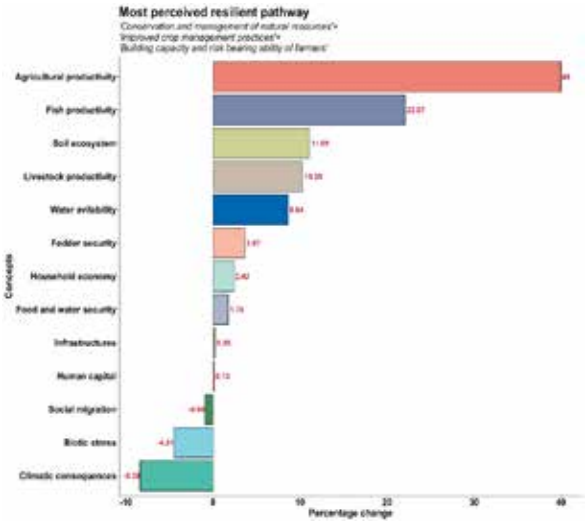
Mapping climate change impacts and adaptation strategies of smallholder dairy farmers of Punjab: Application of fuzzy cognitive mapping approach

Climate change impact, such as increasing heat waves, irregular rainfall, and cold waves are posing a severe threat to smallholder dairy farming systems including declining milk production, increased prevalence of diseases, and heightened physiological discomfort. Consequently, smallholder farmers are facing economic instability, and the agri-food system is experiencing adverse effects. To address these challenges and enhance resilience, it is essential to identify suitable adaptation strategies for the smallholder dairy farmers. This study has tried to identify different adaptation strategies for the smallholder dairy farmers by using fuzzy cognitive mapping approach. The key finding highlights "Milk Yield Loss", "Reduction of Herd Size", "Death in Animals", "Low Growth", etc. were the most central impact of climatic stressors and "Provision of Mineral Mixture", "Provision of Fans and Foggers", "Proper treatment by Veterinarians", etc. were the most central adaptation strategies. Also, this study has found some projected solutions which are perceived to be suitable strategies to make the system resilient. By identifying the adaptation strategies and the need for other perceived strategies, this research highlighted the policy implementation and technological innovation to make the smallholder dairy system resilient.

Mapping cognitive and resilience pathways of the smallholder farming community to cyclone-led climate disasters in coastal West Bengal

Coastal and low-lying regions are projected to be highly at risk with intensified cyclone-led climate disasters compounded by small landholdings and low agricultural productivity. This study, conducted in coastal West Bengal, also known as 'Cyclone capital of India', assessed farmers perceived cyclone-induced impacts, mapped most perceived effective resilient pathway, and evaluated their adaptation behaviour. Cross-sectional data from 360 smallholders were collected using a multi-stage and quasi-quantitative participatory framework. Farmers' perceptions aligned closely with 1974–2025 meteorological data, confirming a trend of increased cyclone frequency, erratic rainfall, rising temperatures (specifically higher minimums), and Temperature-Humidity Index. Salinity intrusion emerged as the most persistent stressor affecting crop-livestock systems. Baseline simulations projected substantial losses in resilience (agriculture; -24.3%, livestock: -22.9%, fisheries: -19.7%), due to cyclone-led climate disaster. Conversely, the most perceived effective resilience pathway yielded marked gains in resilience of agricultural system (+40 %), fisheries system (+22%), and livestock system (+10%), alongside improvements in soil ecosystem services and water availability. Adaptation behaviour exhibited clear sectoral

contrasts, with 38.89% of farmers showing stronger adoption of crop strategies and 43.33% demonstrating weak adaptation in the livestock sector. Adoption decision in crops was significantly influenced by age, kharif paddy, herd size, credit access, and media exposure, while infrastructure, cooperatives, climate information, extension, media participation, and vegetable income influenced adoption intensity. Livestock adoption was driven by herd size, climate information, and community participation, with intensity strengthened by institutional credit, training, and livestock extension services. This study advocates decentralized climate adaptation in cyclone-prone coastal areas. Effective policy must prioritize institutional strengthening, innovation-driven financing, risk-oriented capacity building, and sustainable natural resource management to strengthen climate resilience.



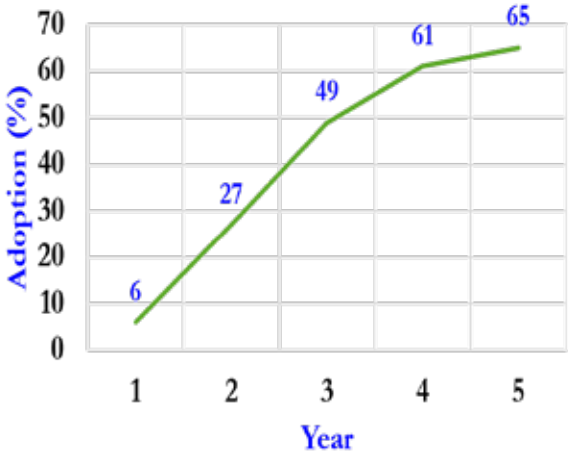
Scenario analysis of most perceived resilient pathway

Socio-ecological resilience of smallholder dairy farmers towards climate change in eastern Uttar Pradesh: A fuzzy cognitive mapping approach

The dairy sector in Eastern Uttar Pradesh is a key livelihood source for smallholder farmers but is highly vulnerable to climate change. This study was conducted in Sonbhadra and Gorakhpur districts to assess the socio-ecological resilience of dairy farmers. A total of 120 respondents from eight villages were selected using purposive and random sampling, following an ex post facto research design. The Fuzzy Cognitive Mapping (FCM) approach was used to analyse linkages between climate stressors and socio-ecological systems through focus group discussions and personal interviews. Findings revealed that climate stressors such as erratic rainfall, floods, heat waves, and livestock diseases significantly affected milk productivity, feed availability, and income stability. Core–periphery and scenario analyses showed that resilience improved through adaptive strategies including assured feed and fodder supply, access to veterinary and financial services, climate-resilient shelters, livelihood diversification, indigenous knowledge, and water-crop management. The study highlights the need for integrated policy and institutional support to strengthen climate resilience among smallholder dairy farmers.

Farmers' participatory appraisal of poly herbal feed supplement on performance of dairy animals in Karnal district of Haryana

A study was conducted to evaluate the effectiveness of a poly herbal feed supplement namely *Karan Pashu Amrit* (KPA) under field conditions. Sixty dairy farmers were selected, comprising 30 crossbred cattle and 30 Murrah buffaloes, which were randomly assigned to treatment and control groups. Results indicated a positive, though statistically non-significant, improvement in milk yield, fat, and SNF in lactating Murrah buffaloes. A substantial reduction in Somatic Cell Count (2.12 lakh cells/ml) was observed, indicating improved udder health; a similar reduction was noted in crossbred cattle (1.95 lakh cells/ml). Perception analysis revealed that 42.8% of respondents had a high level of perception towards KPA, perceiving it as moderately advantageous and compatible, highly trialable, less complex, and highly observable. Adoption forecasting showed that the expected peak adoption of *Karan Pashu Amrit* would be 66% after 10 years, with 65% adoption within 5 years, and 50% adoption achieved in 2.3 years. Farmers reported mixed responses regarding milk yield, with 46.7 % observing a reduction, while some reported increased dry matter intake (23.3%) and improved milk fat (16.7%). Overall, although the effects of *Karan Pashu Amrit* on milk yield, fat, SNF, and SCC were statistically non-significant, the consistent reduction in Somatic Cell Count highlights its potential role in improving udder health.



Adoption prediction of Karan Pashu Amrit, a poly herbal animal feed supplement

Livelihood augmentation of resource-poor scheduled caste farm households in the western dry region of Rajasthan under the SCSP programme

During 2025, activities under the Scheduled Caste Sub Plan (SCSP) were undertaken to strengthen the livelihoods of resource-poor Scheduled Caste farm households in the Western Dry Region of Rajasthan, with focus on livestock health management, government subsidy awareness and crop productivity enhancement. Kisan Sangosthi and Animal Health Camps were organized in Hanumangarh and Bikaner. Total 195 farmers were benefited from these camps. Farmers were sensitized on scientific livestock management and preventive healthcare, including vaccination, deworming, disease prevention and nutritional management. Veterinary medicines such as deworming formulations, ectoparasite control medicines, insect control injections, calcium supplements and anti-allergic sprays were distributed in all villages. Further, varietal demonstrations and seed distribution were conducted in Bikaner district. Demonstrations included wheat varieties DBW-371 and DBW-372 (40 farmers), oat variety Kent (20 farmers) and mustard and Chinese cabbage (20 farmers) to promote higher productivity, fodder availability, crop diversification and nutritional security. Overall, these SCSP interventions significantly contributed to improving livestock health management, enhancing awareness of government subsidy schemes, promoting crop diversification and strengthening income and livelihood security of Scheduled Caste farm households in the region.

Distribution of seed during crop diversification through mustard and Chinese cabbage intervention in Rajasthan

Understanding the inclination of dairy entrepreneurs towards choosing dairying and related businesses as a means of employment in Haryana

The study was conducted to identify the key factors motivating dairy entrepreneurs to continue their profession across different segments of the dairy value chain. The study covered dairy farmers, dairy processors, and dairy marketers from Rewari, Hisar, and Ambala districts of Haryana, involving 150 farmers, 30 processing entrepreneurs, and 30 marketing entrepreneurs. Findings revealed that most farmers were well educated, experienced, and operated small herds, with dairying largely sustained as a family occupation and due to familiarity with the profession. Dairy processing entrepreneurs were predominantly young, moderately educated, and relatively less experienced, while dairy marketers were mainly young individuals with considerable work experience. Low initial investment requirements and business stability emerged as major motivating factors for processing and marketing enterprises. Key challenges included rising input costs for farmers, financial constraints for processors, and lack of holidays for milk vendors. The study recommends subsidized training, improved access to processing machinery, and supportive policies to strengthen dairy entrepreneurship and promote sectoral growth.

Appraisal of natural farming practices across climatic zones of north India

The study was undertaken to evaluate natural farming practices across different climatic zones of North India, covering selected districts of Haryana, Uttarakhand, and Rajasthan. Karnal and Kurukshetra districts from Haryana, Nainital and Almora from Uttarakhand, and Tonk and Ajmer from Rajasthan were randomly selected, with 30 farmers interviewed from each district, resulting in a total sample of 180 respondents. The findings indicated that most farmers were young (below 35 years), educated up to senior secondary level, predominantly male, and belonged to medium-sized families, with natural farming largely practiced for household consumption. Farmers perceived natural farming as cost-effective, sustainable in yield performance, and capable of producing high-quality outputs. Among various practices, Jeevamrit was the most widely adopted under nutrient and soil

management practices, followed by Beejamrit and Ghanjeevamrit, while Neem-based formulations were commonly used for pest management. Major constraints identified included weak market linkages, low price realization, lack of standardized practices, limited consumer willingness to pay premium prices, and the lengthy transition period from conventional to natural farming.

Status of dairy management practices in South Bihar Plains: Farmers perspective

India leads global milk production; however, productivity disparities persist across regions. In Bihar, particularly in the South Bihar Plains, milk yield remains below the state and national averages despite overall sectoral growth. This study examined dairy management practices, productive and reproductive performance, and constraints perceived by farmers in three districts—Gaya, Patna, and Banka. A total of 180 dairy farmers were selected through proportionate stratified random sampling. Findings revealed that most respondents were above 50 years of age with moderate educational attainment. Crossbred cattle showed relatively better performance, with an average daily milk yield of 6.21 litres and a lactation yield of 1828.41 litres; however, productivity remained below the standards recommended by the Indian Council of Agricultural Research, indicating significant yield gaps. Semi-intensive feeding practices were predominant, but scientific feeding interventions such as mineral mixture supplementation were poorly adopted. Housing conditions and milking hygiene were suboptimal, and although artificial insemination was widely practiced, pregnancy diagnosis was largely based on observation. Major constraints identified included limited veterinary access, high treatment costs, fodder scarcity, inadequate vaccination coverage, and absence of village-level dairy cooperatives. The study highlights the need for strengthened extension services, improved input delivery systems, and targeted capacity-building programmes to enhance dairy productivity and sustainability in the South Bihar Plains.

Impact of NDRI kisan sewa kendra on dairy farming in Muzaffarnagar district of Uttar Pradesh

Agriculture remains a key pillar of the Indian economy, with the livestock sector—particularly dairy—showing strong growth. Uttar Pradesh is a leading milk-producing state, and Muzaffarnagar district plays a significant role. To enhance grassroots dairy extension, ICAR-National Dairy Research Institute established a Kisan Sewa Kendra in Lalukheri in 2016. The study assessed the impact of this intervention in eight villages, covering 160 farmers (80 beneficiaries and 80 non-beneficiaries). Using statistical and econometric tools, the findings showed that beneficiaries had significantly higher knowledge and adoption of scientific dairy practices. They also achieved better animal performance, including higher milk yields, longer lactation periods, and shorter dry periods. Endogenous Switching Regression analysis indicated that education, income, herd size, and landholding significantly influenced milk yield. The Kisan Sewa Kendra intervention led to a 34.3% productivity gain among beneficiaries, with potential gains of 24.5% for non-beneficiaries if included. Farmers expressed high satisfaction with services such as elite bull semen and mineral mixture supply. Institutional constraints were identified as the most critical barriers. Overall, the study concludes that Kisan Sewa Kendra interventions significantly improved knowledge, adoption, and dairy productivity, highlighting the need to scale up such farmer-centric extension models to strengthen rural livelihoods Kendra interventions significantly improved knowledge, adoption, and dairy productivity, highlighting the need to scale up such farmer-centric extension models to strengthen rural livelihoods.

Empowering farmers through selective interventions in salt affected agro-ecosystems of Ghaghar plains

Studies boosted buffalo reproduction, milk yield, and health in summer. Pre-calving anionic mishran (100g/day for 21 days) eliminated milk fever, enabled 90% timely placenta expulsion, increased milk yield by 10.03% over farmer practices, and achieved a benefit-cost ratio of 3.95. Summer fodder shortages prompted bypass fat supplementation (100g/day), significantly raising ($P<0.05$) milk yield with a 4.39 B:C ratio; Napier saplings were distributed for year-round green feed. Mineral mixtures (50-60g/day) improved conception rates and milk output ($P<0.05$). Hands-on demos included foldscope fern pattern analysis from cattle/buffalo saliva for veterinarian and farmers. Mastitis checks used California Mastitis Tests to differentiate infected milk, with lab somatic cell count analysis guiding treatments and preventive tips. Herbal remedies from Nirgundi-Neem leaves controlled ticks and lice. Regular camps, trainings, health checks, and input distribution reinforced bypass fat's summer milk benefits.

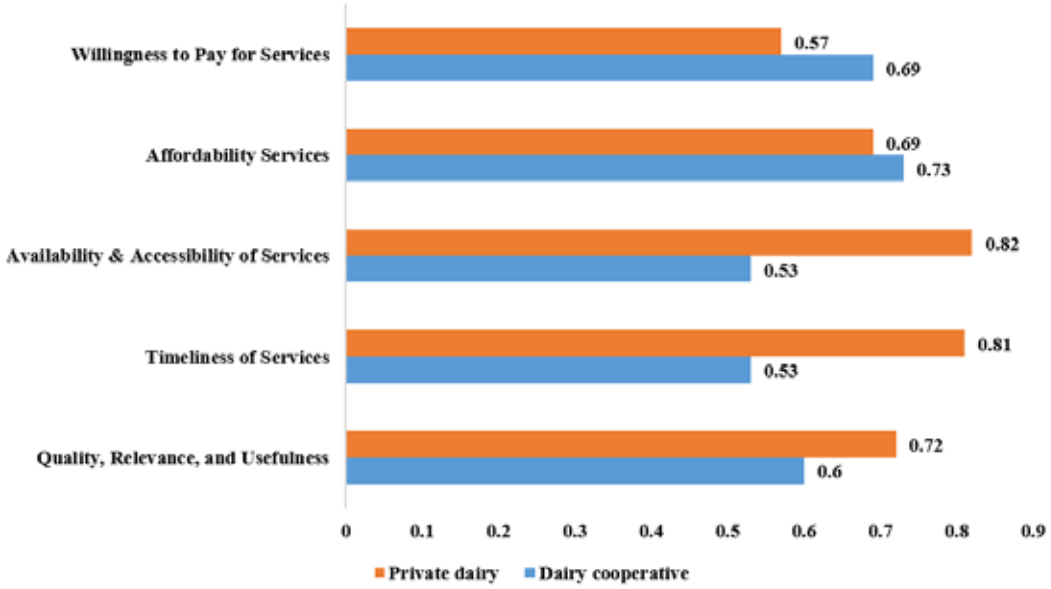
Dairy entrepreneurship development among rural youth and women in aspirational districts of Karnataka state

A new training infrastructure i.e. 'Dairy Entrepreneurship and Skill Development Centre' with digital connectivity interface was established in the campus for organizing various capacity building support to the farmers, entrepreneurs, field extension functionaries and other stakeholders. Various technological interventions on 'scientific dairy farming' were implemented through on-farm and on-campus training and capacity-building programs

in the study area i.e. Raichur and Yadgir, Aspirational Districts of Karnataka State. The selected 550 farmer-beneficiaries from the two districts were sensitized about balanced feeding and improved fodder crop inputs.

Effectiveness of cooperative and private dairy services in Madurai district, Tamil Nadu: A milk producer's perspective

In India, 68% of marketed milk was handled by the unorganized sector and remaining 32% by the organized sector comprising dairy cooperatives and private dairies. In this context the present study was conducted to assess the effectiveness of cooperative and private dairy services in Madurai District, Tamil Nadu. The findings revealed that private dairy services were more effective (Index = 0.72) than dairy cooperative services (Index = 0.62). Private dairy outperformed dairy cooperative services in 'quality, relevance, and usefulness' (0.72 vs. 0.60), 'timeliness' (0.81 vs. 0.53), and 'availability & accessibility' (0.82 vs. 0.53). Dairy cooperative showed relative strength in 'affordability' (0.73 vs. 0.69) and willingness to pay was slightly higher among dairy cooperative milk producers (0.69 vs. 0.57). Multiple regression analysis (R^2 = 0.762) indicated that 'Knowledge empowerment & service access,' 'Extension exposure & social connectivity,' and 'Innovation & risk orientation factors' significantly influenced dairy service effectiveness. Dairy cooperative milk producers faced persistent fodder shortage (78.92), low procurement price (77.43), low milk yield (70.50) and high feed and fodder costs (70.40). Private dairy farmers reported escalating input costs (72.82), milk price fluctuation during the flush season (69.63), and absence of input subsidies (67.45). Strategic interventions suggested included establishing fodder banks, promoting silage preparation, expanding doorstep AI services, implementing transparent pricing and adopting technology-driven solutions. The study highlighted that private dairy demonstrated higher service effectiveness, while dairy cooperative remained essential for equitable access and rural empowerment. Strengthening extension services, input supply and fair pricing mechanisms is vital for enhancing overall dairy service effectiveness.



Indicator wise dairy service effectiveness index among Private Dairy and Cooperatives

Consumption behaviour and livelihood security of dairy farm families in aspirational districts of Uttarakhand

The Aspirational Districts Programme initiated by the Government of India focuses on improving health, nutrition, agriculture, education, and economic conditions in underdeveloped districts. Dairying plays a crucial role in the livelihood for rural families, particularly in the Aspirational Districts of Uttarakhand, where agriculture and livestock farming are primary livelihood activities. In this context, the present study was carried out in the two Aspirational Districts of Uttarakhand State viz. Udham Singh Nagar and Haridwar. The study revealed that dairy farm families exhibited higher overall food group consumption and liquid milk, buttermilk, curd, hot beverages, ghee were central to the respondents' daily dietary habits, reflecting the traditional consumption patterns of milk and related products among the surveyed farming households. A significant share of food particularly milk, vegetables, cereals, and sugar were sourced from own farms by dairy farm families. The composite index score of dairy farm families was found to be 0.62 which was higher than the non-dairy farm families (0.51).

PSM technique revealed that the livelihood security of dairy farm families was significantly higher than non-dairy farm families (17%). The present study concludes that livelihood security of dairy farm families was found to be better secured than non-dairy farm families and consumption of milk and milk products by dairy farm families was higher than non-dairy farm families in the Aspirational districts of Uttarakhand State. Hence, strengthening dairy based developmental programmes can be one of the important interventions for the livelihood and nutritional security of farm families in Aspirational districts of our country.

Dairy entrepreneurial readiness among rural youth of Karnataka: An exploratory study

The dairy industry in India is experiencing rapid growth and presents significant opportunities for addressing employment challenges faced by rural youth, particularly in the wake of the COVID-19 pandemic. In this context, the present study was carried out in the state of Karnataka Entrepreneurial readiness was examined using a modified Theory of Planned Behaviour (TPB) approach, analysed through PLS-SEM software, with influencing factors extracted via exploratory factor analysis and relationships explored using regression modelling. Strategies were developed using mean Garrett scores across five policy dimensions. The Modified TPB approach using PLS-SEM analysis revealed that Personal Attitude (AT) (β= 0.437), Subjective Norm (SN) (β= 0.556), Perceived Behavioural Control (PBC) (β= 0.442), and Risk Orientation (RO) (β= 0.191) had a significant positive impact on entrepreneurial readiness. However, Economic Motivation (EM) (β= 0.113) was found to be insignificant. Attitude emerged as a significant partial mediator (p value of both direct and indirect relationship <0.05) between risk orientation and entrepreneurial readiness and a full mediator (p value of direct relationship was <0.05 but for indirect relationship was >0.05) between economic motivation and entrepreneurial readiness. Gender played a significant moderating role, particularly in the relationship between subjective norm and entrepreneurial readiness, with slope analysis indicating a sharper increase in entrepreneurial readiness among males as subjective norm strengthened. Key strategies for promoting dairy entrepreneurship among rural youth include introducing youth-specific and incentivized dairy development schemes and programs, organizing capacity-building initiatives focused on dairy management, and establishing dedicated dairy parks with integrated facilities for value addition and export readiness. These measures are crucial for fostering dairy entrepreneurship and achieving sustainable development in Karnataka's dairy sector.

Overlapping role of actors in dairy entrepreneurial ecosystem of Karnataka

Dairy ecosystem in drought-prone areas of Rajasthan - A multi-dimensional study

A study was conducted to analyse the dairy ecosystem prevailing in the smallholder dairy production system of drought-prone areas of Rajasthan, constraint analysis in smallholder dairy production systems in the drought-prone area, coping mechanism and information and technological needs of the smallholder dairy production system, was conducted in Rajasthan State, among 210 dairy farmers and stakeholders through personal interview technique. The research findings indicated that, 59.04 % of the farmers, were having agriculture and dairying as their primary occupation and majority (81.42%) of them had natural method of breeding practices for their livestock and 87.01% of the respondents had indigenous cattle breed, with semi medium (2-4 hectare) land holding. The dairy ecosystem profile revealed, a strong linkage between small dairy farmers, input dealers and private dealers. Overall, with an average score of (9.05,7.89) small dairy farmers were the key players who had high interest and high influence in dairy ecosystem and dairy co-operatives with a (7.5,4.51) score are subjects having high interest but low influence on dairy. The major constraints faced by the dairy farmers comprised, high cost of cattle feed and fodder (72.10 GMS), and lack of veterinary service (69.20 GMS). The major constraints experienced by the stakeholders, the reduction in grazing land and the scattered area led coverage gap in veterinary services. Majority of the farmers (73.33%), during drought, stored the feed and fodder in form of hay and silage of bajra and sorghum as coping strategies and at community level they used common grazing land. Majority of the farmers needed technology and information related to the scientific dairy management practices in dairy.

Dynamics of consumer preferences for dairy products in hyderabad: An empirical study

This study examined consumer behaviour towards dairy products across five zones of Hyderabad Metropolitan, Telangana, assessing consumption patterns and purchase determinants among 350

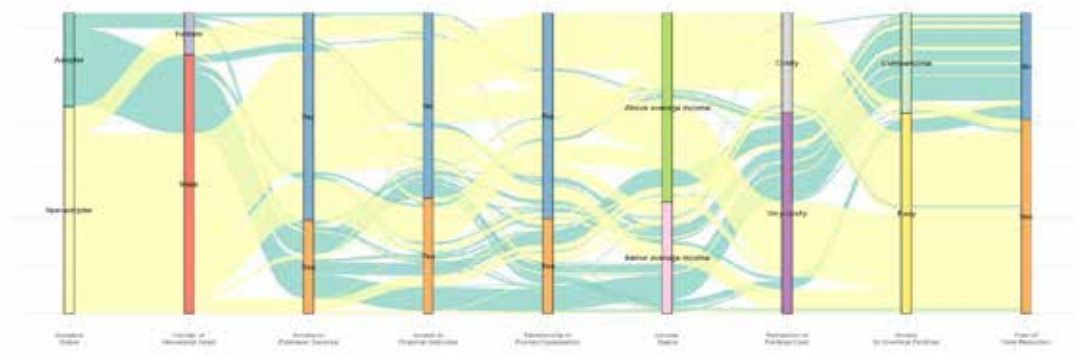
randomly sampled respondents. Curd (90.8%), Paneer (85.1%), and Milk (84.0%) were the most consumed products, while Yogurt (38.86%) and Cheese (39.71%) saw lower uptake. Milk (80.5%) and Curd (48.7%) led in daily consumption, whereas Butter, Ice cream, Lassi, Ghee, and Sweets were mainly weekly or occasional purchases. Ice cream, Buttermilk, and Lassi showed notable seasonal variation. Supermarkets and dairy outlets were the primary purchase sources, though homemade Curd and Buttermilk remained significant. Packaging preferences varied by product: pouches (Milk, Curd), tetra packs (Lassi, Buttermilk), boxes (Sweets, Ice cream), cups (Curd, Yogurt), and jars (Ghee). Binary logistic regression showed age, income, marital status, food habits, and family structure significantly shaped product-specific consumption—younger consumers favoured ice cream and lassi, while higher income and education drove demand for premium products like cheese and yogurt. Principal Component Analysis identified four key drivers of purchase behaviour: Digital Engagement & Social Influence, Store Reputation & Visual Appeal, Trust-Driven Value Orientation, and Product Attributes. While milk and curd remain dietary staples, modern preferences are increasingly shaped by digital exposure, lifestyle, and perceived value—underscoring the need for digital extension interventions, consumer education, and innovative packaging to advance both conventional and functional dairy products in urban India.

Farmer FIRST: enriching knowledge-integrating technology and institutions for holistic village development in horticulture-based farming system

The Farmer FIRST Programme project, "Enriching Knowledge-Integrating Technology and Institutions for Holistic Village Development in Horticulture Based Farming System" (2016-17 to 2024-25), aimed to increase farmers' knowledge of innovations and their participation across all stages of planning, implementation, and evaluation—enhancing production, productivity, income, and equitability across village clusters—while strengthening networks among farmers, scientists, and stakeholders to facilitate access to information, institutions, inputs, technology, and markets for higher returns. During the reporting period, institute interventions included Dairy Animal Health & Infertility Camps and Farmers' Interactive Sessions, organised in two project villages—Hosadurga and Vasappana Doddi in Kanakapura Hobli, Ramnagara Taluk—for the healthcare of dairy cattle benefiting target farm families. The health camp attended to 98 Crossbred HF Dairy Cattle, 35 goats, and 61 sheep, with 46 beneficiaries participating (36 farmers and 10 farm women). Problems identified included mineral deficiency, mastitis, anoestrus, repeat breeding, silent heat, anorexia, malnutrition, lameness, and weakness, addressed through mineral mixture supplements, deworming, and curative medicines. An On-Farm Interactive session, gathering feedback on the on-campus training on Good Dairy Management Practices and Value Addition, drew 40 farmers, farm-women, and farm youth, revealing knowledge gains alongside a continued need for critical farm inputs to support adoption of recommended practices. A further interactive session identified ongoing problems and needs for future need-based interventions. Overall, institute interventions—balanced feeding, deworming, mineral mixture supplementation, and mastitis management—improved dairy cattle health and reproductive performance while reducing mastitis incidence.

Assessment of the socio-spatial dynamics for bio-fertilizer adoption within dairy based farming systems

Access to regular agricultural extension services (χ^2 = 254.03, $p < .01$), membership in formal organizations (χ^2 = 194.77, $p < .01$), and access to organized financial institutions (χ^2 = 43.12, $p < .01$) significantly increasing adoption odds of bio-fertilizer in dairy based farming system. DEMATEL analysis in the New Alluvial Zone revealed technical support and follow-up services emerged as the most influential cause. Effect factors like perceived effectiveness showed the highest prominence (Ci + Ri = 4.05), while peer influence was most dependent on institutional and policy support (Ci – Ri = –1.07). Similarly, in the Coastal Saline Soil Zone, technical support (Ci – Ri = +1.13) was the key driver. In the Red & Lateritic Soil Zone, these causal factors retained dominance with



Sankey diagram showing variables impacting adoption of bio-fertilizer

technical assistance and policy incentives critical for adoption, and perceived effectiveness central (Ci + Ri = 4.04). Under second objective of the study, entropy weights showed zone-specific priorities for capacity building: Red & Lateritic emphasized gender responsiveness highest weight (0.338), New Alluvial balanced gender responsiveness (0.286) and empowerment (0.223), while Coastal Saline prioritized empowerment (0.216) slightly over gender responsiveness (0.214). TOPSIS rankings identified gender inclusive approaches as the top capacity-building domain across zones (scores: 0.822, 0.811 and 0.790). Coastal Saline soil zone uniquely ranked integration with traditional practices third (0.640), reflecting local ecological challenges.

Upliftment of socio-economic condition of tribal people through integrated livestock farming in North Eastern Hill Region/ Eastern part of India

During the period the project benefitted 4,316 tribal farmers through input distribution camps. Distributed agricultural inputs including 8,000-pointed gourd planting materials, 710 fodder cuttings, 300 jackfruit plants, 27.464 tonnes of seeds, 47.557 tonnes of fertilisers, 225 litres of liquid fertiliser, and 223.9 kg of micronutrients. Supported livestock-based livelihoods with 7,000 chicks, 6,300 ducklings, 101 goats, 28.70 tonnes of animal feed, 1,333 kg of mineral mixture, 615 feeders, 465 drinkers, 662 buckets and 529 tumblers. Treated or vaccinated 8,308 livestock through 15 animal health camps and distributed 323 veterinary medicine kits to reduce disease incidences. Organized 4 on- campus capacity-building programmes involving 231 tribal participants. Complementary trainings on scientific animal husbandry, dairy farming and rice-based integrated farming systems enhanced skills of tribal youth and farmers, promoting self-employment, diversification and better resource use efficiency. Collectively, the integrated crop–livestock interventions, input support and knowledge empowerment contributed to higher resilience, improved income potential and better nutritional security of tribal farming families in the target districts.

Improving the livelihood through dairy farming in North Eastern region of India

Under the ICAR-NDRI NEH project component in 2025, systematic extension interventions were carried out across Tripura, Arunachal Pradesh, Nagaland, Manipur and Assam states which directly benefited 864 smallholder farmers by enhancing livestock productivity and resilience through integrated input support and capacity building endeavors. In different farmer-scientist interaction sessions organized at NEH states addressed critical issues in feeding, breeding, housing, health and market linkages with context-specific solutions. Major input distributions included 16,850 chicks, 2,800 ducks and 94 piglets for backyard animal husbandry; 14,830 kg poultry feed, 11,020 kg duck feed, 17,450 kg pig feed, 2,270 kg goat feed, and 2,400 kg cattle feed to demonstrate balanced nutrition; plus 662 feeders/drinkers, 662 kg mineral mixture, 296 veterinary medicine kits, and 108 buckets to boost hygiene and reduce mortality. A total of 394 beneficiary farmers from Assam, 78 from Manipur, 56 from Nagaland, 50 from Arunachal Pradesh and 286 from Tripura received inputs from the project. A 7-day on- campus training (15–21 September) programme for 14 Assam farmers focused on scientific management of indigenous Lakhimi cattle, promoting sustainable dual-purpose rearing and income security.

Enhancement of socio-economic condition of scheduled caste farmers through livestock based integrated farming in Eastern India

The project work was undertaken in different SC dominated villages of West Bengal during the period under study. Various livestock development programs like organization of health/vaccination camp, distribution of chicks/ducklings, veterinary medicines, and mineral mixtures were organised for SC beneficiaries. In each village, scientists-farmers' interaction meeting was conducted for dissemination of updated knowledge on livestock and poultry rearing. Under the project, 80 pure Bengal goats, 2250 chicks and 2500 kg of goat feed, 2300 kg of poultry feed, 200 nos. of poultry feeder/waterer and various inputs (mineral mixtures, dewormers, and vaccines) were distributed among 861 SC farmers in Burdwan and 24 parganas (N) districts of West Bengal. Two mastitis screening camps were organized and treated 47 animals. Twelve nos. of animal health/ vaccination camps and four scientist-farmer meetings

Activities under the SCSP project at different locations in West Bengal

were organized. Front Line Demonstrations were conducted on Berseem, Oat, and Sorghum Sudan fodder benefitted 56 farmers. A total of 11 training programs (one day or 3-days training program) on "Scientific goat farming" and "Scientific Animal Husbandry practices" were conducted for SC farmers' in different SC dominated villages of West Bengal.

Enhancing livelihood security of scheduled caste farmers in dry arid Vindhyachal plateau of Madhya Pradesh

The project was initiated with an objective to empower scheduled caste beneficiary farmers through the adoption of scientific livestock farming practices. The study was conducted in the two districts of Madhya Pradesh namely Vidisha and Raisen. In the study area, SC households depend on traditional livestock systems characterized by various constraints that causes low productivity, reduced income. The project was initiated with a Kisan Sangosthi cum exhibition in Bhagwantpura village of Raisen District on December 13, 2025 and Shri Shivraj Singh Chauhan ji, Union minister for Agriculture and Rural Development was Chief Guest of the event. During the event, Hon'ble minister also distributed input for scientific management of livestock to 500 SC beneficiary farmers. Around 2500 farmers participated and benefitted by deliberations on various aspects of livestock and agriculture farming.

Shri Shivraj Singh Chauhan ji, Union Minister for Agriculture and Rural Development, Govt. of India participated in the Kisan Sangosthi at the Raisen District of Madhya Pradesh organized by ICAR-NDRI on December 13, 2025

Improvement of livelihood status of Schedule Caste community of Uttarakhand by management of dairy animals

Study area of project comprised of 5 villages of Yamkeshwar block of Pauri Garhwal district of Uttarakhand. The base line data of socio-economic aspects of SC population and reproduction and health status of their dairy animals were collected. Majority of farmers in study area work as laborers. Most of the farmers (86%) use natural breeding for their animals. They do not provide mineral mixture to their cattle. Average milk productivity of animals of area is 1.34 kg. Most of farmers use full hand milking and stripping as a method of hand milking. Majority of farmers (90%) do not vaccinate or use dewormers for their dairy animals. Two animal health and awareness camps were organized. One Kisan Mela was also organized at Bithyani. As many as 34 female goats and 5 bucks were distributed to SC farmers. Two technical folders were published and distributed to 50 farmers.

Distribution of inputs in Scheduled Caste Sub Plan (SCSP) Project

4

RESEARCH PRIORITIZATION, MONITORING AND EVALUATION

The objective of Research Prioritization, Monitoring and Evaluation (PME) Cell is to put in place a robust mechanism for managing research functions and for developing and strengthening the research ecosystem. The essential elements of such an ecosystem, viz., generation of knowledge and facilitation of research, innovation and technology development for industrial & societal benefits, are addressed by human resource, intellectual capital, governance and financial resources, information management system, research promotion & guidance, Integrity and ethics, capacity building and research monitoring. The PME Cell creates a conducive environment for enhanced research productivity, encourages collaboration across industry, government, community-based organizations, and agencies at the local, national, and international levels and to facilitate research through mobilization of resources and funding. PME Cell at ICAR-NDRI coordinates and manages research activities and facilitates the decision support system with the following terms of reference:

- To co-ordinate and synthesize the recommendations of QRT, RAC, IRC and Vision document of Institute and ICAR.
- To recommend research priorities of the institution for short-listing researchable problems at Institute level.
- To co-ordinate and arrange for annual monitoring of each on-going project and evaluation of completed projects through internal and external experts.
- To co-ordinate and arrange for technology validation and impact assessment of successful technologies through internal and external experts.
- Regularly sensitizing and capacity building of research managers and scientists through training programmes.
- Maintaining a database on all publications, technologies developed, IPRs, consultancy projects undertaken in the past and on-going projects.

Research Advisory Committee (RAC)

The new Research Advisory Committee (RAC) for ICAR-NDRI, Karnal was constituted as per the provisions of 'functions' of RAC provided under clause 71C of the ICAR Society rules, which includes, among other functions: (i) to suggest research programs in national and global context of research in thrust areas, and (ii) to review the research achievements of the Institute and deliberate as per the program developed by the institute and the provision 71F of the ICAR Society rules. During the year 2025, the meeting of RAC of ICAR-NDRI was conducted on May 7-8, 2025 under the Chairmanship of Dr. Nagendra Sharma, former-Vice Chancellor, Sher-e-Kashmir University of Agricultural Sciences & Technology of Jammu and Former; Director, NDRI, Karnal & CIRG, Makhdoorn, Mathura.

Institute Research Committee (IRC)

The key functions of Institute Research Committee (IRC) are to critically review the on-going and completed research projects, to consider the new research proposals and to advise on fostering of linkages between the groups/ divisions of the Institute in respect of multi-disciplinary/ multi-locational projects. The IRC meetings to evaluate the outcome of the completed research projects and to consider new research projects proposals were held on 8th, 9th ,16th April, 5th May & 11th June, 2025 for ICAR-NDRI, Karnal and its Regional Stations. The completed and new research projects were critically discussed in order to address current emerging issues of the dairy sector in presence of invited outside subject matter experts. A total of 82 projects were evaluated. The mid-term review of IRC projects of ICAR-NDRI was taken up on 7th, 9th, 10th, 11th, 14th and 15th October, 2025 at ICAR–National Dairy Research Institute (NDRI), Karnal; 7th November, 2025 at ERS, Kalyani and 29th November, 2025 at SRS, Bengaluru. The progress reports of all ongoing in-house (90) and externally funded projects (81) were discussed thoroughly and valuable suggestions were given to the PIs of the projects to achieve its committed objectives. Key areas included immunomodulatory panchmrit, subclinical mastitis diagnostics, microbial quality assessment of milk, fermented dairy products, probiotic-based therapies, antimicrobial resistance and dairy packaging innovations.

Screening and Evaluation of Concept Proposals of Externally Funded / Contract / Consultancy Projects

The meetings of the PME Unit were convened for thorough deliberations on the functions envisaged under the purview of PME Cell with the overall objective of facilitating the decision support system of ICAR-NDRI, Karnal. PME also screened and evaluated Externally Funded / Contract / Consultancy research proposals received from time to time. A total of 61 Externally Funded / Contract / Consultancy research proposals were screened for submission to external funding agencies. Out of which 11 number of externally funded projects were sanctioned amounting to **₹570.94 lakhs** from various funding agencies. NDRI has been successful in getting external funding from almost all leading national funding agencies i.e. Department of Biotechnology (DBT),National Agricultural Science (NASF),Department of Science and Technology (DST),Haryana State Council for Science and Technology (HSCST), National Bank for Agriculture and Rural Development (NABARD),Ministry of Environment and Forests (MoE&F), Food Safety and Standards Authority of India (FSSAI), Indian Council of Medical Research (ICMR),Indian Council of Agricultural Research (ICAR), Indian Tobacco Company (ITC) Ltd.(Corporate Social Responsibility Fund), etc.

PME also coordinated with scientists of the divisions and regional stations and facilitated submission of research proposals after proper documentation. The cell also handled all the correspondence and maintained liaison with SMD, ICAR for smooth implementation of research and training proposals.

Formulation of Guidelines

In order to provide robust mechanism for developing and strengthening the research ecosystem, PME Unit formulated guidelines related to submission of Project Proposals for In- house/ External Funding / Consultancy / Contract Research. PME Cell also prepared guidelines for smooth function of the Unit by way of defining roles to be performed by the members of the ITMU.

MoUs Signed and Implemented

PME Unit provided all the logistic support for scrutinizing / finalizing the following MoUs signed between ICAR-NDRI and Other State Agricultural Universities and Central Universities.

1. MoU signed with IIT Roorkee, Saharanpur campus, UP on 15.01.2025
2. MoU signed with M/s. Smillet, H.No.663, Housing Board Colony, Sector-4 Karnal on 12.01.2025
3. MoU signed with M/s. Acuity Millets LLP, F 802, Level-8, Frangipani Tower, Park View Spa, Sector-47, Islampur, Gurugram- (Haryana) on 13.02.2025
4. MoU signed with Chandra Shekhar Azad University of Agriculture and technology Kanpur Uttar Pradesh on 13.02.2025
5. MoU signed with Galgotias University through Department of Food Technology, School of Biosciences and Technology, Greater Noida, Gautam Budd Nagar, UP on 28.02.2025
6. MoU signed with University Institute of Engineering and Technology, Kurukshetra University, Kurukshetra on 07.03.2025
7. MoU signed with M/s. Smillet, H.No.663, Housing Board Colony, Sector-4 Karnal on 08.3.2025
8. MoU signed with Ministry of Science & Technology, Government of India, New Delhi on 16.06.2025

Technical Screening Committee Meetings

Technical Screening Committee constituted under the Chairmanship of Joint Director (Research) evaluated the manuscripts for publication in the form of books, technical bulletins, manuals etc. Based on the recommendations of the committee, the manuscripts were also sent to outside experts for evaluation. The same were again evaluated in light of the comments received from experts and the contents of the publications got modified and subsequently got published as Institute publications. During the period under report, the following manuscripts were screened, evaluated and allotted ISBN numbers. The details are as follows:

Details of Institutional Publication to which ISBN Allotted in 2025-26

Sr No	Book Title	ISBN	Language	Name of Author/Editor	Publication Date
1	धान-गेहूँ फसल प्रणाली में फसल अवशेषों का प्रबंधन	978-81-984794-2-6	Hindi	Editor : विजेन्द्र कुमार मीणा, बाबू लाल मीणा, संतोष कुमार, पंकज कुमार सारस्वत, हरी नारायण मीणा, जय प्रकाश मिश्र	9/5/2025
2	समृद्ध पशुपालन का आधारः हरा चारा	978-81-984794-6-4	Hindi	Editor : विजेन्द्र कुमार मीणा, बाबू लाल मीणा, राजेश कुमार मीणा, कमल गर्ग, संतोष कुमार, पंकज कुमार सारस्वत	9/5/2025
3	ICAR-NDRI Annual Report-2024	978-81-987777-2-0	English	Editor : Rajan Sharma, Richa Singh, Gopal R. Gowane, Sanjit Maiti, Biswajit Sen, Braj Kishor	10/7/2025

Sr No	Book Title	ISBN	Language	Name of Author/Editor	Publication Date
4	Sustainable Backyard Poultry Farming: A Step-by-Step Guide for Beginners	978-81-987777-6-8	Bengali	Author : Saroj Rai, Anupam Chatterjee, Santanu Bera, Tapas Kumar Dutta, Santanu Banik	14/08/2025
5	Application of Foodomics and Advanced Analytical Techniques for Ensuring Quality, Safety and Functional Properties of Dairy Foods	978-81-987777-8-2	English	Editor: Richa Singh, Mr. Manvik Joshi, Sumit Arora	10/12/2025
6	Compendium of Short Course on Emerging Trends in Nanotechnology for Dairy and Food Applications	978-81-987777-3-7	English	Editor: Monika Sharma, Vairat Amita Dinkar, Arindam Dhali	10/12/2025
7	Next-Gen Animal Breeding: An Approach to Genomics, Selection Strategies, and Artificial Intelligence for Dairy Animals	978-81-987777-4-4	English	Editor: Vikas Vohra, Rani Alex, T V Raja, G R Gowane	10/12/2025
8	High-Altitude Food and Fodder Systems in Ladakh Diversity, Nutritional Values and Conservation Needs	978-81-987777-5-1	English	Anurag Saxena, Hardev Ram, M.S. Raghuvanshi, M.K. Gaur, Sanjeev Kumar, RK Meena, Preety Rajkumari, Stanzin Landol	24/12/2025
9	Climate Change Impacts on Ladakh's Agriculture Vulnerabilities, Trends and Resilience Pathways	978-81-987777-0-6	English	Anurag Saxena, M.S. Raghuvanshi, Hardev Ram, M.K. Gaur, Truptimayee Suna, Samiksha Pandey, Veda T.V., Stanzin Landol	24/12/2025
10	Perspective and Practices of Forage Maize-Based Livestock Nutrition in India	978-81-987777-1-3	English	Rajesh Kumar Meena,Shreyas Bagrecha, Hardev Ram and Anurag Saxena	18/02/2026
11	Improved Dairy Farming Practices and Value-added Dairy Products	978-81-987777-7-5	English	S Subash, Devaraja H C, Devi M C A, Jeyakumar S	18/02/2026
12	Scientific Dairy Farming and Processing of Milk and Milk Products	978-81-987777-9-9	Kannada	Devaraja H C, S Subash, Siddaramanna, Vedamurthy G V, Sathish Kumar M H	18/02/2026
13	Technologies Available at NDRI for Commercialization	978-81-999512-4-2	English	Dheer Singh, Rajan Sharma, Sachin Kumar, Pradip Behare, Richa Singh	25/02/2026
14	घरेलू स्तर पर दूध, फल और सब्ज़ियों का मूल्य-संवर्धन	978-81-999512-2-8	Hindi	डॉ सोनिया, श्रीमती दीपा कुमारी, श्री प्रदीप ए., डॉ पंकज कुमार सारस्वत	26/02/2026
15	Livestock Systems in Cold-Arid Ladakh Climate Stressors, Resource Dynamics and Resilience Pathways	978-81-999512-7-3	English	Anurag Saxena, Arun Kumar Misra, Hardev Ram, M.S. Raghuvanshi, M.K. Gaur, Tsewang Youdol, Preety Rajkumari, Stanzin Landol	26/02/2026
16	विकसित एवं आत्मनिर्भर भारत हेतु डेरी उद्यमिता	978-81-999512-8-0	Hindi	डॉ गोपाल सांखला, डॉ अनुपमा मुखर्जी, डॉ बी एस मीना, डॉ पंकज कुमार सारस्वत, डॉ संजित माइति, डॉ चित्रनायक, डॉ राज कुमार, डॉ योगेश खेत्रा, डॉ संचिता गरई, डॉ इन्दु देवी, डॉ मुनीष लहरवान, श्री धीरज शर्मा	02/03/2026
17	Hybrid Napier Grass: A Climate-Resilient and Sustainable Fodder Crop	978-81-999512-3-5	English	Rajesh Kumar Meena, Hardev Ram, Anurag Saxena, Shreyas Bagrecha, Bhanusri Kothuru, Shivangi Kaith	02/03/2026
18	दुधारू पशुओं में गर्मी का तनाव: प्रभाव एवं प्रमुख नियंत्रण उपाय	978-81-999512-9-7	Hindi	डॉ. अजय के. डांग, मनीषा, डॉ. पवन सिंह	13/03/2026

Research Documentation and Publication

The PME Cell of the Institute is responsible for documentation and dissemination of research output through Annual Reports, Half Yearly Reports, Quarterly Reports, Monthly Reports, Technical Reports / Bulletins, etc. During the period under report, the following publications were prepared, edited and published through this cell:

- Annual Report -2025.
- ICAR-NDRI News Letter-a quarterly newsletter in English.
- Director's Report for the 21st Convocation-2025.
- Research Projects (2025).
- Institute Research Committee (IRC) Proceedings (2 No) under the identified research programmes of the Institute.
- Research achievements of ICAR-NDRI for inclusion in ICAR / DARE Annual Report 2025-2026.

XVI Plan EFC Memo Document (2026-31)

Formulation of EFC plan document under the theme: "Dairy Production &Technology Development" amounting to **₹238.5590 lakhs** with the objectives to science-led sustainable and globally competitive dairying to improve nutritional security and livelihood towards Viksit Bharat and ICAR-NDRI, Karnal: Network Project on Harnessing the Nutraceutical and Therapeutic Attributes of Bovine and Non-Bovine Milk amounting to **₹35.4464 lakhs** for consideration and final approval.

- Prepared replies of comments received on EFC document from various appraisal agencies and Ministries including Niti Aayog etc.
- Prepared Action Taken Report on actionable points for Animal Science Division on suggestions made by the Hon'ble Agriculture Minister & MoS (A &FW) during the presentations on SFC / EFC of SMD.
- Prepared information regarding justification of continuation / extension of on-going schemes proposed under EFC document of the Institute for the period (2026-31) alongwith significant achievements of XVI Plan and year-wise outputs / deliverables of XVI Plan.

Half Yearly/ Quarterly/ Weekly/ Monthly Reports

- PME unit consolidated yearly/ Quarterly/ Monthly Reports of the Institute in the prescribed formats and submitted to the Council. Likewise, quarterly reports were consolidated in terms of financial and physical targets of TSP activities being carried out at Eastern Campus, Kalyani.
- Consolidated yearly/ Quarterly Reports with respect to implementation of North-Eastern Hill (NEH) Region and SCSP schemes.

Assessment / Retention Cases of Scientists

The PME Unit also processed the documents for the assessment of 08 scientists and the retention cases of 25 scientists at ICAR-NDRI, Karnal. Assessment meetings were held in January 23, 2025, while the meeting for retention cases took place on June 19, 2025.

Action Taken Reports (ATRs) and Information Collation

This Unit also prepared the following **Action Taken Reports** on recommendations emerged during the following meetings and submitted the same to the Animal Science Division of ICAR, New Delhi.

- The proceedings of the review meeting of the ICAR Institutes under Agriculture Engineering Division of the ICAR.
- SOC meetings
- Observation(s)/suggestion(s) with respect to Department of Agriculture Research and Education (DARE) in prescribed format pertaining to ICAR-NDRI for uploading on e-SamikSha portal
- The proceedings of Annual conference of VCs/ Directors-2025.
- The proceedings of 97th foundation and technology held on 15-16 July, 2025
- The minutes of 95th Annual General meeting of ICAR Society held in 2025
- Actionable points pertaining to NDRI, Karnal made to review the meetings of ICAR Institutes held during 2025.
- e-Samiksha observation(s)/suggestion(s) made in cabinet meetings.
- Scaling up and promotion vaccine/health management protocols and reproductive technologies developed by the ICAR Institutes emerged during the meeting of the committee constituted under the Co-Chairmanship of Secretary (A & FW) and Secretary (DARE) & DG, ICAR to discuss the agenda topics/issues submitted by various divisions of the Council
- Minutes of the meeting held under the Chairmanship of Additional Secretary, DARE & Secretary, ICAR to review the preparedness for ICAR Foundation Day celebrated on 16th June, 2025.

Besides, PME Cell also collated information towards agenda and eight action taken reports on the recommendations of ICAR- Regional Committees No. I, II, III, IV, V, VI, VII and VIII held from time to time. The Unit also collated information sought by the Council from time to time on the Institute activities,

achievements, technologies, training programmes, initiatives undertaken for the growth of dairy sector for realizing various components of white revolution scheme for next 5 years, GB meetings as well as for third party evaluation at SMD level. PME Cell also prepared the information on formulation of vision and strategy to the agriculture sector in view of vision of India@2047.

Information for Parliamentary Standing Committees and Parliament Questions

- PME cell consolidated information for Parliamentary Standing Committee on Agriculture on the performance review of NDRI; ATRs on the recommendations / observations contained in the 40th Report based on comprehensive agricultural research based on "Geographical Conditions and Impact of Climatic Changes to Ensure the Food Security in the Country" of Parliamentary Standing Committee on Agriculture.
- Prepared information on studies carried out by the Institute regarding change in milk production pattern of indigenous breeds of cattle in the country to the Parliamentary Standing Committee on Agriculture, Animal Husbandry and food processing branch
- During the period under report, a total number of 49 parliament questions (Lok Sabha & Rajya Sabha) were attended.

Promotion of National and International Linkages

The unit also acted as a catalyst to promote and strengthen linkages with other Institutions of national and international repute. Visits of international delegations and distinguished visitors at the national level were coordinated and through scientific interactions / deliberations, agenda for mutual collaboration was chalked out with a view to arrive at MoUs for promotion of research and educational endeavours.

Research Projects 2025 (In-House on going)

Sl. No.	Project No.	Title	PI	Duration
1.	A-83	Enhancing economy of livestock farmers of SC community through artificial insemination using cloned buffalo bull semen	Manoj Kumar Singh	2022-2027
2.	A-84	Exploring the potential of OPU-IVF in buffaloes	Naresh Selokar	2022-2025
3.	A-86	Genetic selection for milk traits using genomic approach in Sahiwal cattle	Anupama Mukherjee	2023-2026
4.	A-87	Optimization of strategies for genomic selection suitable for crossbred cattle for enhancing milk production	Rani Alex	2023-2026
5.	A-89	Evaluation of genetic merit in Deoni cattle using emerging machine learning algorithms	D. N. Das	2023-2026
6.	A-90	Genomic selection strategies for identification of climatic resilience dairy cattle for increasing productivity.	T.V. Raja	2024-2026
7.	A-91	Estimation of genomic heterosis and genome-wide association for milk production traits in developing improved KF Cattle	Sabyasachi Mukherjee	2024-2026
8.	A-92	Early identification and selection of superior dairy animals through genomic evaluation	Vikas Vohra	2024-2026
9.	A-93	Development of glycan-lectin based colorimetric assay to assess the fertilizing potential of buffalo spermatozoa	Rakesh Kumar	2024-2026
10.	A-94	Development of an automated blastocyst grading system using artificial intelligence in cattle and buffalo	Bharati Pandey	2024-2026
11.	A-95	Production of gene edited buffalo fibroblast cells for expression of the human lysozyme	Satish Kumar	2024-2026
12.	A-96	Sex-sorting of bovine semen by selectively killing of Y-sperm to accelerate production of female calves.	Rajani Kr. Paul	2024-2025
13.	A-97	Validation of Progesterone loaded nanofibre based polyurethane sponge system for estrus synchronization in dairy cattle	Vedamurthy G V	2024-2026
14.	A-98	Establishment of field-based conservation unit of Lakhimi Cattle of Assam	Santanu Banik	2024-2025
15.	A-99	Development of salivary carbohydrate based estrus identification assays for buffaloes	Suneel Kumar Onteru	2025-2027

Sl. No.	Project No.	Title	PI	Duration
16.	A-100	Rapid luteinizing hormone sensor for ovulation prediction and timed AI in Buffaloes	Varij Nayan	2025-2028
17.	B-58	Enhancement of socio-economic condition of scheduled caste farmers through livestock based integrated farming in eastern India. (SCSP)	Ajoy Mandal	2020-2026
18.	B-68	Automated individual identification of dairy animals using computer vision and deep learning approach	Indu Devi	2021-2026
19.	B-70	Letrozole: a non-steroidal aromatase inhibitor on ovarian function and controlled breeding in cattle and buffaloes	S. Jeyakumar	2023-2026
20.	B-71	Effect of vaccination stress relieving feed supplements on semen quality of buffalo bulls.	Nishant Kumar	2024-2026
21.	B-72	Development and validation of immuno-biosensing assay for estrus identification in buffaloes	Rubina K. Baithalu	2024-2026
22.	B-73	Milk production prediction in India under changing climate scenarios with machine learning algorithms.	A.K. Sharma	2024-2027
23.	B-74	Development of an isothermal bovine semen straw thawing device	Ankit Deep	2024-2026
24.	B-75	Facial Image-Based Biometric Recognition for Unique Animal Identification using Machine Learning	Santanu Banik	2024-2027
25.	B-76	Elucidating the role of placental characteristics on birth related traits, reproductive efficiency and mother-kid bonding in Black Bengal goats (BBG).	Dilip Kumar Mandal	2024-2027
26.	B-77	Enhancing the fertilizability of Bengal buck semen through optimization of sperm dose and amelioration of oxidative stress with membrane targeting antioxidants.	M. Karunakaran	2024-2027
27.	B-78	Augmenting the performance and welfare of buffaloes through harnessing their natural behaviour for sustainable and economical dairy farming	M. L. Kamboj	2025-2027
28.	B-79	Improvement of livelihood status of Schedule Caste community of Uttarakhand by Management of Dairy Animals	Nishant Kumar	2024-2027
29.	C-68	Effect of sewage water on berseem-maize cropping system under different nutrient management practices	Hardev Ram	2021-2026
30.	C-69	Development of organic nutrient management practices on fodder–food based cropping systems	Sanjeev Kumar	2022-2026
31.	C-70	Effect of residue management on soil microbial activities under salt affected soils in rice-wheat system	Rakesh Kumar	2022-2024
32.	C-71	Designing and development of continuous bioreactor for *in vitro* rumen studies	Raman Malik	2023-2026
33.	C-74	Development of silage inoculants possessing probiotic potential for enhancing nutrient utilisation from crop residues and agro-industrial waste.	Nitin Tyagi	2024-2026
34.	C-75	Exploring lemon grass and palmarosa grass residue on rumen fermentation and production performance in dairy animals	Goutam Mondal	2024-2027
35.	C-76	Reduction of aflatoxin M1 (AFM1) in milk using aflatoxin detoxifying agents in dairy animals	Ram Singh	2024-2027
36.	C-77	Development and characterization of moringa-napier pellets.	Rajesh Kumar Meena	2024-2026
37.	C-78	A machine learning approach to assess gait kinematics for prediction of lameness in crossbred cattle	Mukund A. Kataktalware	2024-2027
38.	C-79	Effect of environmental and feeding stress on the total discomfort of dairy animals and their performance	Bandla Srinivas	2024-2026
39.	C-80	Formulation of a novel feed supplement to promote early rumen development for improving animal productivity.	A. Santra	2024-2027
40.	C-81	Validation of nutrient enriched rice straw technology in an organized dairy farm	A. Chatterjee	2024-2025

Sl. No.	Project No.	Title	PI	Duration
41.	C-82	Evaluating genetic variations of feeding behaviours and their associations with production and reproduction performance of Jersey crossbred cattle	Ajoy Mandal	2024-2026
42.	C-83	Therapeutic management of calf diarrhea with probiotics and herbal anti-diarrheal compounds	Saroj Rai	2024-2027
43.	C-84	Studies on land configuration and fertilizer doses on crop productivity under fodder-based cropping system	Magan Singh	2025-2028
44.	C-85	Exploring sex- and age-specific mitochondrial bioenergetics and biogenesis in buffalo brain and blood	Sadeesh E.M.	2025-2028
45.	D-62	Profiling of milk constituents from indigenous breeds of cattle and buffalo	Rajesh Kumar	2021-2024
46.	D-63	Utilization of paneer whey towards sustainable production of bioactive lactose-derived oligosaccharides	Priyanka Singh Rao	2022-2025
47.	D-64	Development of spray dried probiotic direct vat set starters of *Lactiplantibacillus plantarum* strain(s)	Chand Ram	2023-2025
48.	D-65	Characterization and bioprocess optimization for enhanced vitamin B12 production by *Limosilactobacillus reuteri* NCDC 958	Manorama Kumari	2023-2025
49.	D-66	Characterization of Urolithin A (UroA) producing probiotic strains as a functional health ingredient.	Diwas Pradhan	2024-2026
50.	D-67	Development of Autochthonous Dahi and Yoghurt Starter Culture Blends to Strengthen NCDC Repository.	Pradip Behare	2024-2026
51.	D-68	Profiling of bovine and non-bovine milk constituents and determining their therapeutic potential to enhance market profitability.	Rajan Sharma	2024-2026
52.	E-61	Improvement in functionality of buffalo milk protein concentrate (BMPC80)	Ganga Sahay Meena	2023-2026
53.	E-64	Development of nutri-cereals based ready to reconstitute payasam mixes	Menon Rekha Ravindra	2023-2026
54.	E-65	Densification of cattle dung-based composite torrefied biomass for bioenergy	Vairat Amita Dinkar	2023-2026
55.	E-66	Development of Technology for 3-D Printing of Traditional Indian Milk Products.	Kaushik Khamrui	2024-2027
56.	E-67	Development of milk and plant proteins based egg white analogues	Deep Narayan Yadav	2024-2027
57.	E-68	Development of green packaging materials from agro-co-product proteins for dairy products	Narender Raju Panjagari	2024-2027
58.	E-69	Development and integration of automatic thermal storage module with solar fermentation unit	Chitranayak	2024-2026
59.	E-70	Scale-up and validation of magnetic induction heating unit for milk	Hima John	2024-2026
60.	E-71	Development of a mechanized unit for Pinni manufacturing	P. Barnwal	2024-2027
61.	E-72	Characterization of ghee prepared using Bilona Process.	Vivek Sharma	2024-2026
62.	E-73	Physico-chemical characterization and storage stability of khoa prepared from low lactose milk with reduced maillard browning	Sumit Arora	2024-2027
63.	E-74	Adsorption and microbial purification of GOSs derived from paneer whey and its utilization in select dairy products	Manoj Kumar C.T.	2024-2027
64.	E-75	Valorization of industrially produced ghee residue through extraction of phospholipids and production of phospholipid rich powder	Monika Sharma	2024-2027
65.	E-76	Development of whey protein based clear beverage	Ajay Yadav	2025-2027

Sl. No.	Project No.	Title	PI	Duration
66.	E-77	Production of spray-dried buffalo milk micellar casein concentrate	Gaurav Kumar Deshwal	2025-2027
67.	E-78	Effect of key metabolites on the technological properties of goat milk yoghurt	Heena Sharma	2025-2026
68.	E-79	Development of milk protein incorporated jellified confections	S. A. Hussain	2025-2027
69.	E-80	Development of process technology for puffing of millet grains and preparation of fiber and protein rich dairy delicacy therefrom	Writdhama G. Prasad	2025-2027
70.	E-81	Development of microwave assisted continuous flow heating system	Priyanka	2025-2028
71.	E-82	Integration of automated heat transfer fluid recirculation system in chest freezer based milk cooling unit.	P. S. Minz	2025-2027
72.	F-38	Dung-mining for understanding the linkage of microbial assemblage to milk productivity in dairy animals	Anil Kumar Puniya	2024-2026
73.	F-39	development of engineered endolysins as a novel therapeutic agent for multi-drug resistant *E. coli* infections in dairy animals	Jai K Kaushik	2024-2027
74.	F-40	Deoni cow urine-based formulation for wound healing in animals	Mamta Chauhan	2024-2027
75.	F-41	A rapid test kit for detecting bovine ketosis at point of care	Mohan Mandal	2024-2027
76.	F-42	Carbon Quantum Dots (CQD) based antimicrobial post milking teat dip formulation for mastitis prevention in dairy animals	Basavaprabhu H. N.	2025-2026
77.	F-43	Designing and characterization of molecularly imprinted polymers for selective extraction of vitamin B12 from food matrix	Richa Singh	2024-2027
78.	F-44	Development of Paper-Based Microfluidic Device for the Simultaneous Detection of Selected Milk Adulterants	Sonu K.S.	2024-2027
79.	F-45	Development of methodology for determination of adulteration in Paneer	Shilpa Shree B.G.	2025-2027
80.	G-79	Livelihood augmentation of resource poor scheduled caste farm households in western dry region of Rajasthan	Gopal Sankhala	2021-2026
81.	G-80	Empowerment of tribal farmers through dairy interventions in Rajasthan	B.S. Meena	2022-2025
82.	G-85	Consumer behaviour and demand–supply analysis of dairy based functional foods in India	Ajmer Singh	2023-2026
83.	G-88	Women-Centric vulnerability mapping and participatory adaptation planning to climate change for dairy farmers in Haryana	Sanchita Garai	2023-2026
84.	G-90	Estimation of lifetime economics of Deoni cattle in organized and unorganized farms	Shivaswamy GP	2023-2026
85.	G-91	Developing Dairy Development Index of India – framework and determinants	Subhasis Mandal	2024-2026
86.	G-92	Assessment of the socio-spatial dynamics for bio-fertilizer adoption within dairy based farming systems	Asif Mohammad	2024-2027
87.	G-93	Competitiveness and readiness of indian states for dairy exports: a comparative analysis	Gunjan Bhandari	2025-2027
88.	G-94	Harnessing opportunities of enhancing camel milk production in India – Role of markets and institutions	Udita Chaudhary	2025-2027
89.	G-95	Socio-economic transformation of scheduled castes in the Kachhar Region of Eastern Uttar Pradesh	Deep Narayan Yadav	2025-2027
90.	G-96	Enhancing livelihood security of scheduled caste farmers in dry arid Vindhyachal plateau of Madhya Pradesh	Anupama Mukherjee	2025-2027

New Externally Projects Sanctioned-2025

In the year 2025, following 11 projects had been sanctioned to the faculty of ICAR-NDRI with total financial layout of **₹570.94 lakhs**.

S No.	Title of the Project	Name of PI	Name of Associates	Funding Agency	Duration	Total Cost (₹ in Lakh)
1.	Development of nutrigenomics strategies through foetal epigenetic reprogramming for enhanced performance in goats	Vikas Vohra	Rani Alex, Gopal R. Gowane, Sachin Kumar	NLM, GOI	2025-2028	63.91
2.	Kisan Sarathi 2.0: Enhancement, Operations, Maintenance and Support	Gopal Sankhla	Sanjit Maiti, Sachin Kumar, Rajkumar, Indu Devi, Sanchita Garai, P. Narender Raju, B. S. Meena	ICAR	2025-2028	36.00
3.	Promotion of livestock based technological interventions for socio-economic improvement of scheduled caste farmers in Chhotanagpur plateau of West Bengal	C. Bhakat	A. Mandal, A. Mohammad, S. Banik, D. K. Mondal, A. Chatterjee, S Kademani	ICAR-IIAB, SCSP	2025-2028	30.00
4.	Centre for innovations to foster full cycle processing of agriculture waste to wealth PAWW Sub title: Bio conversion of agricultural waste into nutraceutical for incorporation in milk replacer and calf starter to augment gut health and productivity of calves	Sachin Kumar	Sumit Arora, Nitin Tyagi, Richa Singh, Heena Sharma	DST	2025-2030	30.00
5.	Application of horticultural, dairy and small ruminant technologies for technological empowerment to enhance and sustain livelihood security of small and marginal SC farmers in Karnataka (Lead Centre: ICAR-IIHR, Bengaluru).	Mukund A. Kataktalware	Devaraja H.C. and Arindam Dhali	DST/SEED/ SCSP	2025-2028	35.00
6.	Enhancing dairy production efficiency in India through improved ration balancing and advanced feed library development	Sachin Kumar	Goutam Mondal, Nitin Tyagi	Cornell University (USA)	2025-2027	120.78
7.	Integration of millets and their Derivatives with Dairy and non-dairy food matrices for improved functionality	Writdhama Prasad	S. A. Hussain	DST	2025-2027	50.46
8.	Network project Project title: Adoption pattern and economic impact assessment of sex sorted semen technology in India Component 1:Impact assessment of agricultural technology	Subhasis Mandal	Biswajit Sen, A.K. Sharma, Gunjan Bhandari	ICAR-NIAP	2025-2026	11.50
9.	Probing the nano-therapeutic potential of super cationic carbon quantum dots for combating the bovine mastitis associated multi-drug resistant pathogens	Basavaprabhu H.N	-	ANRF	2025-2028	65.00

S No.	Title of the Project	Name of PI	Name of Associates	Funding Agency	Duration	Total Cost (₹ in Lakh)
10.	Prevalence of Microbiological and Chemical Hazards in Traditional Fermented Foods of North-East India	Buddhiman Tamang Assistant Professor, Department of Microbiology, Sikkim University, Gangtok Diwas Pradhan, Scientist, DM Division , NDRI, Karnal	Nagendra Thakur, Gangtok, Sikkim Richa Singh, Raghu V	DBT	2025-2028	37.10
11.	Preclinical Validation and clinical evaluation of expolysaccharides – Iron complex enriched fermented dairy product for ameliorating Iron deficiency anaemia.	Pradip Behare	CCPI Bikash Medhi, Sanjay K Bhadada, Deba Prasad Dhiber Sumit Arora, Manorama Kumari, Abdul Hussain	ICMR	2025-2029	91.19
					Total	**570.94**

Dr. Dheer singh, Director NDRI extending warm welcome to RAC member Dr. S. S. Maan on May 7, 2025

A view of RAC meeting held on May 7, 2025

5

EXTRA-MURAL FUNDING AND COLLABORATIONS

As on 31.12.2025, the following 81 externally funded projects having financial layout of Amount ₹ **9882.64 lakhs** are in progress at ICAR-NDRI, Karnal.

Externally Funded Projects-2025-26

SN	Title of the Project	Name of PI	Name of Associates	Funding Agency	Duration	Funds Sanctioned (₹ Lakhs)
1	Network programme on veterinary type culture (VTC)-Rumen Microbes.	Sachin Kumar	Nitin Tyagi	ICAR-NCVTC	2021-2026	13.80
2	Indigenous breed improvement programme (Sahiwal Cattle).	Anupma Mukherjee	Vikas Vohra, T. K. Mohanty, S. S. Lathwal and M. Bhakat	ICAR	2021-2026	8.35
3	Capacity building of resource for farmers in paddy-wheat cum dairy production system through Farmer First Programme.	Gopal Sankhala	S. Meena, H. R. Meena, S.S. Lathwal, Rakesh Kumar, Ajmer Singh, A. K. Singh,V. K. Pandita (IARI), Nitin Tyagi, Sanket Borad, Heena Sharma, Sachin and Omvir Singh (CTO)	ICAR	2021-2026	33.62
4	Enriching knowledge-integrating technology and institutions for holistic village development in horticulture-based farming system.	B. Balakrishna, IIHR, Bengaluru	M. C. A. Devi and S. Subhash	ICAR-FFP	2021-2026	31.80
5	"Incentivizing Research in Agriculture" Project-V Semen sexing in cattle.	Sudarshan Kumar	—	ICAR	2021-2026	239.50
6	Network project on buffalo Improvement-Institute herd-ICAR	Vikas Vohra	Pawan Singh, G.R. Gowane and T.K. Mohanty and Mukesh Bhakat	ICAR	2021-2026	15.60
7	Network project on buffalo Improvement-Field Unit	Vikas Vohra	G.R. Gowane, Sabyasachi Mukherjee and S.K. Rathi	ICAR	2021-2026	30.70

SN	Title of the Project	Name of PI	Name of Associates	Funding Agency	Duration	Funds Sanctioned (₹ Lakhs)
8	National Innovations in climate resilient Agriculture (NICRA)	Goutam Mondal	A. K. Dixit, Anjali Aggarwal, B. S. Meena, Anurag Saxena, S. De, Nitin Tyagi, Nishant Kumar, Sachin Kumar, Sunita Meena, Rani Alex, Indu Devi and Naresh Selokar	CRIDA (ICAR)	2021-2026	91.50
9	Improving the livelihood through dairy farming in North Eastern region of India.	T. K. Dutta	S.K. Das, A. Santra, C. Bhakat, A. Mandal, D.K. Mandal, A. Chatterjee, M. Mondal, M. Karunakaran, Asif Mohammad and Saroj Rai	ICAR	2021-2026	20.00
10	Incentivizing research in agriculture "Project-V "semen sexing in cattle	T. K. Mohanty (up to 31.07.2025), Rubina Kumari Baithalu (w.e.f from 01.08.2025)	Mukesh Bhagat, A. Kumaresan and Pawan Singh	ICAR	2021-2026	549.84
11	Empowering farmers through selective interventions in salt affected agroecosystems of Ghaghar Plains	Sohanvir Singh CCPI		ICAR-FFP	2016-2026	169.80
12	Scheme on Dairy Microbes under Network Mode	P.V. Behare	A.K. Puniya	ICAR Network Project	2021-2026	95.00
13	Upliftment of socio-economic condition of tribal people through integrated livestock farming in north eastern hill region/eastern part of India –ICAR	T. K. Dutta	M. K. Ghosh, S. K. Das, A. Santra, C. Bhakat, A. Mondal, A. Chatterjee, D. K. Mondal, Mohan Mondal, M. Karunakaran, Asif Mohammad, S. Rai and R. Behera.	ICAR	2021-2026	50.00
14	Establishment of AI network in Muzaffarnagar	Pawan Singh and Indu Devi	B. S. Meena, Sohanvir Singh, Nishant Kumar and Indu Devi	DADF	2022-2025	859.10
15	Generation of milk somatic cell reference values and intelligent and predictive modelling for monitoring mammry profile and milk quality of indigenous dairy animals.	A.K. Dang	Gourav Kumar. Deshwal and Adesh Kumar Sharma	DBT	2021-2026	73.06
16	ICAR Network programme on precision agriculture.	T. K. Mohanty (up to 31.07.2025), Indu Devi (w.e.f. from 01.08.2025)	A. K. Misra, S. S. Lathwal (up to 31.03.2025), Nishant Kumar, Rubina Kumari Baithalu, Vikas Vohra, Goutam Mondal, Sachin Kumar, Sanjit Maiti, P. S. Minz and Chitranayak	ICAR-NEPPA	2021-2026	332.00

SN	Title of the Project	Name of PI	Name of Associates	Funding Agency	Duration	Funds Sanctioned (₹ Lakhs)
17	Dairy entrepreneurship development among rural youth and women in aspirational districts of Karnataka State	S. Subash	K.P. Ramesha, S. Jeyakumar and H.C. Devaraja	RKVY	2021-2026	232.00
18	Evaluation of bio functional attributes of extracellular components derived from probiotic lactobacilli as postbiotics	Rajeev Kapila	Suman Kapila	SERB	2022-2025	40.00
19	Unique innate-immunity genomic signatures identification in Sahiwal Gir, Tharparkar, Kangeyamm Karan Fries and Holstein Friesian cattle using immune informatics	Suneel Kumar Onteru	Ragothaman M. Yennamalli, Asstt. Prof. Sastra Deemed to be University, Thanjavur	NASF	2022-2025	95.40
20	Evaluation of semen characteristics and fertility parameters of cloned bulls and performance of clones progenies- phase II	Prem Singh Yadav, ICAR-CIRB, Hisar	Manoj K. Singh, ICAR-NDRI, Karnal-132001	NASF	2022-2025	450.58
21	One-step multiplex genome editing and improvement of lactation traits in Indian water buffalo	Naresh Selokar	Chi-hun-Park, Ravikant Reddy Ponnuru	BMGF	2022-2027	709.10
22	Unravelling the genomic diversity and identifying Putative SNPs for Milk quality and production in Bilahi and crossberd population in Haryana State.	G.R. Gowane	Vikas Vohra and Rani Alex	DST(HSCSI&T)	2022-2025	40.00
23	Utilization of paddy straw as complete fodder block by treating with Gomutra (Indigenous cow urine)	Nitin Tyagi (CCPI)	Sachin Kumar	DST-SEED-SUTRA	2021-2026	70.68
24	Development of nano-micro matrices for the delivery of bioactives, micro-nutrients and therapeutics	Rajesh Kumar	Naveen K Navani, IIT Roorke Rajendran D., ICAR-NIANP, Bengaluru P. Senthil Kumar, TANUVAS, Orathanad and P. Heartwin Amaladhas	NASF-ICAR	2022-2025	180.30
25	Development of nano-micro matrices for the delivery of bioactives, micronutrients and therapeutics	P. Heartwin Amaladhas	F. Magdaline Eljeeva Emerald and A. Manimaran	NASF-ICAR	2022-2025	36.25
26	Characterization of native livestock and poultry population of West Bengal State.	Ajoy Mandal	S.M. Deb M. Karunakaran and Mohan Mandal	ICAR	2022-2027	27.50
27	Development of climate resilient and sustainable agri based systems for better food, feed, nutritional and livelihood security potions to farming community of cold arid region– Ladakh	Anurag Saxena	Nirmal Kumar Ravindra Kashinath Naitam, Shiraj Saleem Bhatt, Sandeep Saran and Goutam Kolluri	DST	2022-2025	272.00

SN	Title of the Project	Name of PI	Name of Associates	Funding Agency	Duration	Funds Sanctioned (₹ Lakhs)
28	Isolation of proline-rich poly peptides from colostrum of select indigenous cattle breed and evaluation of their neutraceutical potential.	Sathish Kumar and M.H.	Shaik Abdul Husain	NASF	2022-2025	100.55
29	Delineating the drug delivery potential of milk exosomes to combat intracellular pathogenic niche causing bovine mastitis	Dheer Singh	Suneel Kumar Onteru	DBT	2023-2026	98.72
30	Evaluation of the impact of mitochondrial changes on milk production traits of indigenous cattle	Sadeesh E.M.		SERB-DST	2023-2025	29.53
31	Controlled Release of Olfactory Cues for Management of Lesser Grain Weevil, Sitophilus Oryzaea Stored Product Pest of Rice	Gautam Kaul	Rajani Paul	DBT	2023-2026	86.42
32	Overexpression of recombinant linoleic acid isomerise/desaturase on the surface of probiotic *Lactobacillus spp.* for enhanced in situ production of conjugated linoleic as acids in gastrointestinal tract of the host	Anita Kumari Garsa Mentor: J. K. Kaushik PS		DST under Women Scientists Scheme (WOS-A)	20232026	31.28
33	Establishment of Centre of Excellence with OPU-IVF Technology	M.K Singh	Naresh Selokar, Rubina Baithalu, Subhash Chand and Ranjit Verma	MoFAHD	2023-2028	1185.25
34	Production of cloned indigenous cattle using simplified handmade cloning method	Naresh L Selokar	M K Singh and Ranjeet Verma	ICAR	2023-2026	35.00
35	Indian dromedary camel genome diversity analysis and development of customized low density SNP chip for camel.	Ved Prakash (AGB, NRCC, BIKANER	G.R.Gowane, Basanti Jyotsana and A. Sahoo, (NRCC)	NRCC Bikaner as part of coordinated research project IAEA Vienna	2023-2028	37.00
36	Valorization of pearl millet straw for production of gut health caring nutraceuticals- Global Centre of Excellence on Millets (Shri Anna): Sub-Component	Ashis Kumar Samanta (upto 09/04/2025), Sachin Kumar (w.e.f from 10/04/2025)	Sumit Arora, Shaik Abdul Hussain and Nitin Tyagi	ICAR-IIMR	2023-2026	50.00
37	Identification of heat stress- specific biomarkers to develop a biosensor for formulating mitigation strategies in high yielding dairy animals	A.K. Dang	-	DBT	2023-2026	49.10

SN	Title of the Project	Name of PI	Name of Associates	Funding Agency	Duration	Funds Sanctioned (₹ Lakhs)
38	Building resilience model for the vulnerable hotspots to climate change in smallholder dairy production system of Indo-Gangetic Plain Region of India using GIS and fuzzy cognitive mapping approach	Sanjit Maiti	BS Meena, Sanchita Garai, Raj Kumar, Goutam Mondal, Anjali Aggarwal	NASF	2023-2026	54.94
39	The South Asia Agriculture Adaptation Atlas: Interconnections between climate risk, practices, technologies and policies	Sanjit Maiti	Gopal Sankhala, Sanchita Garai, Anjali Aggarwal, Goutam Mondal	MOA&FW	2023-2026	28.86
40	Affordable sustainable and nutritionally balanced milk millet protein ingredients	Yogesh Khetra	Sumit Arora, G.S. Meena and Shaik Abdul Hussain	DST	2023-2026	29.69
41	Sensor based estrus identification and health monitoring device in dairy animals	T. K. Mohanty (up to 31.07.2025), R.K. Baithalu (w.e.f. from 01.08.2025)	-	DST	2023-2026	34.04
42	*In-situ* production of active vitamin B12 rich ready to use therapeutic composite dairy food and evaluation of its bioavailability and safety	Devraja H.C., SRS	Monika Sharma, Rashmi H.M. and Goutam Kaul	ICMR	2023-2026	44.89
43	Novel nano purification technology for enrichment of super sperm population to improve fertility and skew sex ratio towards female in dairy animals.	A. Kumaresan	-	Funded under national fellow ICAR	2023-2028	376.59
44	AICRP on Mechanization of animal Agriculture Production and Post-Production Mechanization Augmented with innovation Technologies for sustainable agriculture Development Total Budget 359.80 crore	P Barnwal	Indu Devi	ICAR	2024-2026	11.70
45	In vitro production of oocyte- and spermatozoa-like cells from pluripotent stem cells of farm animals	M. K. Singh	Naresh L. Selokar	NASF	2024-2027	88.86
46	Harnessing Ruminant Immunity for Practical Application	Sachinandan De	-	National Professor Scheme	2024-2028	-
47	Exploring the role of non-coding RNAs in regulating the epigenomics of lactation in low yielding cows	Sudarshan Kumar	Jai Kaushik	DBT	2023-2026	87.13
48	Production of broiler livestock and poultry using CRISPR technology	Naresh Selokar	M K Singh, S S Lathwal, Bharati Pandey and Dheer Singh	ICAR	2024-2026	329.00

SN	Title of the Project	Name of PI	Name of Associates	Funding Agency	Duration	Funds Sanctioned (₹ Lakhs)
49	Exploring CRISPR/Cas9-based genome editing for skewed sexed embryo production in buffalo-NDRI	M K Singh	Naresh Selokar and Dheer Singh	ICAR	2024-2026	136.00
50	Development of fertility signatures for identifications of repeat breeding cows by exploring crosstalk mechanism in SNP-miRNA-mRNA networks	Rani Alex	G R Gowane and Vikas Vohra	HSCSIT	2024-2027	40.00
51	Preparation of greenhouse inventory from Indian Livestock for first BTR, fourth BUR and fourth NC from livestock sector	Goutam Mondal	Nitin Tyagi and Sanjit Maiti	MOEF&CC	2024-2027	70.15
52	Development and functional characterization of spray-dried lactose-free milk powder using high molecular weight polysaccharide as adjunct	Richa Singh	Sumit Arora	DST	2024-2027	27.96
53	Development of novel strategy for the detection and tackling of antimicrobial resistant (AMR) Mastitis pathogens in dairy animals and environment using nanotechnology	Raghu H.V.	Shilpa Vij	NASF	2024-2027	82.25
54	Bacteriophage and Metal based Antimicrobial Therapy for the Bio-Control of Multi-Drug Resistant(MDR)Zoonotic Bacterial Dairy Pathogens	Raghu H.V	A K Puniya, Shilpa Vij, S De Kamal Gandhi	ICMR	2024-2027	85.00
55	DPP-IV inhibitory (antidiabetic) peptides-rich milk protein hydrolysates: Effect of simulated digestion and safety evaluation	Sathish Kumar M.H Suman Kapila	Devaraja H C, Manoj Kumar C T, Priyanka Singh Rao and Rajeev Kapila	DST	2024-2026	94.63
56	Biosynthesis and downstream processing of lacto bionic acid from paneer whey using lactose oxidizing bacteria.	Yogesh Khetra	G S Meena, Rashmi H M and Sumit Arora	DBT	2024-2027	38.20
57	Livelihood improvement of rural farmers through augmentation of fertility in dairy cows with assured female calf approach in Chakdaha and Haringhata blocks of Nadia district, West Bengal	M Karunakaran	Asif Mohammad, Mohan Mandal, Ajoy Mondal and C Bhakat	NABARD	2024-2027	20.09
58	Upskilling and reskilling Pashu Sakhis on improved animal husbandry and agricultural practices for effective dissemination of technologies	M Karunakaran	Mohan Mandal, Ajoy Mondal and C Bhakat	ITC (CSR)	2024-2026	9.76

SN	Title of the Project	Name of PI	Name of Associates	Funding Agency	Duration	Funds Sanctioned (₹ Lakhs)
59	Application of mesenchymal stem cells for the treatment of metritis to control repeat breeding in cattle and buffaloes for improvement of the livestock	Dhruba Malakar (PI up to 30/09/2025) and Satish Kumar w.e.f. 01/10/2025	-	DST Haryana	2024-2026	30.00
60	All India Network Programme (AINP) on antimicrobial resistance (AMR) in Fishery & animal sciences (INFAAR)	Raghu H. V	Diwas Pradhan	ICAR-NBFGR		37.80
61	All India Network Programme on "Livestock and poultry product safety" (Lead Division: Dairy Microbiology)	Raghu H.V.	-	ICAR	2024-2026	25.00
62	Effect of processing on the levels of aflatoxin M1 in selected dairy products	Raghu H. V	Kamal Gandhi, A.K Puniya and Writdhama Prasad	FSSAI	2024-2026	86.20
63	Pre-Clinical efficacy, safety and toxicity of colostrum whey protein derived formulations ('ProPep') in animal model	Shilpa Vij	A. K. Puniya and Vikas Dighe	ICMR	2024-2026	179.86
64	Development of probiotic formulation containing *Lactiplantibacillus plantarum* Lp91(MTCC 5690) and its pre-clinical safety & efficacy study for human use	Rashmi M.H	Diwas Pradhan and P. Heartwin Amaladhas	ICMR	2024-2026	205.47
65	Awareness of Farmers on Scientific Management Practices of Gir Indigenous Cattle and Productivity Enhancement in Goras Region (MP) Lead Division: Livestock Production and Management)	S. S. Lathwal (up to 31.03.2025), B. S. Meena (w.e.f from 01.04.2025)	Arun Kumar Misra, Nishant Kumar, Gopal R. Gowane and Indu Devi	DADF	2023-2028	276.65
66	Comprehensive characterization of Badri cow milk bioactivities and its dairy products (yogurt and paneer) across seasons	Rashmi H M	Suneel Kumar Onteru	DBT	2024-2027	17.95
67	Application of aptamer, microfluidics and protein targeted approaches for sex specific spermatozoa enriched in bovine and technology development thereof	Mohan Mondal (ERS)	M Karunakaran Ajoy Mondal and S K DAs	DBT	2024-2026	102.74
68	Application of aptamer, microfluidics and protein targeted approaches for sex specific spermatozoa enriched in bovine and technology development thereof	Sudarshan Kumar	Jai Kaushik, Satish Kumar, Tushar Mohanty and Rubina Baithalu	DBT	2024-2026	94.96

SN	Title of the Project	Name of PI	Name of Associates	Funding Agency	Duration	Funds Sanctioned (₹ Lakhs)
69	Designing, synthesis and functional evaluation of therapeutic potential of bovine specific novel kisspeptin-10 analogues for reproduction augmentation in livestock species	Mohan Mondal	M Karunakaran	DST-SERB	2024-2027	95.00
70	Comparison of milk compositional and transcriptomic landscape of major and minor dairy species of India	Sonika Alhawat, ICAR-NBAGR	Vivek Sharma	NLM	2024-2027	-
71	Development of nutrigenomics strategies through foetal epigenetic reprogramming for enhanced performance in goats	Vikas Vohra	Gopal Gowane, Rani Alex and Sachin Kumar	NLM_DAHD	2025-2028	63.91
72	Kisan Sarathi 2.0: Enhancement, Operations, Maintenance and Support	Gopal Sankhala	B.S. Meena, Sanjit Maiti, Sanchita Garai, Raj Kumar, P.N. Raju, Sachin Kumar and Indu Devi	ICAR	2025-2027	36.00
73	Promotion of livestock based technological interventions for socio-economic improvement of scheduled caste farmers in Chhotanagpur plateau of West Bengal	C. Bhakat	A. Mandal, A. Mohammad, S. Banik,. D. K. Mondal, A. Chatterjee and S Kademani	ICAR-IIAB, SCSP	2025-2028	30.00
74	Centre for innovations to foster full cycle processing of agriculture waste to wealth PAWW *Sub title: Bio conversion of agricultural waste into nutraceutical for incorporation in milk replacer and calf starter to augment gut health and productivity of calves*	Sachin Kumar	Sumit Arora, Nitin Tyagi, Richa Singh and Heena Sharma	DST	2025-2030	30.00
75	Application of horticultural, dairy and small ruminant technologies for technological empowerment to enhance and sustain livelihood security of small and marginal SC farmers in Karnataka (Lead Centre: ICAR-IIHR, Bengaluru).	Mukund A. Kataktalware	Devaraja H.C. and Arindam Dhali	DST/SEED/ SCSP	2025-2028	35.00
76	Enhancing dairy production efficiency in India through improved ration balancing and advanced feed library development	Sachin Kumar	Goutam Mondal and Nitin Tyagi	Cornell University (USA)	2025-2027	120.78

SN	Title of the Project	Name of PI	Name of Associates	Funding Agency	Duration	Funds Sanctioned (₹ Lakhs)
77	Integration of millets and their Derivatives with Dairy and non-dairy food matrices for improved functionality	Writdhama Prasad	S. A. Hussain	DST	2025-2027	50.46
78	Network project Project title: Adoption pattern and economic impact assessment of sex sorted semen technology in India Component 1:Impact assessment of agricultural technology	Subhasis Mandal	Biswajit Sen, A.K. Sharma and Gunjan Bhandari	ICAR-NIAP	2025-2026	11.50
79	Probing the nano-therapeutic potential of super cationic carbon quantum dots for combating the bovine mastitis associated multi-drug resistant pathogens	Basavaprabhu H.N		ANRF	2025-2028	65.00
80	Prevalence of Microbiological and Chemical Hazards in Traditional Fermented Foods of North-East India	Buddhiman Tamang Assistant Professor, Department of Microbiology, Sikkim University, Gangtok Diwas Pradhan	Nagendra Thakur, Gangtok, Sikkim Richa Singh and Raghu V	DBT	2025-2028	37.10
81	Preclinical Validation and clinical evaluation of *expolysaccharides* – Iron complex enriched fermented dairy product for ameliorating Iron deficiency anaemia.	Pradip Behare	CCPI Bikash Medhi, Sanjay K Bhadada, Deba Prasad Dhiber Sumit Arora, Manorama Kumari and Abdul Hussain	ICMR	2025-2029	91.19
					Total	**9882.64**

Dr. Dheer Singh, Director, ICAR-NDRI along with Dr. Joseph W. McFadden, Associate Professor from Cornell University, USA

6

INTELLECTUAL PROPERTY MANAGEMENT

Institute Technology Management Unit (ITMU)

Institute Technology Management Unit (ITMU) at NDRI is managed by Institute Technology Management Committee (ITMC). ITMC is the highest body which takes important decisions for the intellectual property management at NDRI viz., filing of patents, Copyrights, approval of the technology for commercialization, pricing of the technologies ready for commercialization etc. ITMC is chaired by the Director.

In 2025 the following ITMC was in place

S.No.	Name of the officer	Position
1	Dr. Dheer Singh, Director	Chairman
2	Dr. Rajan Sharma, Joint Director (Research) & Member Secretary, IRC	Member
3	Dr. Deep Narayan Yadav, Head, DT Division	Member
4	Dr. S. De, PS & Technical Expert	Member
5	Dr. Chand Ram, PS & Technical Expert	Member
6	Ms. Shikha Singh, Associate Partner, LexOrbis, New Delhi & IPR Expert	Member
7	Dr. Pradip V. Behare, Sr. Scientist & Office-in-charge, ITMU	Member-Secretary

ITMC Meetings Organized

1. 65th ITMC Meeting was held on 03.01.2025
2. 66th ITMC Meeting was held on 04.03.2025
3. 67th ITMC Meeting was held on 16.05.2025
4. 68th ITMC Meeting was held on 18.07.2025
5. 69th ITMC Meeting was held on 30.09.2025
6. 70th ITMC Meeting was held on 30.12.2025

At these meetings, pricing of technologies and examination of patent applications for their novelty and commercial applicability before filing patent applications were taken-up. The details of 11 technologies approved in the year 2025 are as follows:

Technologies Developed

S. No.	Name of technology	Approved on	Inventors
1	Polyherbal Feed Supplement for Improving Dairy Productivity and Milk Quality	65th ITMC on Jan 3, 2025	Sachin Kumar, A.K. Samanta, Nitin Tyagi, Pramod Kumar, Dheer Singh
2	Technology of instant Buttermilk powder	67th ITMC on May 16, 2025	G. S. Meena, Subhadip Manik, A.K. Singh, Yogesh Khetra
3	Technology of Ghee residue based fat spread	67th ITMC on May 16, 2025	G. S. Meena, Jitendra Sharma, A.K. Singh, Yogesh Khetra
4	Lateral flow ImmunoAssay (LFIA) for early detection of Pregnancy in cow and buffalo	67th ITMC on May 16, 2025	Sudarshan Kumar, A. K. Mohanty, , T. K. Mohanty, Rubina K. Baithalu, Dr. Sushil Kumar Saini, Munna Lal Yadav, Shweta Yadav
5	Technology of Chhana Podo	68th ITMC on July 18, 2025	H.C. Devaraja, B.C. Ghosh, K. Jayaraja Rao, S. Kulkarni, B.V. Balasubramanyam, F. Magadalin Eljeeva Emerald, C.T. Manoj Kumar
6	Cheese Puri mix	68th ITMC on July 18, 2025	Monika Sharma, S. Kulkarni, B.V. Balasubramanyam, K. Jayaraja Rao, Sathish Kumar M.H.
7	Spore based paper strip sensor for detection of Aflatoxin B1 in food and feed	70th ITMC on Dec 30, 2025	Raghu H.V., Priya Kalyan, Srishti Patel, Naresh Kumar, Rajan Sharma

S. No.	Name of technology	Approved on	Inventors
8	Paper based assay for the detection of boric acid in milk	70th ITMC on Dec 30, 2025	Kamal Gandhi, Jessica Pahsyntiew, Rajan Sharma, Sonu K.S.
9	Paper based strip assay for the simultaneous detection of nitrites and nitrates in milk	70th ITMC on Dec 30, 2025	Kamal Gandhi, Saya Vilas Deshmukh, Rajan Sharma, Sonu K.S
10	Paper based strip assay for the detection of starch in milk (Inventors – Kamal Gandhi	70th ITMC on Dec 30, 2025	Kamal Gandhi, Saya Vilas Deshmukh, Rajan Sharma, Sonu K.S.
11	Process technology for the preparation of whey-based carbonated beverage	70th ITMC on Dec 30, 2025	Ajay Yadav, Ashwani Tomar, D.N. Yadav, Gaurav Deshwal

Technologies Commercialized in 2025

During the period January-December 2025, A total of **10 technologies** were transferred to 02 Commercial house through 02 License agreement thereby earning a total of ₹40.97 Lakhs (after 15% Discount to MSME and Excluding service tax) for the institute through technology licensing fee. The list of technologies licensed are given below:

S. No.	Name of technology	Inventor(s)	Technologies Licensed date	Price Fix (In ₹)	Buyer
1	A new strip based test for detection of neutralizers in milk	Rajan Sharma, Priyae Brath Gautam, Y.S. Rajput and Bimlesh Mann	March 26, 2025	36.97 Lakhs	Everest Instruments Pvt. Ltd., Ahmedabad, Gujarat
2	A new strip based test for detection of urea in milk	Rajan Sharma, Priyae Brath Gautam, Y.S. Rajput and Bimlesh Mann	March 26, 2025		
3	Strip based test for detection of glucose in milk	Rajan Sharma, Y.S. Rajput, Bimlesh Mann and Panchal Bhaveshkumar R	March 26, 2025		
4	Strip based test for detection of hydrogen peroxide in milk	Rajan Sharma, Y.S. Rajput, Bimlesh Mann and Priyae Brath Gautam	March 26, 2025		
5	Strip based test for detection of maltodextrin in milk	Rajan Sharma, Y.S. Rajput, Bimlesh Mann and Panchal Bhaveshkumar R	March 26, 2025		
6	A strip based test for detection of sucrose in milk	Rajan Sharma, Priyae Brath Gautam, Y.S. Rajput and Bimlesh Mann	March 26, 2025		
7	Strip for detection of sodium chloride in milk	Rajan Sharma, Y.S. Rajput and Bimlesh Mann	March 26, 2025		
8	Strip based technology for early detection of sub-clinical and clinical Mastitis	Naresh Kumar, Kriti Dua and Bhawani, N	March 26, 2025		
9	Detection of sorbitol in milk using paper based discs	Vivek Sharma, Ms. Shailja Shinde, Sumit Arora, Priyanka Singh Rao, Richa Singh and Karra Madhavi Latha	March 26, 2025		
10	Indigenous Probiotic *Limosilactobacillus fermentum* NCDC 400 strain	Pradip V. Behare, M. Kolhekar, Sudhir Kumar Tomar and A.K. Mohanty	June 12, 2025	4.00 lakhs	The Rohtak Coop. Milk Producers Union Ltd., Rohtak, Haryana

Patents Filed (14 Nos)

S. No	Title of Patent	Inventors	Date of Filing	Patent Application No.
1	Media and method for detection of shigella species by three stage assay	Raghu H V., Harshitha P R, Aishwarya M, Shilpa Vij, Diwas Pradhan	January 10, 2025	202511002406
2	Spore based paper strip sensor for detection of aflatoxin B1 in food and feed	Raghu H.V., Priya Kalyan, Srishti Patel, Naresh Kumar, Rajan Sharma	January 10, 2025	202511002407
3	An in vitro assay for assessing the Aflatoxin M1 toxicity in a sample	Suneel Kumar Onteru, Ankita Kapri, Sanjay Sharma, Suman Rani, Priyanka Patel, Dheer Singh	February 14, 2025	202511012695

S. No	Title of Patent	Inventors	Date of Filing	Patent Application No.
4	A bull sperm RNA transcript panel for bull fertility prediction, methods and uses	Arumugam Kumaresan, Manish Kumar Sinha, Shivanagouda Patil, Ebenezer Samuel King j, Tirtha Kumar Datta, Rakesh Kumar, Ayyasamy Manimaran, Sakthivel Jeyakumar, Kerekoppa Puttaiah, Bhatta Ramesha	March 12, 2025	202511022146
5	Fusion protein comprising cathelicidin and *Escherichia coli* endolysin	Jai Kumar Kaushik, Neha	March 13, 2025	202511022856
6	System and method for detecting abnormalities and providing reproductive management in bovine	Ajoy Mandal, Muthu Karunakaran, Champak Bhakat	March 24, 2025	202531026917
7	A process for milk protein stabilized nanoencapsulated curcumin dried formulation	Rajesh Kumar, Kaviya P, Parvesh, G Poojitha, Shaik Abdul Hussain, Rajan Sharma, Bimlesh Mann	March 25, 2025	202511028031
8	Additives formulation for enteric methane mitigation	Nitin Tyagi, Chamadiya Bilal, Antra Gupta, Ashutosh, Sachin Kumar, Goutam Mondal	March 29, 2025	202511030754
9	A process for the production of Vitamin B12 employing whey-based culture media and *Limosilactobacillus reuteri*	Pradip Vishnu Behare, Deepa Pauly Chakiath, Manorama Kumari, Richa Singh	April 18, 2025	202511037722
10	A Vitamin B12 rich dietary supplement and a method of preparation thereof	Devaraja H. C., Rashmi H. M., Monika Sharma, Gautam Kaul, Anjal Katiyar, Amandeep Singh, Nidawanbiang Najiar, Manoj Kumar C.T., Ashwani Koth, Arindam Dhali	June 28, 2025	202511061934
11	A point of care apparatus, method and kit for detection of bovine pregnancy associated glycoprotein-2	Sudarshan Kumar, A. K. Mohanty, Sushil Kumar, Rubina Kumari, Baithalu, T. K. Mohanty, Munna Lal Yadav, Shweta Yadav	July 30, 2025	202411057694
12	A device and a method for creating interconnected cell-culture wells in a gel-based structure	Suneel Kumar Onteru, Suman Rani, Ankita Kapri, Priyanka Patel, Dheer Singh	July 31, 2025	202511072929
13	Teat spray formulation for combating subclinical mastitis and process for preparation thereof	Sachin Kumar, Nitin Tyagi, Ashis Kumar Samanta, Ashish Kumar Singh, Pradip Vishnu Behare, Nutan Chauhan, Ojal Singh	November 20, 2025	202411093245
14	An assay for rapid identification and detection of single nucleotide polymorphism in buffalo genes	Suneel Kumar Onteru, Priyanka Patel, Ankita Kapri, Suman Rani, Dheer Singh	December 23, 2025	202511130887

Copyright Granted (08 numbers)

S. No.	Copyright title	Author and Co-Author(s)	Registration Number	Date of Registration
1	Karan Fries Cattle: 'The Pride of NDRI' Development Report, Planning and Research	Sabyasachi Mukherjee, Anupama Mukherjee, Vikas Vohra, Shivam Bhardwaj, Archana Verma	L-162961/2025	27-03-2025
2	Catalogue of National Collection of Dairy Cultures	Pradip Vishnu Behare, Yogita Sharma, Shilpa Vij	L-163054/2025	28-03-2025
3	MAST-D software	Ajoy Mandal, Authors from other Institute - Subhankar Mukharjee, C-DAC, Kolkata, Karabi Biswas, IIT, Kharagpur	SW-2025021556	03-09-2025
4	Buffalo cloning: From inception to translation	Naresh Selokar, Manoj Kumar Singh, Dheer Singh, M.S. Chauhan	LD-20250178321	9-10-2025
5	CRISPR/Cas Technology: Fundamentals, Applications, and Success Stories in Farm Animals	Dheer Singh, Naresh L. Selokar, Manoj K. Singh, M.S. Chauhan	LD-20250175395	10-10-2025
6	Curriculum for Climate Resilient Dairy Farm School	Sanjit Maiti, B. Mounika, Manjunath KV, Sanchita Garai, B.S. Meena, Goutam Mondal, Anjali Aggarwal, Mukesh Bhakt, Raj Kumar, Gopal Sankhala	LD-20250177278	17-11-2025

7	वैज्ञानिक विधि से पशुपालन	Nishant Kumar, Sachin Kumar, Ramesh Chandra, Rakesh Kumar	LD-20250177311	20-11-2025
8	NDRI Climate Service Mobile Application	Sanjit Maiti, Manjunath KV, Sanchita Garai, Goutam Mondal, Anjali Aggarwal, Mukesh Bhakt, Raj Kumar, Gopal Sankhala	SW-2025021978	28-11-2025

Copyright filed

S. No.	Copyright Title	Author and Co-Author	Diary No.	Date of filing
1	Atlas of Socio-climatic Risk and Hotspots of Dairy Production System in Indo-Gangetic Plains of India	Sanjit Maiti, Siddhesh Zade, Amitava Panja, Sanchita Garai, Gopal Sankhala	15162/2025-CO/L	21-04-2025
2	Artificial Intelligence in livestock farming	Dilip Kumar Mandal, Santanu Banik, Tapas Kumar Dutta and Rajan Sharma	LD-21619/2025-CO	29-05-2025

Technology Transfer

Transfer of 09 Technologies titled "Rapid Tests for Detection of Milk Adulteration" to Everest Instruments Pvt. Ltd., Ahmedabad on 26-03-2025

Transfer of Technology titled "Indigenous Probiotic Limosilactobacillus fermentum NCDC 400 strain" to The Rohtak Coop. Milk Producers Union Ltd., Rohtak, Haryana on 12-06-2025

7

ENTREPRENEURSHIP DEVELOPMENT, BUSINESS INCUBATION ACTIVITIES AND CONSULTANCY SERVICES

Consultancy Processing Unit

The consultancy processing unit facilitates and coordinates the professional service functions of the institute by offering different services to organization, individuals, industries and entrepreneurs. The services include contract research, consultancy services, contract service and training programmes. Contract research comprises all research activities undertaken through specific contractual agreements with external agencies for the purpose. Consultancy shall mean professional services rendered to external agencies in terms of scientific, technical, engineering or other professional advice/assistance based on the expert knowledge and skill available at the institute. Contract services would mean services rendered to the external organizations/ clients/ customers, or assistance of minor nature based on available knowledge, expertise, skills and facilities of the institute.

Contract Research Project

Institute is engaged in active collaboration with industry, government agencies and other stakeholders for executing the research projects funded by them. In year 2025, one contract research project was received. The details of contract research projects are given below:

Project Name	Name of the bilateral/ multilateral organization	Name of consultant
Management of subclinical mastitis through indigenous approach at lower Gangetic region	M/S. National Innovation Foundation (NIF), Amarpur, Gandinagar-382650, Gujarat	Dr. Champak Bhakat, PS, ERS

Consultancy Project

Institute is offering both general and advisory consultancy to individuals or organization on various aspects of dairy production, processing and management. The details of consultancy projects are given below:

Project Name	Firm Name	Name of consultant
Providing SOPs and onsite training to Uttarakhand Cooperative Dairy Federation Ltd. (UCDFL) for ensuring product uniformity across various production plant of Uttarakhand	M/S. Uttarakhand Cooperative Dairy Federation Ltd. (UCDFL) Haldwani, Uttarakhand	Dr. Kaushik Khamrui, PS, DT

General Contract Services (2025)

Professional Service Functions at a glance

S.No.	Services	Number
1	Contract Research Project	1
2	Consultancy Project	1
3	Analytical Services	34
4	Supply of Kits and Culture	3
5	General Consultancy	2
6	Training to students (Internship)	171
7	Entrepreneurial Training Programme (SRS)	1

Agri-Business Incubator/ Technology Business Incubation

During the period of January – December, 2025, a total of 14 training programmes including 13 Entrepreneurship Development Programmes and 1 Foundation Training Programme were conducted for 104 entrepreneurs and 21 Dairy Field officers, respectively. The details are as follows:

S.No.	Programme	Date	No. of Participants	Coordinators
1	Entrepreneurship Development Program on "Commercial Dairy Farming"	January 6-11, 2025	08	Dr. Nitin Tyagi & Dr. Rubina Baithalu
2	Entrepreneurship Development Program on "Milk and Milk Products Processing"	January 20-25, 2025	06	Dr. S.A. Hussain & Dr. Writdhama Prasad
3	Entrepreneurship Development Program on "Commercial Dairy Farming"	March 4-8, 2025	09	Dr. Nitin Tyagi & Dr. Rubina Baithalu
4	Entrepreneurship Development Program on "Technology of cheese making"	April 21-25, 2025	04	Dr. Yogesh Khetra & Dr. Sangita Ganguly
5	Entrepreneurship Development Program on "Commercial Dairy Farming"	May 5-10, 2025	08	Dr. Nishant Kumar & Dr. Rubina Baithalu
6	Entrepreneurship Development Program on "Milk and Milk Products Processing"	June 9-14, 2025	08	Dr. Heena Sharma & Dr. Gaurav Deshwal
7	Foundation Training Programme (FTP) for Dairy Field Officer Trainees, Govt. of Bihar	June 18-19, 2025	21	Dr. S.A. Hussain
8	Entrepreneurship Development Program on "Commercial Dairy Farming"	July 7-12, 2025	07	Dr. Goutam Mondal & Dr. Sachin Kumar
9	Entrepreneurship Development Program on "Milk and Milk Products Processing"	August 25-30, 2025	08	Dr. P.N. Raju & Dr. Ajay Yadav
10	Entrepreneurship Development Program on "Commercial Dairy Farming"	September 22-27, 2025	08	Dr. Nitin Tyagi & Dr. Indu
11	Training Programme on "Kefir and Probiotic Fermented Milk Preparation"	November 17-21, 2025	03	Dr. P.V. Behare & Dr. Manorama Kumari
12	Entrepreneurship Development Program on "Milk and Milk Products Processing"	November 24-29, 2025	09	Dr. Yogesh Khetra & Dr. S.A. Hussain
13	Entrepreneurship Development Program on "Commercial Dairy Farming"	December 8-13, 2025	08	Dr. Nishant Kumar & Dr. Indu
14	Entrepreneurship Development Program on "Commercial Dairy Farming"	December 15-20, 2025	08	Dr. Nitin Tyagi & Dr. Nishant Kumar

Group photo with trainees during Commercial Dairy Farming Training (January 6-11, 2025) at ICAR-NDRI

Incubation Support Provided

- Incubation support MoU was signed with M/s. ACUITIY MILLETS LLP, Haryana for the product "*Milk-millet based probiotic beverages*" for a period of six months from February 13th to August 12th, 2025.
- Incubation support MoU duration extended for M/s. SMILLET, Haryana for the product "*Millets supplemented biscuits and cookies*" for a period of six months from January 12th to July 11th, 2025.
- Incubation support MoU was signed with M/s. GANGANIYA NATURAL PRODUCTS PRIVATE LIMITED, Haryana for the products "*Ghee*" for a period of six months from June 10th to December 9th, 2025.
- Incubation support MoU was signed with M/s. SHUKRANA GLOBAL DELIGHTS PVT. LTD., Haryana a for the products "*Seed based herbal tea*" for a period of six months from July 8th, 2025 to January 7th, 2026.
- Incubation support MoU was signed with M/s. FARM TO KITCHEN, Haryana for the products "*Ghee and Dahi*" for a period of six months from August 26th, 2025 to February 25th, 2026.
- Incubation support MoU was signed with M/s. SHAGUN STAR DHABA, Haryana for the products "Extended shelf-life falvoured milk" for a period of six months from September 8th, 2025 to March 7th, 2026.
- Incubation support MoU was signed with M/s. AGRINEER INNOVATIVE SOLUTIONS, Haryana for the product "*Refinement of the mobile app developed for the use of dairy farmers*" for a period of six months from November 19th, 2025 to May 18th, 2026.

Innovation and Creativity Contest

An Innovation and Creativity Contest was organized on March 4, 2025 by ABI, ICAI-NDRI as a part of Academic Fortnight. The purpose of this event was to inculcate creative thinking and promote innovative mindset among the students. Applications were invited from UG, PG and PhD students of ICAR-NDRI in two different categories viz. Business idea and Research idea. Several ideas were received in the broad categories form students viz. Post-harvest management and storage, Quality and safety assurance tools, Alternative processing technologies, Innovative value-added products, Marketing & branding, Sustainable packaging solutions, Superior Germplasm multiplication technologies, Conservation of Indigenous breeds, Diagnostic tools/Kits, Precision dairy farming, Application of IoT in animal production, management & food supply chain, Climate resilient agriculture and animal husbandry and Waste management for circular economy. A total of 32 ideas were presented by student teams and prizes were awarded to three best ideas from each category.

Quinquennial Review Team (QRT) members interacting with students of ICAR-NDRI on January 14, 2025

8

DAIRY EDUCATION

1. EDUCATION AND TRAINING

ICAR-National Dairy Research Institute (ICAR-NDRI) is the premier Institution of International repute in Human Resource Development for the growing dairy industry in India. ICAR-NDRI which has been conferred deemed to be university status vide Govt. of India, Ministry of Human Resource Development, Department of Education, and Notification No. F. 9-15/85-U.3 dated 28.3.1989, is well equipped and staffed to meet emerging needs of the 21st Century of the Dairy Industry. The University offers academic programmes at under-graduate and post-graduate levels in the field of Dairy Science and Technology, Animal Sciences and Social Sciences. The following courses were offered by NDRI Deemed University during the academic session 2024-25. The courses have been so designed as to provide broad base as well as specialized training on different aspects of dairying.

B.Tech. (Dairy Technology)

This 4-year degree programme offers intensive training in the processing, preservation, packaging, and quality control of milk and milk products, along with engineering and management aspects of dairy processing plants. The programme prepares students for careers in dairy industries, quality assurance, and allied sectors.

B.Tech. (Food Technology)

This 4-year degree programme provides comprehensive training in the processing, preservation, packaging, safety, and quality control of food products. It also covers engineering principles of food processing plants, food safety regulations, and product development, preparing graduates for roles in the food processing and allied industries.

B.Tech. (Biotechnology)

This 4-year degree programme offers intensive training in biological sciences and biotechnological processes, including genetic engineering, microbiology, biochemistry, molecular biology, and industrial biotechnology. The programme equips students with skills for applications in food, dairy, pharmaceutical, agricultural, and environmental biotechnology sectors, as well as research and development.

I. MASTER'S AND DOCTORAL PROGRAMMES

The Institute offers Master's degree programme in the following disciplines:

1	Dairy Microbiology
2	Dairy Chemistry
3	Dairy Technology
4	Dairy Engineering
5	Animal Biochemistry
6	Animal Biotechnology
7	Animal Genetics and Breeding
8	Livestock Production and Management
9	Animal Nutrition
10	Animal Physiology
11	Agricultural Economics
12	Agricultural Extension Education
13	Agronomy
14	Animal Reproduction Gynaecology and Obstetrics

The Institute offers Doctoral degree programme in all the above disciplines.

II. SCHOLARSHIP AND FELLOWSHIPS

Masters and Ph.D. students are awarded Institute scholarship at the following rates in accordance with the prescribed rules and regulations of ICAR.

Institute Scholarships

1.	Master's degree	₹ 7560/- P.M. for two years plus ₹ 6000/- per annum as contingency.
2.	Ph.D.	₹ 31000/- P.M. for first two years, ₹ 35000/- during third year and ₹ 10000/- per annum as contingency. (w.e.f. 23.10.2025).
3.	Ph.D. (In-service)	₹ 3000/- P.M. for three years and ₹ 10000/- per annum as contingency

ICAR Junior/Senior Research Fellowship

1.	Master's	₹ 12640/- P.M. for two years and ₹ 6000/- per annum as contingency.
2.	Ph.D.	₹ 37000/- P.M. for first two years, ₹ 42000/- during third year and ₹ 10000/- per annum as contingency.

NATIONAL TALENT SCHOLARSHIP

The National Talent Scholarship (NTS) of ₹ 3,000 per month is awarded by ICAR on merit to all eligible undergraduate students whose domicile is outside the State of Haryana and who are admitted to the Institute/University in accordance with the prescribed ICAR guidelines.

III. CAREER GUIDANCE, TRAINING AND PLACEMENT CELL

The placement Cell provides career guidance, training and placement services for the passing out students in various disciplines of the Deemed University. B.Tech. (Dairy Technology) and Master in Dairying students were provided employment in reputed organizations through campus interviews. Passed out students of NDRI are getting employment in Dairy/ Food Industry (Govt./Cooperative/Multinationals). Salary ranges from ₹ 30,000 to 60,000/- per month. In addition to employment a number of students also opt for higher studies in India and abroad. The major functions of the Cell are as follows:

- To counsel the undergraduate and post graduate students in career planning.
- To compile a directory of corporate and academic bodies at the National and International level engaged in the area of Dairying and Food Processing.
- To prepare a compendium of resume of the final year students for facilitating placement/screening with prospective employers.
- To evolve mechanism for placement of Graduate/ Postgraduate students from various disciplines by arranging campus interviews.
- To arrange seminars/workshops/presentations to maintain closer liaison between student community and industry.

IV. COUNSELLING FOR ADMISSIONS

Online Counselling for admission to UG/PG programmes was held by the Education Division of ICAR New Delhi.

V. ADMISSIONS

Admission for the academic session 2025-26 for B.Tech. (Dairy Technology), (Food Technology) and (Biotechnology), M.Sc./M.V.Sc./M.Tech. and Ph.D. programmes were made.

S.No.	Courses	No. of students admitted	Male	Female
1	B.Tech (DT), (FT) and Biotechnology programme	106	71	35
2	Master's programme	119	65	54
3	PhD programme	101	50	51

VI. MEETINGS

- Meetings of Standing committee on course curricula and academic affairs during the year were organized on February 11, 2025, March 21, 2025, April 11, 2025, July 4, 2025, July 17, 2025, July 29, 2025, August 4, 2025, August 25, 2025, August 29, 2025 and October 17, 2025.
- 55th meeting of Academic Council was held on April 21, 2025.

VII. CELEBRATION OF ACADEMIC FORTNIGHT (From 1st week of March onwards)

Date	Event
March 4, 2025	Inauguration of Academic Fortnight Innovation & Creativity Contest in Dairying, Animal Sciences and Allied Disciplines
March 8, 2025	Celebration of International Women Day Let's Accelerate Action for Gender Equality
March 10, 2025	"Dr. K.K. Iya Memorial Oration" by Dr. Ch. Srinivasa Rao, Director & Vice Chancellor, ICAR-IARI, New Delhi, on "*Why One Health? Soil-Water-Environment-Crop-Animal-Human Continuum*"
March 11, 2025	"Dr. D. Sundaresan Memorial Oration by Dr Sanjay Kumar presently serving as Chairman of Agricultural Scientists Recruitment Board (ASRB), Department of Agricultural Research & Education, Ministry of Agriculture & Farmers Welfare, Govt. of India., on "*Nurturing innovations and value creation for bioeconomy*"

Date	Event
March 13, 2025	"Dr. N.N. Dastur Memorial Oration" Dr. Raghavendra Bhatta Deputy Director General (Animal Science) Indian Council of Agricultural Research, New Delhi, on "*New Paradigms in Livestock Feeding and Management under Changing Climate*"
March 17, 2025	Presentation of Best Thesis for Doctoral Programme for Processing, Production and Social Science groups Presentation of Best Thesis for Master's Programme for Processing, Production and Social Science groups
April 4, 2025	Presentation for Best Division for Processing, Production and Social Science Divisions
April 21, 2025	Meeting of Academic Council
April 21, 2025	BOM Meeting & Rehearsal of Convocation
April 22, 2025	21st Convocation of ICAR-National Dairy Research Institute, Karnal

21st Convocation of ICAR-National Dairy Research Institute, Karnal

The 21st convocation of the ICAR–NDRI was held on **April 22, 2025**. Hon'ble Shri Shivraj Singh Chouhan, Union Minister of Agriculture and Farmers Welfare & Rural Development, Government of India, graced the occasion as the Chief Guest. Sh. Bhagirath Chaudhary, Minister of State for Agriculture and Farmers' Welfare, Government of India was Guest of Honour. During the convocation, degrees were awarded to 201 students, including 32 Undergraduate, 98 Postgraduate, and 71 Ph.D. Scholars. Notably, 98 of the graduating students were girls. Hon'ble Chief guest congratulated the students and urged them to offer their knowledge for the benefit of the farming community and the Nation. Shri Sukhbir Singh Mann, a distinguished alumnus of the ICAR-NDRI, Karnal was bestowed with *Honoris causa* degree by the university for his exemplary achievements in food and dairy processing sector and for his notable contribution in strengthening the academic infrastructure of the university. Topper students of UG, PG and Ph. D. programme received medals for academic excellence, 6 students were awarded with Best thesis prizes and another 32 students awarded for merit certificates during the convocation. Among the awardees 60% were girl students.

Shri Sukhbir Singh Mann receiving Honoris causa degree from Chief Guest, Hon'ble Shri Shivraj Singh Chouhan, Union Minister of Agriculture and Farmers Welfare & Rural Development, Government of India on April 22, 2025

Hon'ble Shri Shivraj Singh Chouhan, Union Minister of Agriculture and Farmers Welfare & Rural Development, Government of India nurturing a sapling on the occasion of 21st Convocation of ICAR-NDRI on April 22, 2025

Dr. Dheer Singh, Director felicitating Sh. Bhagirath Chaudhary, Hon'ble Minister of State for Agriculture and Farmers' Welfare, Government of India on the occasion of 21st Convocation of ICAR-NDRI on April 22, 2025

Conferment of Dr. D. Sundaresan, Dr. N.N. Dastur and Dr. K.K. Iya Memorial Oration Awards

On the recommendations of the Committee constituted by the Director for searching/ suggesting the names of eminent Agricultural Scientists for conferment of Dr. D. Sundaresan, Dr. N.N. Dastur and Dr. K.K. Iya Memorial Oration Award for their outstanding contribution, the awards were conferred to the following eminent scientists:

- **Dr Sanjay Kumar** presently serving as Chairman of Agricultural Scientists Recruitment Board (ASRB), Department of Agricultural Research & Education, Ministry of Agriculture & Farmers Welfare, Govt. of India conferred upon Dr. D. Sundaresan Memorial Oration Award.
- **Dr. Ch. Srinivasa Rao**, Director & Vice Chancellor, ICAR-IARI, New Delhi conferred upon Dr. K.K. Iya Memorial Oration Award.
- **Dr. Raghavendra Bhatta** Deputy Director General (Animal Science) Indian Council of Agricultural Research, New Delhi for Dr. N.N. Dastur Memorial Oration Award.

The awards carry a cash award of ₹ 20,000/-, Shawl, Certificate and a Citation.

Conferment of Honoris Causa (Doctor of Science) Degree to Eminent Academicians/ Scientist/Distinguished Alumni during the 21st Convocation of ICAR-National Dairy Research Institute, Karnal

Based on the discussions and great contribution made by the researchers' academicians and industrialists which is evident by their brief resumes and recognition made at National and International levels, Shri Sukhbir Singh Mann, CEO of Mann Ventures recommended for the award of Honoris Causa degree of ICAR-National Dairy Research Institute (Deemed University), Karnal during the 21st Convocation on April 22, 2025 for his remarkable entrepreneurial journey and contributions in institutional activities of ICAR-NDRI, Karnal.

Conferment of "Best Division Award"

Based on the presentations made by the Heads of Divisions on innovations and significant achievements in Education, Research and Extension during the year 2025 before a committee constituted by the Director including outside experts, the Best Division award was awarded to **"Dairy Extension Division"**.

Best Division Award presentations by Heads of Division on April 4, 2025

Gold, Silver and Bronze Medal awardee students of B. Tech. (DT), Master's and Doctoral Degree Programme and Best Thesis Award for Master's and Doctoral degree students.

Bachelor's students:

Registration No.	Name of the Student	Father's Name	Degree	Discipline	OGPA	Medal
20-B-DT-22	Ms. Riya	Sukhvinder	B.Tech.	Dairy Technology	8.88	Gold
20-B-DT-23	Mr. Aman Singh	Harish Kumar Singh	B.Tech.	Dairy Technology	8.69	Silver
20-B-DT-04	Mr. Himanshu	Virender Kumar	B.Tech.	Dairy Technology	8.53	Bronze

Master's Degree students

Registration No.	Name of the Student	Father's Name	Degree	Discipline	OGPA	Medal
22-M-ES-01	Mr. Dhasarathan M	Matheswaran	M.Sc.	Agricultural Economics	8.91	Gold
22-M-AN-06	Mr. Ojal Singh	Ashok Kumar Singh	M.V.Sc.	Animal Nutrition	8.83	Silver
21-M-AN-10	Mr. Amandeep Goyal	ShyamLal	M.V.Sc.	Animal Nutrition	8.79	Bronze

Ph.D. Degree students

Registration No.	Name of the Student	Father's Name	Degree	Discipline	OGPA	Medal
20-P-GO-06	Ms. M Lavanya	T Maharajan	Ph.D.	Veterinary Gynaecology & Obstetrics	8.78	Gold
17-P-AG-05	Ms. Martina Pukhrambam	Pukhrambam Bheirob Singh	Ph.D.	Animal Genetics & Breeding	8.75	Silver
20-P-AN-06	Ms. Rashika Srivastava	V K Srivastava	Ph.D.	Animal Nutrition	8.73	Bronze

Best Thesis Award for Master's and Doctoral degree students:

Master's Programme

Group	Name of the student	Name of the Guide	Discipline
Production	Ms. Rinki Paul	Dr. Rani Alex	Animal Genetics & Breeding
Processing	Mr. Harsh Jindal	Dr. P.N. Raju	Dairy Technology
Social Science & Management	Mr. Mrin Moy Das	Dr. Gunjan Bhandari	Agricultural Economics

Doctoral Programme

Group	Name of the student	Name of the Guide	Discipline
Production	Ms. Lija, S.	Dr. A.K. Dang	Animal Physiology
Processing	Ms. Poornima	Dr. A.K. Singh	Dairy Technology
Social Science & Management	Mr. P. Akshith Sai	Dr. K. Ponnusamy	Agricultural Extension Education

The work of Ms. Harneet Kour was innovative and Committee recommended that she may be awarded **"Appreciation award".**

A best thesis award carries a Citation, and gold medal for Ph. D. scholars. For PG students, a Certificate and cash prize of ₹ 5,000/-.

Number of students given degree during 21st convocation

Degree	Total	Boys	Girls
Ph.D.	69	36	33
Master's	91	46	45
B.Tech.	30	25	5
Total	190	107	83

Deeksharambh: Induction-cum-Foundation Course

ICAR-NDRI, Karnal, conducted "Deeksharambh: Induction-cum-Foundation Course," a two-week orientation programme for newly admitted students of B.Tech. (Dairy Technology, Food Technology and Biotechnology), M.Tech., M.Sc., and Ph.D. programmes from November 12-18, 2025. During the current academic year, 259 students were admitted, comprising 115 undergraduates, 68 postgraduates, and 76 Ph.D. scholars. The programme is designed to acquaint students with the institute's academic culture, regulations, and support systems, thereby ensuring a confident and smooth beginning to their academic journey.

The inaugural ceremony was presided over by Dr. Dheer Singh, Director and Vice-Chancellor, ICAR–NDRI, in the presence of Dr. Ashish Kumar Singh, Joint Director (Academics) & Dean, Dr. Rajan Sharma, Joint Director (Research), and other senior faculty members.

Addressing the students, Dr. Dheer Singh encouraged them to believe in their abilities and approach their studies with confidence and perseverance. He emphasized that intelligence develops through continuous effort and learning, and urged students to remain proactive, innovative, and entrepreneurial. He also assured them of the institute's full support for both academic excellence and personal growth.

As part of the induction programme, students were introduced to ICAR–NDRI's academic and research ecosystem, enabling them to understand institutional expectations, opportunities, and avenues for holistic development. Different sessions on personality development, team building, leadership skills, Indian History, Culture & Diversity, Sustainable Development Goals (SDG-2030) & Viksit Bharat-2047, Swacchh Bharat Abhiyaan and Extension & Outreach Activities, Science, Literature and creativity, Communication & Presentation Skills were conducted.

Innauguration of the Deeksharambh-2025

Newly admitted students during the organization of Deeksharambh-2025

Glimpse of various activities during Deeksharambh-2025

FOUNDATION DAY PROGRAMME

103rd Foundation Day of ICAR–NDRI was celebrated on July 1st, 2025 with great enthusiasm at main and regional campuses located at Kalyani and Bangalore. As part of the celebration, a mass Tree Plantation drive was organized within the Institute campus. The celebrations witnessed active participation from students and staff of the institute. Student Council of ICAR-NDRI, Karnal has organized various events on the occasion consisting of a short video competition on 100 years of NDRI was organized, encouraging students to creatively express the glorious journey of the university. An **Elocution Contest** on the theme *"Sustainable Dairy Sector: Challenges and Prospects for NDRI"* was held, providing a platform for students to share their insights and ideas. In addition, students from B. Tech, M.Sc., and Ph.D. programs enthusiastically took part in a **quiz competition** organized to commemorate the Foundation Day. Hon'ble Director and Vice Chancellor Dr. Dheer Singh, presided over the functions. Dr. Sudhir Gupta, illustrious alumnus of ICAR-NDRI was the guest of honour on the occasion.

A view of mass plantation programme under the theme "Eik Ped Maa Ke Nam" on the occasion of Foundation Day of ICAR-NDRI on July 1, 2025

Dr. Dheer Singh, Director, ICAR-NDRI and Dr. Sudhir Gupta presented certificates to the quiz winners during the Foundation Day celebration of ICAR-NDRI on July 1, 2025

NDRI Students' Corner

Introduction

The NDRI Student Council (NDRISC) actively organized and facilitated a wide range of events encompassing cultural, academic, sports, environmental, and social welfare activities during this period. These events aimed to promote student engagement, leadership, social responsibility, and overall campus well-being.

Event Summaries

1. NDRISC Elected Members Meeting

May 29, 2025: A meeting of the elected members of the NDRISC was convened to discuss planning, coordination, and role allocation for upcoming academic, cultural, and student welfare activities. The meeting facilitated structured decision-making and ensured effective coordination among council members for smooth execution of planned programmes.

2. World Milk Day Celebrations

June 1, 2025: World Milk Day was conducted at DT Division and Milk Parlour, ICAR-NDRI observed through poster display, collage making competition, and turncoat activities organized by NDRISC. The programme aimed to promote awareness among students and staff regarding the nutritional importance of milk and dairy products, encouraging informed dietary choices and appreciation of the dairy sector.

3. World Bicycle Day & Clubs' Executive Committee Nominations

June 3, 2025: On World Bicycle Day, a cycle rally was organized at ICAR–NDRI, led by the Director, Joint Director Academics, Joint Director Research, and NDRISC President, with participation from faculty and students. On the same day, online nominations were invited for Clubs' Executive Committees, receiving over 50 applications.

4. Clubs' Executive Committee Selection

June 4, 2025: The selection process for the Executive Committees of various student clubs was conducted to formalize leadership roles. The exercise ensured transparent selection and effective constitution of committees, strengthening student participation and structured functioning of clubs under the NDRI Student Council.

5. World Environment Day Observance

June 5, 2025: World Environment Day was observed through a declamation competition involving 11 participants and a "Best out of Waste" competition with 27 participants across 13 teams. The programme aimed to promote environmental awareness, sustainability, and creative utilization of waste materials among students.

6. Basketball Court Inauguration

June 6, 2025: The newly developed basketball court at ICAR-NDRI was inaugurated by the Director, ICAR-NDRI. A friendly basketball match involving mixed-gender

teams was organized, with participation of 21 students. The initiative marked a significant enhancement of campus sports infrastructure and promoted active student engagement in outdoor sports.

7. International Yoga Day Observance

June 21, 2025: International Yoga Day was observed through mass yoga sessions organized at the NDRI Community Centre. Students, staff, and faculty members participated actively in the early morning programme, promoting physical fitness, mental well-being, and awareness of yoga as an integral component of a healthy lifestyle.

8. NDRI Foundation Day Celebrations

June 1to July1, 2025: NDRI Foundation Day was commemorated through tree plantation activities, elocution competition, short video presentations on the institute's legacy, and quiz competitions. The multi-day programme aimed to foster institutional pride, environmental awareness, and academic engagement among students through participatory activities.

9. NDRI Basketball League

July 11-13, 2025: The NDRI Basketball League was organized at the Sports Complex, with participation from male and female student teams. Competitive matches were conducted over three days, culminating in the declaration of winners in both categories. The league promoted sportsmanship, teamwork, and regular participation in competitive sports.

10. Volleyball League Inauguration

July 18, 2025: The Volleyball League was inaugurated by Dr. A. K. Singh, Joint Director (Academics), at the NDRI Sports Complex. Five male teams participated in the tournament. The event encouraged physical fitness, team spirit, and healthy competition among students through organized sports activities.

11. NDRI Open Mic Event

July 19,2025: An Open Mic event was organized at the NDRI Cafeteria, providing a platform for students to showcase talents in poetry, storytelling, singing, and stand-up performances. The programme witnessed participation of 19 students and encouraged creative expression and cultural engagement within the campus community.

12. Mehendi and Dance Competition

July 25,2025: Mehendi and Dance competitions were organized at the Activity Hall, Brahmaputra Hostel, with active participation from students. The events provided opportunities for artistic expression and cultural interaction, fostering creativity, confidence, and inclusive participation among students in a co-curricular setting.

13. Independence Day Rehearsals and Celebrations

August 11-15, 2025: Independence Day celebrations were organized at ICAR-NDRI with rehearsals conducted from August 11-14, 2025, followed by the main programme on August 15, 2025. The event was graced by the Director, Dr. Dheer Singh, and featured 16 cultural performances by 50 students, reflecting India's unity in diversity.

14. Janmashtami and Dahi Handi Celebration

August 16, 2025: Janmashtami and Dahi Handi celebrations were organized in the presence of the Director, Dr. Dheer Singh. The Dahi Handi competition witnessed participation from male and female teams, symbolizing the cultural essence of Krishna Janmashtami and fostering festive spirit and community participation.

15. Anti-Ragging Week Observance

August 18, 2025: As part of Anti-Ragging Week, an essay writing competition was conducted at the Brahmaputra Reading Room, along with a Nukkad Natak performed by B.Tech. third-year students at the Cafeteria. The programme aimed to raise awareness on the harmful effects of ragging and promote a safe, inclusive campus environment.

16. Ganesh Chaturthi Celebration

August 27-31, 2025: Ganesh Chaturthi was celebrated at Krishna Hostel, ICAR-NDRI, over five days with active participation from students, faculty, and staff. The celebration fostered cultural harmony, collective participation, and a sense of devotion, strengthening community bonding and cultural engagement within the campus.

17. Flood Relief Fundraising for Punjab

September 9 ,2025: The NDRI Student Council organized a flood relief fundraising drive to support people affected by floods in Punjab. Along with financial contributions, essential sanitary items for women were collected. The initiative reflected students' social responsibility, empathy, and commitment towards humanitarian support during natural calamities.

18. Dandiya Night Celebration

September 28, 2025: Dandiya Night was organized at the Sports Complex, ICAR-NDRI, as part of Navratri celebrations. The event witnessed participation from over 300 students and 200 faculty members. Cultural festivities and food stalls created a vibrant atmosphere,

promoting cultural interaction, recreation, and community engagement on campus.

19. Blood Donation Camp

October 1, 2025: The NDRI Student Council (NDRISC) organized a Blood Donation Camp at the Community Health Centre, ICAR-NDRI, Karnal. About 60 students and staff members voluntarily donated blood, resulting in the collection of 60 units. The initiative promoted awareness on blood donation and social responsibility.

20. Swachhta Abhiyan and Shramdaan

October 2, 2025: A Cleanliness Drive was conducted across the ICAR-NDRI campus by the NDRI Student Council. Students and faculty actively participated in cleaning activities to promote hygiene, environmental awareness, and civic responsibility. The initiative was organized in observance of Gandhi Jayanti and reflected collective commitment towards maintaining a clean and healthy campus.

21. Pre-Diwali Celebration and Clothes Donation Drive

October 16,2025: Pre-Diwali Celebration and Clothes Donation Drive was organized at the Staff Club, ICAR-NDRI, by NDRISC in collaboration with NSS and the Environment and Social Outreach Club. Along with festive celebrations, students and faculty donated clothes for the needy, promoting social responsibility and community outreach.

22. National Agricultural Students Sammelan

October 27,2025: NDRISC led a delegation of 100 students to the National Agricultural Students Sammelan at NASC, ICAR-IARI, New Delhi. Student representatives highlighted academic concerns before ICAR leadership, including the Hon'ble Minister of Agriculture and DG (ICAR), strengthening student representation and dialogue at the national level.

23. Celebration of 150 Years of Vande Mataram

November 7,2025: NDRISC organized a programme at Dr. D. Sundaresan Auditorium, ICAR-NDRI, to commemorate 150 years of Vande Mataram. Students, staff, and faculty participated in the patriotic event, which aimed to foster national pride and honor India's cultural heritage through collective participation.

24. New Students' Welcome and Registration Assistance

November 10-11,2025: NDRI Student Council facilitated registration assistance for newly admitted students by setting up a Welcome Desk and Help Desk on campus. The initiative ensured smooth onboarding, in the premises of addressed student queries, and supported a hassle-free registration process for incoming students.

25. Student Council Interaction with New Students during Deekshaarambh

November 13,2025: During Deekshaarambh 2025, the NDRI Student Council (NDRISC) interacted with newly admitted students to familiarize them with the academic environment, campus facilities, and student support systems at ICAR-NDRI. The session addressed initial queries, introduced the role of the Student Council, and supported smooth transition of new students into campus life.

26. Sports Activities

November 22,2025: The NDRI Student Council (NDRISC) organized sports activities at ICAR-NDRI, Karnal, including a Table Tennis Tournament and the NDRI Badminton League. The events witnessed enthusiastic participation from students in singles, doubles, and mixed categories. The competitions promoted physical fitness, sportsmanship, and team spirit among students.

27. Hostel Introduction Programme for Fresher Students

November 26 and 28, 2025: The NDRI Student Council (NDRISC) organized Hostel Introduction Programmes for newly admitted students at Narmada Hostel (boys) and Kaveri Hostel (girls). The sessions, conducted in the presence of hostel authorities, familiarized freshers with hostel facilities, rules, and welfare mechanisms, ensuring smooth adjustment to hostel life and effective communication with wardens.

28. Shishir Utsav 2025

October 1-6, 2025: Shishir Utsav 2025 was organized by the NDRI Student Council at ICAR-NDRI, Karnal. The festival featured literary, art, mass media, hobby, and cultural events, including elocution, quiz, poster making, short films, open mic, and cultural fiesta. The programme promoted creativity, teamwork, and holistic student engagement across the campus.

29. Freshers' Day Celebration

December 11, 2025: The Freshers' Day Celebration was organized at ICAR-NDRI, Karnal. NDRISC supported the programme by coordinating and screening cultural performances including dance, singing, mono acting, theatre, fashion show, and mime. The event warmly welcomed new students and strengthened campus camaraderie.

Glimpses of various activities carried out by the students' council of ICAR-NDRI

Faculty members, officers, and students participating in a bicycle rally organized on the occasion of World Bicycle Day on June 03, 2025 at ICAR-NDRI promoting sustainable transport and environmental awareness

Opening interaction between officials and student participants during a basketball event at ICAR–NDRI, Karnal

Students participating in the elocution event conducted at ICAR–NDRI, Karnal

Dahi Handi event conducted during Janmashtami celebrations at ICAR–NDRI, Karnal, promoting cultural traditions and community bonding

Dr. Dheer Singh, Director, NDRI along with NCC Cadets on 79th Independence day celebrated on August 15, 2025

A view of International Yoga day celeberation on June 21, 2025

9

TECHNOLOGY DISSEMINATION AND EXTENSION PROGRAMMES

National Dairy Mela and Agri Expo - 2025

The ICAR-National Dairy Research Institute, Karnal, organized a three-day National Dairy Mela and Agri Expo during February 27th – March 1st 2025. Dr. Rajbir Singh, Deputy Director General (Agricultural Extension), Indian Council of Agricultural Research, New Delhi inaugurated this mega event. This mela and expo was organized to showcase the latest research achievements as well as technological knowhow of NDRI, Karnal; ICAR institutes private industry and in the field dairying and animal husbandry. More than 40 thousand farmers from Haryana, Punjab, Uttar Pradesh, Rajasthan, Himachal Pradesh, Bengal, Bihar, Madhya Pradesh and Northeastern states etc. and 2000 school children visited this mega event. Further, 108 institutes/ organization/ companies/progressive farmers exhibited their latest research output and products particularly on livestock feed and medicines, dairy machinery and innovative dairy products etc. A total of 196 dairy animals comprised of major breeds like Holstein, Jersy, Murrah, Sahiwal, Tharparker, Gir, Hariana etc were participating in 26 categories of different live competitions on milk production and beauty contest. Besides, two competitions namely paneer making and animal milking were organized for rural women dairy farmers. Highest milk yield was recorded under different milk production competition categories as HF Cross-87.74 kg; Murrah-28.866 kg; Gir – 20.636 kg; Sahiwal-19.027 kg, Haryana-16.464 kg, Tharparkar-17.565 kg. Besides these, this year a new session was organized to promote dairy-entrepreneurship and start-up among the rural youth. In this session, all the developed technologies of ICAR-NDRI, Karnal were presented and discussed. To attract the talented mind in dairy education, a session on career prospect of dairy education was also organized for the school children and more than 2000 school children participated in session. In this mega event, special emphasis was given on promotion of livestock insurance among the dairy farmers with the help Agricultural Insurance Company.

Glimpses of National Dairy Mela and Agri Expo- 2025 organized at ICAR-NDRI during February 27 – March 1, 2025

Technological Interventions/Demonstration at Farmers' Field

Technology	Results of the demonstration	No of Demonstration	Area Covered (Ha)	No of Farmers involved
Integrated Pest Management in Paddy	IPM in Paddy: By effectively controlling pests and diseases in the paddy crop using IPM techniques, an average yield of 54-55 quintals per hectare (q/ha) was recorded.	50	20.24	50
Integrated Nutrient Management in Wheat	INM in wheat, through the use of multiple nutrient sources, enhanced crop productivity compared to conventional practices, with farmers' field demonstrations recording average yields of 61–62 q/ha.	35	14.17	35
Integrated Weed Management in Wheat	Through integrated weed management practices in wheat, including control measures for *Phalaris minor* and other weeds, an average yield of 61.5-62.5 q/ha was achieved.	35	14.17	35

Demonstrationof Integrated Pest Management in Paddy crop variety (PB-1692)

Technology	Results of the demonstration	No of Demonstration	Area Covered (Ha)	No of Farmers involved
Varietal Trial of Wheat Cultivation for higher productivity	The average yield and net return of wheat varieties are as follows: DBW-371 yielded 62.99 q/ha with a net return of ₹1,23,036.90 per hectare,	35	14.17	35
	Wheat variety (HD-3386 & HD-2967) was also introduced in 2025-26.	40	16.19	40
Crop diversification through Mustard	For crop diversification, demonstrations were conducted on mustard varieties, wherein the variety Radhika recorded a yield of 16.05 quintals per hectare (q/ha).	35	14.17	35
Wheat Seed Production	Seed production of the new wheat variety DBW-371 recorded an average yield of 62.98 q/ha at a price of ₹3,500 per quintal, reflecting a significant advancement in agricultural technology and breeding efforts.	10	4.04	10

Demonstration of Wheat crop variety (HD- 2967)

Demonstration of Wheat crop variety (DBW-371)

Demonstrationof Mustard crop variety (Radhika)

Wheat Seed for Demonstration

Technology	Results of the demonstration	No of Demons-tration	Area Covered (Ha)	No of Farmers involved
Control of ecto & endo parasitic infestation among dairy animals. Cow, buffalo Goat and Sheep covered among the FFP villages	Continuous ecto- and endo-parasite control in the adopted villages effectively reduced parasitic load, improved overall animal health, and led to an increase of 200-300 ml milk per milch animal per day, along with a noticeable improvement in body condition score.	1543	1543	287
Demonstrations on estrus detection in buffaloes through saliva scope	Silent heat was identified as the major reproductive disorder in buffaloes, highlighting the need for improved estrus detection technologies. A Satisfaction Index indicated that 66.00% of respondents were satisfied with the technology, with relative cost being the highest-rated factor for its acceptance. The ADOPT software predicted a 94.00% peak adoption of the Saliva Scope within 11 years.	200	200	180
Tympany / Bloat, 172 animals like cow, buffalo, goats and sheep was treated.	Supplementation of Him Bloat to animals effectively managed tympany (bloat) caused by excessive feed intake or foreign material, achieving up to 80% recovery by reducing gas accumulation, relieving bloating, and improving rumen health.	87	87	67
Assessment of minerals and vitamin supplementation on production and reproduction performance in cows and Buffaloes	Most farmers reported positive outcomes from the intervention: 72.22% observed improved animal health, 85.45% noted better reproductive efficiency, and 96.51% reported increased milk yield. However, 3.50% observed no noticeable change, while 9.55% did not prioritize animal rearing and focused mainly on crop farming.	236	236	194

Technology	Results of the demonstration	No of Demons-tration	Area Covered (Ha)	No of Farmers involved
Poly Herbal Feed Supplement (Karan Pashu Amrit) on productive performance of dairy animals	**Lactating buffalo:** The average treatment effect of KPA showed a slight increase in milk yield, fat, and SNF content in the experimental group compared to the control, though these differences were not statistically significant (P > 0.05). A noticeable reduction in somatic cell count (SCC) was observed in the treated group, indicating improved udder health; while not statistically significant, the magnitude suggests a biologically meaningful positive effect of KPA supplementation. **Lactating crossbred cattle:** In crossbred cattle, KPA treatment showed a slight numerical decline in milk yield compared to the control group, with all changes being statistically non-significant (P > 0.05). However, a noticeable reduction in somatic cell count (SCC) was observed in the experimental group, indicating improved udder health and a potential beneficial effect of KPA on mammary health.	60	60	60
Animal Health Camp and Field Monitoring Visits	A total number of 10 animal health camps were organized. A total number of 42 field monitoring visits were conducted.	10 42	All villages	473 1026
Milk Processing	A successful entrepreneurial dairy processing unit, VIREN DAIRY, has been established in Samora village. The unit processes about 450 litres of milk per day and produces value-added products such as dahi, paneer, ghee, and khoa, generating a net monthly income of ₹95,000 with a benefit ratio of 13.92%, demonstrating strong profitability within the farming community.	10	-	10

Animal health camps organized under the Farmer FIRST programme

Technology	Results of the demonstration	No of Demonstration	Area Covered (Ha)	No of Farmers involved
Introduction of fruit and vegetable cultivation as nutritional gardens	Under the horticulture intervention, fruit saplings were planted in FFP villages for backyard kitchen gardening–Mango Amarpali (800), Mango Mallika (200), Lemon (400), and Guava (200).	82	0.20	82
	Three vegetable interventions—Palak (All Green), Pea (Pusa Prabal), and Fenugreek (PEB)—were evaluated. Palak (All Green) recorded an average yield of 88.92 q/ha with a net return of ₹58,045/ha, Pea (Pusa Prabal) yielded 111.15 q/ha with a net return of ₹1,53,140/ha, while Fenugreek (PEB) produced 74.10 q/ha with a net return of ₹43,966/ha.	3	0.60	3

Demonstration of Pea variety (Pusa Parbal)

Demonstration of fenugreek variety (PEB)

Demonstration of Palak variety (All Green)

Demonstration of high yielding Guava

Technology	Results of the demonstration	No of Demonstration	Area Covered (Ha)	No of Farmers involved
Integrated Farming for Sustainable Income and employment	After the Farmer FIRST Programme (FFP) intervention, studies showed that implementing IFS led to a 21.49% increase in net returns while also generating additional employment for rural communities.	28	11.33	28

Kisan Sangosthi

Twenty-four Kisan Sangosthies were organized at village level and following topics were discussed in detail:-

1. Awareness on ecto-parasite infestation
2. Balanced feeding of dairy animals
3. Clean milk production practices
4. Cutting management in fodder crops
5. Importance of animal deworming
6. Importance of regular vaccination of dairy animals
7. Management of inter-calving period in dairy animals

Kisan Sangosthi and Animal Health Camp at Rajasthan

8. Management of Reproductive problems in dairy animals
9. Preparation of value added milk products
10. Preventive measure for mastitis control
11. Role of mineral mixture in animal diet
12. Round the year green fodder production
13. Silage preparation

Question/Answer sessions were also arranged in these sessions which provided excellent opportunities to the farmers and explained the solutions to their day-to-day problems and also collected the feedback on the extension programmes.

Climate Resilient Dairy Farm School

Two climate resilient dairy farm schools were developed during 2025 to improve climate resilience of the smallholder dairy production system. First climate resilient dairy farm school was established in Padha village of the Munak block of Karnal district, Hayana and 35 women dairy farmers were enrolled in this school. Second school was established in the Bhelura Ram Pur Village of Patna district, Bihar. Twenty five smallholder dairy farmers were enrolled in this school.

Climate Resilient Dairy Farm School at Bhelura Ram Pur Village of Patna district, Bihar

Agro-Advisories

The SMS advisories for crops, animal husbandry, weather, and dairy farming have significantly benefited farmers by saving costs, reducing risks, and optimizing practices. During the period, 1,70,364 messages in Hindi and English have been sent, including event invitations. Farmers have shown strong interest and positive feedback, and the SMS portal effectively supports the dissemination of seasonal technologies and interventions.

Table. Extension programme organized by the Dairy Extension Division, ICAR-NDRI, Karnal

Event	No of Event conducted	Participation			
		Farmers	Public Leaders/VIPs	Others	Total
Kisan Sanghosties	6	154	5	4	163
Animal Health Camps	27	804	4	6	841
Crop Health Camps	1	72	3	2	78
Field Visits Organised	25	520	3	7	555
Institute Visits	5	139	-	3	147
Exposure Visits	5	86	-	4	95

Educational Visit and Tour

Sl. No.	Particulars	Jan- Mar 2025	April-June 2025	July-Sep 2025	Oct-Dec 2025	Total
1	Number of Institutions/ organization/Colleges	113	42	82	78	315
2	Boy students	4218	1204	2902	3266	11590
3	Girl students	4186	1031	1706	3084	10007
4	Male faculty	237	64	152	182	635
5	Female Faculty	224	62	118	106	510
6	Total visitors	8865	3261	4878	6638	23642

Vikasit Krishi Sankalp Abhiyan

Vikasit Krishi Sankalp Abhiyan was organized Under the leadership of Dr. Dheer Singh, Director, NDRI and Nodal officer of Haryana State. For successful implementation of VKSA we have made 782 teams of ICAR scientists working in Haryana and conducted farmer-scientist dialogues in 2403 cluster villages in 22 districts of Haryana, in which 323716 farmers have actively participated. Each team of VKSA comprising 3 scientists, 2 KVK SMS and 3 officials of line department of Haryana government. During the VKSA scientists, Expert explained the package of practices of kharif crops, dairy animal, soil health, Govt. schemes, etc. While organizing the various farmer-scientist dialogues the concerned team noted down the farmers' problems, feedback, innovations, ITKs related to farming and allied sectors.

Common Issues/Grievances reported during the Abhiyan

Category	Issues Reported
Government Schemes	• Not working properly (frequent). • Delay in subsidies. • Implementation gap. • Awareness lacking. • unsatisfied with soil health cards,
Animal Husbandry	• Repeat breeding problem. • Need for qualified veterinary doctors at village level • Lack of quality semen (Sahiwal, Gir, etc.) • Insurance needs. • Health management gaps.
Marketing	• Faulty procedure in grain market for deciding the value of farmers produce. • Milk adulteration (milk & paneer). • Middlemen problems. • Call for direct selling, apps, FPOs.
Agricultural Inputs	• Non-availability of quality seed and fertilizer, • Adulteration in pesticides and herbicides, and different brads having different prices which are too high. • Authentic seed issues. • Saline soil. • Chemical inefficacy (e.g., wheat residue decomposition).
Youth & Training	• Youth not interested in farming. • Need for more trainings (Scientific dairy farming, entrepreneurship). • Interest in ICAR courses.

The feedback of stakeholders

Particulars	Information
Farmers	Increased awareness: Farmers gained knowledge in government schemes, CRM, horticulture, aquaculture, dairy health, natural farming, DSR, and more. Enthusiastic participation: Regular requests for more frequent programs—ideally every six months. Openness to innovation: Interest in modern farming tools, scientific buffalo/dairy practices, natural farming models, and field demonstrations.
Scientist	Conduct biannual awareness sessions in every village. Deploy extension teams or mobile vans for soil/water sampling and follow-up. Schedule exposure visits to research institutions and universities. Introduce weed & pest management protocols suitable for DSR. Facilitate availability of DSR machines, residue incorporators, mulchers, seeders. Promote natural farming with yield buffer via trial demonstrations.
Extension personnel	Establish veterinary clinics at block/village level. Provide training for paravets and scientifically trained AI technicians. Ensure qualified veterinarian visits, stocking AI semen, mineral mixtures, vaccines. Monitor and research causes of mastitis and repeat breeding, including claims linked to 5G or effluents.
Significant outcomes	High satisfaction: Widespread appreciation for the Vikshit Krishi Sankalp Abhiyan and the opportunities to interact with experts.

Viksit Krishi Sankalp Abhiyan organized by ICAR-NDRI, Karnal

Dr. Dheer Singh, Director, ICAR–NDRI, interacting with farmers in a village as part of the Viksit Krishi Sankalp Abhiyan held from May 29 to June 12, 2025

SOUTHERN REGIONAL STATION, BENGALURU

Advisory services

Advisory services were rendered to seventy-four clienteles, comprising progressive farmers and entrepreneurs, most through digital media, phone, mail enquiries and on personal visits. The profile of the advisory services comprised, technical information on quality milk production, dairy start-ups, dairy animal housing, training programme on dairy farming, dairy profile and information on management of dairy cows, dairy farming business modules, indigenous dairy cows, milk products for dairy business, improved fodder varieties.

Exposure visit/Training programme

- A total of 130 students and 30 farmers visited the campus for exposure visit.
- Under ATMA programme a total of 180 farmers from Tamil Nadu and 30 farmers from Karnataka visited to the campus and underwent one- day training cum exposure programme on Scientific Dairy Cattle Management on March 19th - 20th 2025.
- A total of 368 students from different educational institutions made exposure visit to the campus for the technical knowhow on dairying and milk processing.
- An Exposure cum One Day Training Programme on Scientific Dairy Management, organised for 157 (105 male and 52 female) farmer trainees in 8 batches comprising farmers, farmwomen and farm youth from Tamil Nadu State, viz. Tiruvannamalai, Ramanathapuram, Erode, Pudukottai and Vellore districts, under 'Support to State Extension Programmes for Extension Reforms' (SSEPERS) under Agricultural Technology Management Agency (ATMA) scheme. Exposure visit to 129 students (47 male and 82 female) was organized on scientific dairy farming and milk processing.
- A total of 467 Dairy farmers trainees from Tamil Nadu, visited SRS, NDRI for one day exposure visit and training under ATMA programme.
- A total of 317 Students from various educations institutions of Southern India visited SRS NDRI during one-day exposure visit.
- On-farm interactive sessions organised, in the Farmer First Adopted Village, Hosadurga, focused on balanced feeding of dairy cows for addressing infertility problems, mastitis management, dairy animal health care and clean milk production, for 30 beneficiaries, comprising farmers, farmwomen and farm youth participated in the programme.

Exposure visit and training on dairy farming practices at Southern Regional Station (SRS) of ICAR-NDRI, Bengaluru

Exhibition participation

- Participated in the National Horticultural Fair 2025, held from February 27th, 2025 to March 1st, 2025 at ICAR: IIHR, Hesaraghatta, Bengaluru, organized by ICAR-IIHR, in collaboration with the Society for Promotion of Horticulture (SPH) and BESST- HORT, a Technology Business Incubator of ICAR-IIHR, with the theme of focus for Viksit Bharat: Nutrition, Empowerment and Livelihood.
- Participated in Exhibition organized at ICAR-IIHR on September 9th 2025 as part of VKSA programme during the visit of Honourable Agricultural Minister, MoA&FW. Participated in the Krishi Mela 2025 organised by University of Agricultural Sciences,

at GKVK Campus, Bangalore from November 13th to 17th, 2025. NDRI Stall depicted key focus areas of improved green fodder production, indigenous breeds of Southern region, quality milk production and profile of milk products of SRS, to benefit the visiting farming community.

Animal health care & management programmes

Under Farmer FIRST Collaborative Project of ICAR-IIHR &SRS-NDRI, Dairy Animal Health & Infertility Camp and Farmers' Interactive Session, was organised in two project villages, Hosadurga and Vasappana Doddi in Kanakapura Hobli of Ramnagara Taluk during the period 2025, for the health care of the dairy cattle, for the benefit of the target beneficiary of the farm families. The animals attended in the health camp included, 98 Crossbred HF Dairy Cattle and 97 sheep/goat, with participation profile of 44 beneficiaries. The problem profile included, Malnutrition, Silent Heat, Anorexia, Repeat Breeding and Mastitis. Corrective measures comprised mineral mixture supplements, deworming and curative medicines for the healthcare of the dairy cattle, to benefit beneficiary farm families of the adopted villages.

During the period, various technical inputs were distributed to beneficiary-SC farmers in the adopted villages of Kolar District, Karnataka State, under DAPSC project. Under TSP programme, at Pingyanalli and Husenpura Villages, Chintamani Taluk, Chikkaballapura District of Karnataka District, in coordination with KOCHIMUL (Kolar-Chikkaballapura Milk Union) of Karnataka Milk Federation, on-farm programmes were organised and farmers were provided with critical inputs, improved hybrid fodder crop seeds viz., Sorghum CoFs-31and mineral mixture supplements to enhance their animal productivity and income from livestock farming. Dairy Cattle Health cum Infertility Camp was organized in collaboration with KMF officials for the benefit of SC farmers in the adopted villages of Kolar District under SCSP funded IRC project. The institute interventions included distribution of Fodder Seeds-CoFS-31, Vermi compost, Stem cuttings and training kits which benefitted, 800 SC Farmers with 2800 dairy cattle and 121 ST farmers with 185 dairy cattle; Clean Milk Production Kits – Pre & Post Teat Dip Cups & Pre and Post Dip Solutions were provided to 50 SC farmers beneficiaries for dairy cattle health care of 70 animals; Training kits were distributed to 1000 dairy farmers during the period under report.

On-campus training programme organized

- A training programmes on 'Good Dairy Management Practices' were organised for the farmers of Southern States, Karnataka, Tamil Nadu and Kerala in coordination with the State Milk Federation and State Departments of Agriculture & Animal Husbandry, for the benefit of 1061 farmers / farmwomen / farm youth.
- Under the SCSP program, the Farmers Training program on 'Scientific Dairying and Value Addition to Milk' was organized at SRS of ICAR-NDRI. The on-campus training program was attended by 911 dairy farmers / farm women, belonging to the SC community from Karnataka and Tamil Nadu States. The dairy farmers were sensitized on various aspects of scientific dairy farming practices including scientific breeding & reproduction management, balanced feeding, silage making, green fodder cultivation practices and health management besides value addition to milk and milk products and also about quality milk production practices to be adopted at farm level.

Activities carried out under Tribal Sub Plan Programme in West Bengal by ERS of ICAR-NDRI, Kalyani

EASTERN REGIONAL STATION, KALYANI

Outreach activities carried out under TSP

The Tribal Sub-Plan project implemented in 2025 adopted an integrated crop–livestock approach to strengthen livelihood security among farming households in West Bengal. Through coordinated input distribution, frontline demonstrations and targeted training, the initiative promoted diversification, resilience and sustainable practices.

Table. Outreach activities carried out by ERS of ICAR-NDRI, Kalyani under Tribal Sub-Plan Project (TSP)

Activity	Details	Coverage/Output
Input distribution camps	Conducted across Birbhum, 24 Parganas (N), East Burdwan, Bankura, and Nadia district of West Bengal	47 camps benefitting 4,316 tribal farmers
Frontline demonstrations	FLSs were conducted in pointed gourd, maize fodder, sorghum, oats, okra, ridge gourd, chilli, bitter gourd, black gram, paddy, mustard	Varietal replacement, improved cropping intensity, food–fodder–cash crop integration
Planting material & inputs	A total of 8,000 pointed gourd cuttings, 710 fodder cuttings, 300 jackfruit saplings, 27.464 tonnes of seeds, 47.557 tonnes of fertilizers, 225 liters of liquid fertilizer, and 223.9 kg of micronutrients were distributed among tribal farmers.	Enabled showcasing scientific farming practices in the tribal areas
Livestock support	Total 7,000 chicks, 6,300 ducklings, 101 goats, 28.70 tonnes animal feed, 1,333 kg mineral mixture, 615 feeders, 465 drinkers, 662 buckets, 529 tumblers were distributed to tribal farmers	Strengthened animal husbandry efficiency & hygiene among tribal farm families
Animal health services	Total 323 veterinary medicine kits were distributed and 15 health camps were organised	8,308 livestock treated/vaccinated, reducing disease incidence
Post-harvest & tools	Total 302 milk cans, 153 gumboots, small agri-tools were distributed among tribal farmers	Improved product quality, safety, reduced drudgery

Activities carried out under Tribal Sub Plan (TSP) Programme in West Bengal

Outreach activities carried out under North Eastern Hill (NEH) project

Under the NEH project in 2025, integrated extension interventions and livestock input distribution programmes were systematically implemented across the North Eastern Region, combining input support, farmer–scientist interactions and capacity-building efforts to strengthen productivity, resilience and livelihood security of smallholder farmers.

Table. Outreach activities carried out by ERS of ICAR-NDRI, Kalyani under North Eastern Hill (NEH) programme

Activity	Details	Coverage/Output
Extension Camps	Conducted in Tripura (3), Assam (3), Manipur (1), Nagaland (1), Arunachal Pradesh (1). Integrated packages included input support, capacity building and technical backstopping	9 camps across 5 states; 864 farmers benefitted (394 Assam, 286 Tripura, 78 Manipur, 56 Nagaland, 50 Arunachal Pradesh)
Farmer–Scientist Interactions	Structured sessions documented field problems in feeding, breeding, housing, health management and market linkages	Problems addressed and solutions refined for all participating farmers
Livestock distribution	16,850 chicks, 2,800 ducks, 94 piglets distributed	Distribution of chicks, ducks, and piglets to diversify species composition and promote backyard poultry/piggery
Feed Supply	14,830 kg poultry feed, 11,020 kg duck feed, 17,450 kg pig feed, 2,270 kg goat feed, 2,400 kg cattle feed supplied	Balanced nutrition ensured through nutritional demonstrations under farmer field conditions
Housing & Hygiene Support	662 feeders & drinkers, 662 kg mineral mixture, 296 veterinary medicine kits, 108 buckets distributed	Strengthened scientific housing and feeding practices; improved hygiene and disease prevention

Activities carried out under NEH project in different states of north eastern region by ERS of ICAR-NDRI, Kalyani

Capacity development activities

The capacity-building programmes conducted by ERS of ICAR-NDRI in 2025 reflected a commitment to empowering farmers and rural communities through scientific training. Each initiative was carefully designed to address region-specific needs, combining classroom instruction with hands-on demonstrations and exposure visits.

Table. Training programmes conducted by the ERS of ICAR-NDRI, Kalyani in 2025

Programme	Duration	Participants	Focus Areas
Scientific Dairy Farming	3 days (Mar 4–6)	50 tribal farmers (Birbhum & Nadia) + 25 non-tribal trainees (NABARD project)	Breeding, balanced feeding, animal health, sustainable dairy practices
Scientific Animal Husbandry	5 days (May 19–23)	24 male farmers (Seraikela-Kharsawan, Jharkhand)	Breeding, feeding, healthcare, livestock management, exposure visits
Kid Nursery & Goat Farming (ITC)	5 days (May 26–30)	23 female farmers (Hooghly & Howrah, WB)	Kid management, feeding, healthcare, housing, entrepreneurship, marketing
Artificial Insemination & Vet First Aid	32 days (Jun 17–Jul 18)	23 participants (incl. 6 women nominated by ARD Dept. WB)	Semen handling, AI technique, first aid, herd health management
Kid Nursery & Goat Farming (ITC)	5 days (Aug 4–8)	12 participants (10 women, 2 men from Kamrup, Assam)	Kid survival, herd productivity, sustainable goat farming
Refresher Training for NGO Staff	2 days (Aug 26–27)	11 staff (7 male, 4 female from Asansol Burdwan Seva Kendra)	Dairy & livestock management, breeding, feeding, healthcare
Lakhimi Cattle Rearing (Assam)	7 days (Sep 15–21)	14 farmers (from Darrang, Assam)	Indigenous cattle management, milk production, sustainable animal husbandry

Capacity building Activities of ERS of ICAR-NDRI, Kalyani

Capacity development activities

Table. Training programme organized for tribal farmers

Date	Training title	Participant	Male	Female
March 4 - 6, 2025	Scientific Animal husbandry (Funded by NABARD)	25	2	23
March 4 - 6, 2025	Course on scientific Animal husbandry for Tribal unemployed youth '	50	6	44
May19 - 23, 2025	Scientific Animal Husbandry Training program for Farmers from Seraikela-Kharsawan District of Jharkhand	24	24	0
May 26 - 30, 2025	Course on Kid Nursery & Scientific Goat Farming Practices (Funded by ITC)	23	0	23
June 17 - July 18, 2025	Artificial Insemination & veterinary first Aid	23	17	6
August 4 - 8, 2025	Course on Kid Nursery & Scientific Goat Farming Practices (Funded by ITC)	12	2	10
August 26 - 27, 2025	Refresher Training of 'Scientific Animal Husbandry'	11	7	4
September 15 -21, 2025	Scientific Animal husbandry focusing on Rearing Lakhimi cattle for Farmers from Assam	14	14	0

Participation in Agricultural Fairs

ERS of ICAR-NDRI showcases innovations at National Natural Fibre Festival 2025

The ERS of ICAR-NDRI participated in the National Natural Fibre Festival (NNFF 2025), held at ICAR-NINFET, Kolkata, from January 2nd- 4th, 2025. The ERS stall showcased key innovations, including location specific mineral mixture formulation, goat kid milk replacer, and sustainable animal husbandry practices, highlighting their role in improving livestock health and productivity while supporting eco-friendly agriculture. Honorable Shri Giriraj Singhji, Minister of Textiles, visited the stall on January 3rd, 2025, and commended ICAR-NDRI's contributions to promoting sustainable livestock management that complements the natural fiber value chain. The event provided a platform for fostering synergies between dairy and textile sectors, emphasizing the integration of sustainable practices for enhanced rural development and environmental conservation.

Enhancing livestock health and awareness: Animal health camp by ICAR-NDRI in Alukaranbarh

On January 8th, 2025, the Eastern Regional Station of ICAR-NDRI organized an animal health camp as part of a rural exhibition in Alukaranbarh village, East Midnapur district, West Bengal. This initiative aimed to address the health and management needs of livestock while fostering awareness among the rural farming community. A multidisciplinary team of scientists and support staff provided a range of essential veterinary services, including vaccination, deworming, and health check-ups for various livestock species. The camp also served as a platform to disseminate knowledge about modern animal husbandry practices, disease prevention, and the importance of maintaining proper nutrition and hygiene for livestock.

Showcasing dairy innovations at the Eastern Zone Regional Agricultural Fair 2024–25

As part of its outreach and technology dissemination initiatives, the Eastern Regional Station (ERS) of ICAR-NDRI participated in the Eastern Zone Regional Agricultural Fair 2024–25 held at ICAR-CRRI, Cuttack, from February 27th to March 1st, 2025. An exhibition stall was set up to showcase the institute's innovative dairy and agricultural technologies. The stall attracted a wide range of stakeholders, including farmers, researchers, and extension personnel. It served as an effective platform for interaction, knowledge sharing, and promotion of region-specific technologies, generating significant interest and discussions on their applicability and benefits for sustainable development in the eastern region.


Shri Giriraj Singh, Honorable Minister of Textile, Govt. of India is showing keen interest of demonstrated technologies of ERS of ICAR-NDRI

Participation of ERS of ICAR-NDRI in different Exhibition

KRISHI VIGYAN KENDRA, ICAR-NDRI, KARNAL

During the year, KVK, ICAR-NDRI, Karnal has conducted following Front Line Demonstrations (FLDs) and Cluster Front Line Demonstrations (CFLDs) at farmers' fields to establish the production potential of technologies developed by National Agricultural Research Systems (NARS).

Front Line Demonstrations (FLDs)

FLD 1: Popularization of CIFA Carp Starter Feed in Nursery rearing of carps

Technology Details:

- Carp Starter Feed: A floating feed for carp (Moisture:8-10%, Crude protein:30-34%, Crude fat: 5-6%, Crude fibre:4-5%

Treatment:

- T_1: Carp Starter Feed 5-10% of body wt and total length (for 45 days)
- T_2: Farmer practice (Mustard oil cake and rice bran feeding for 45 days)

Front Line Demonstration (FLD) on carp starter feed at Kamalpura village, Karnal

Table. Comparison of CIFA carp starter feed at the farmers' field

Parameters/ Performances	Demonstration (CIFA Carp Starter feed)	Farmers Practice (Mustard oil cake and Rice bran)
Avg. Body length (cm)	14.85	10.46
Avg. Survival rate (%)	44%	31.5%
Gross Cost (₹)	22400	14400
Gross Return (₹)	88300	42100
Net Return (₹)	65900	27700
BCR	2.94	1.92

Feedback from farmers:

- Carp fry growth and survival rate is significantly high compare to traditional practice
- Farmers requested that the price of carp starter feed be reduced and

Cluster Front Line Demonstrations (CFLDs)

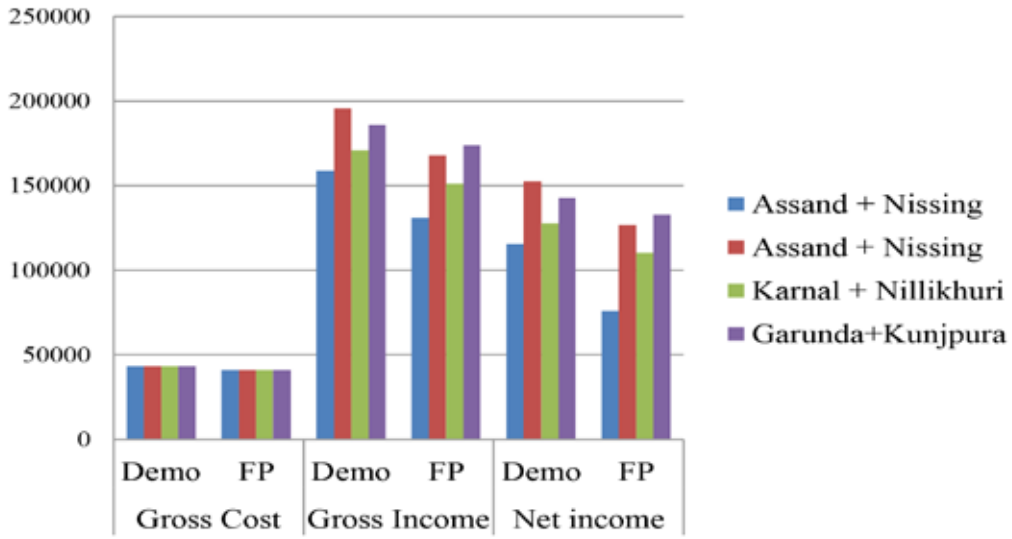
CFLD 1: Cluster Front Line Demonstrations- Oilseeds Crop Mustard [CSSRI, Karnal (CS-60) & DRMR, Bharatpur (Radhika)]

Table. Coverage of cluster front line demonstrations on oilseeds, crop mustard

Crop	Thematic area	Variety	Season and year	Area (ha)		No. of farmers/ demonstration		
				Proposed	Actual	SC/ST	Others	Total
Mustard	Crop diversification	Radhika and CS-60 (DRMR-2017-15)	Rabi 2024-25	100	100	30	135	165

Table. Performance of the cluster front line demonstrations on oilseeds crop

Crop Mustard	Improved Variety (Demon-stration)	Farmers Practice (FP)	Area (ha)		Gross Cost		Gross Income Grain		Gross Income Straw		Gross Income		Net income		BC Ratio	
	Demo	FP	Demo	FP	Demo	FP	Demo	FP	Demo	FP	Demo	FP	Demo	FP	Demo	FP
Assandh + Nissing	CS-60	Local Variety (CS-61)	13.76	13.76	40210	38175	154700	128520	11700	9720	166400	138240	126190	100065	4.13	3.62
Assandh + Nissing	Radhika	Local Variety	51.82	51.82	40210	38175	166600	148750	10200	9300	176800	158050	136590	119875	4.39	4.14
Karnal + Nillikhuri	Radhika	Local Variety	18.21	18.21	40210	38175	146370	130900	9000	8190	155370	139090	115160	100915	3.86	3.64
Gharunda+ Kunjpura	Radhika	Local Variety	15.78	15.78	40210	38175	162435	143990	10237.5	8160	172672	152150	132462.5	113975	4.29	3.98



Economics of the cluster front line demonstrations on oilseeds crop-mustard (₹/ha)

Showing date: October 05th to November 15th, 2025

Source of technology: Radhika - DRMR, Bhartpur
CS-60 - CSSRI, Karnal

1. **Crop sequence:** Rice-Mustard
   Sorghum-Mustard
2. **Situation:** Irrigated
3. **Soil type:** Loam and Sandy Loam
   Organic Matter- 0.36 to 0.69 %
   Nitrogen- 115 to 193 kg/ha
   Phosphorus- 9 to 46 kg/ha
   Potassium - 126 to 456 kg/ha
4. **Weed flora:** *Chenopodium album, Chenopodium murale, Asphodelus tenuifolius*
5. **Diseases:** Alternaria Blight (*Alternaria brassicae*), White Rust (*Albugo candida*)
6. **Insect:** Aphid (*Lipaphis erysimi*)

Table. Comparison of cluster front line demonstrations on oilseeds crop-mustard

Particulars		Variety Radhika	Variety CS-60
Area	Ha	85.82	13.76
Demonstrations	No	148	17
Farmers	No	148	17
Technology/ Variety		DRMR 2017-15 (Radhika)	CS-60
Maximum Potential Yield	Q/ha	26-30	24-29 (Normal Soil)
Average Potential Yield	Q/ha	17.88	18-22 (Salt affected soil)
Yield (Q/ha)	Demo	28	26
Gross cost (₹/ha)	Demo	40210	38175
Gross Return (₹/ha) Grain (₹ 5620 /ha) and straw (₹300 /ha)	Demo	176800	138240
Net Return (₹/ha)	Demo	136590	100065
B: C Ratio	Demo	4.39	3.64
Feedback		1 Farmers appreciated the Mustard variety Radhika with excellent yield performance, BC ratio and negligible attack of Alternaria blight and white rust disease.	Farmers not interested this variety due to low yield. But this variety more suitable for yield salinity and alkali soil.
		2 M.S.P increased and payment of M.S.P be ensured to farmers.	M.S.P increased and payment of M.S.P be ensured to farmers.

Table. Technical Feedback on the demonstrated technologies

S. No.	Technical points recorded (Feed Back)
1	Mustard variety **Radhika** exhibited better performance.
2	Mustard variety **Radhika** was found Tolerant to Downy Mildew diseases in demonstrated practice than farmer practice

Table. Farmers' reactions on specific technologies

S. No.	Technical points recorded (Feed Back)
1	The farmers showed interest in fallow all parameters of crop i.e. Optimum seed rate and sowing depth, timely sowing, seed treatment, integrated pest management and integrated diseases management.
2	Farmers of the District Karnal were found less interested in growing Mustard crop because of unorganized marketing facilities, less sale price than MSP.

CFLD 2: Cluster Front Line Demonstrations – Pulses

Table. Cluster frontline demonstrations on summer Moong (HAU, Hisar)

Crop	Thematic area	Variety	Season and year	Area (ha)		No. of farmers/ demonstration		
				Proposed	Actual	SC/ST	Others	Total
Moong	Crop diversification	MH 1142	Summer 2025	20	20	10	40	50

Table. Performance of the cluster frontline demonstrations on summer moong

Crop / Enter-prise	Techno-logy demo	Demo Yield (Qt/Ha)			Yield of local Check (Qt/ Ha)	Demo Avg. Cost of Cultivn. (₹/Ha)	Check Avg. Cost of Cultivn. (₹/Ha)	Demo Avg. Gross Return (₹/Ha)	Check Avg. Gross Return (₹/Ha)	Demo Avg. Net Return (₹/Ha)	Check Avg. Net Return (₹/Ha)	Demo B:C Ratio	Check B:C Ratio
		H	L	A									
Summer Moong	MH-1142	1850	1070	960	650	28350	27240	83347.2	56433	54997.2	29193	2.93	2.71

Cluster Frontline Demonstration (CFLD) on Moong

CFLD 3: In-Situ Crop Residue Management Project

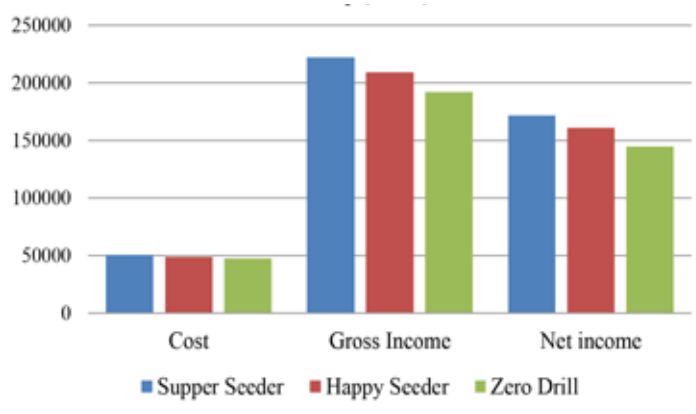
Demonstrations on the use of CRM machinery for paddy crop residue management in wheat crop

Table. Coverage of the crop residue management programme (CRM) machinery

S. No.	Village	Super Seeder Area (Acre)	Happy Seeder Area (Acre)	Zero Tillage Area (Acre)	Mulcher Area (Acre)	Total Area (Acre)	Total No. of Farmers
1.	Dachar	36	18	20	5	79	40
2.	Brass	12	5	10	5	32	15
3.	Nissing	44.5	20	10	5	79.5	35
Total		92.5	43	40	15	190.5	90

Table. Performance of the demonstrations on the use of CRM machinery for paddy crop residue management in wheat

Wheat (Var: DWH-1270)	Villages	Demo Area (ha)	Grain Yield (Q/ha)	Cost ₹/ ha	Gross Income Grain	Straw Yield (Q/h)	Gross Income Straw	Gross Income	Net income	B. C. Ratio
Supper Seeder	Dachar, Brass and Nissing	107.5	70	50320	169750	87.5	52500	222250	171930	4.41
Happy Seeder	Dachar, Brass and Nissing	43	66	48570	160050	82.5	49500	209550	160980	4.31
Zero Drill	Dachar, Brass and Nissing	40	60.5	47350	146712.5	75.62	45375	192087.5	144737.5	4.05



Economics of Wheat crop (₹/ha) under Crop Residue Management (CRM) machaneries

Demonstration of crop residue management at the farmers' field

Out Scaling of Natural Farming Project

Demonstration Programmes conducted on crops

Table. Performance of the demonstration on natural farming on wheat

Crop/ Variety	NF components/Technology applied/demonstrated	Area (ha)	Place (Village) Demo.	No. of Demonstration laid out under NF	Observations Recorded		
					Name of parameter	Performance	
						Without NF practice	With NF practice
Wheat C-306, DBW 303,, DBW 372,	Beejamrit, Jeevamrit, Neemastar, Deshparni	0.40	Vill- Tikri	8	Plant Height (inch)	44.5	42.0
		0.40	Vill- Bastada		Yield (q/ha)	26	13.5
		0.40	Vill- Gheer		Soil OC (%)	0.68	0.84
		0.40	Vill-Phurlak		Soil pH	7.92	7.7
		0.40 0.40 0.40	Vill-Kaimla Vill-Gagsina Vill-Kudakjageer		Soil EC (dSM)	0.52	0.44
					Soil Microbes (cfu)	-	-
		0.40	Vill- Aungadh		Any other (specify)	No incidence of MYMV	Incidence of MYMV and poor plant growth
		Total=	3.2				

Demonstration programmes conducted on vegetables

Table. Performance of the demonstration on natural farming on vegetables

Crop/Variety	NF components/ Technology applied/ demonstrated	Area (ha)	Place (Village/KVK) of OFT/FLD Demo.	No. of OFT/FLD Demonstration Laid out under NF	Observations Recorded		
					Name of parameter	Performance	
						Without NF practice	With NF practice
Turmeric and Vegetables (Variety-PB2)	Beejamrit, Jeevamrit, Neemastar, Deshparni	0.25	Vill-Bastara	Demonstration	Yield (q/ha)	260.0	220.0
					Soil OC (%)	0.54	0.65
					Soil pH	7.54	7.05
					Soil EC (dSM)	0.30	0.42
Cucurbits (Bottle gourd and Sponge Gourd), Methi, Coriander, Radish	Beejamrit, Jeevamrit, Neemastar, Deshparni	0.25	Vill-Tikri	Demonstration	Yield (q/ha)	160.0	110.0
					Soil OC (%)	0.49	0.61
					Soil pH	7.85	7.15
					Soil EC (dSM)	0.24	0.26

Table. Training programmes on natural farming

Name of NF Awareness programmes	Title topic	Venue of Programme	No of Programmes	No. of Participants
Out scaling of Natural Farming	Lectures, technical input preparation and demonstration	KVK campus	2	52

Table. Awareness programmes on natural farming

Name of NF Awareness programmes	Title topic	Venue of Programme	No of Programmes	No. of Participants
Out scaling of Natural Farming	Natural farming of vegetables crop	Village- Aungadh,	1	32
Out scaling of Natural Farming	Natural farming of pulse crops	Village- KVK	1	37
Out scaling of Natural Farming	Natural farming of Turmeric	Village- KVK	1	44
Total			3	113

Awareness programme on Natural Farming at KVK -NDRI

Capacity building programmes organized by KVK, ICAR-NDRI, Karnal

KVK provides strong training support to disseminate need-based and skill-oriented technology for various target groups for achieving a production breakthrough in Dairying, Agriculture and allied subjects. Need-based short and long-term trainings on various disciplines, viz. Dairy Production, Dairy Processing, Agriculture, Horticulture, Vermi-culture, Bee-keeping, Fish Farming and Home Science are being organized for farmers, farm-women, rural youth, in-service personnel and rural leaders. The training programmes organized and achievements made by KVK during January 2025 to December 2025 have been summarized in the table.

Table. Training programmes organized by KVK, ICAR-NDRI, Karnal in the year 2025

Title of the course	No of Trainings	No of Participants
Scientific Dairy Farming (Sponsored)	9	371
Scientific Dairy Farming	6	136
Dairy processing	5	113
Crop residue management	1	15
Fisheries production & management	3	65
Goat Farming	3	91
Home Science	2	36
Vermi-compost Production	3	88
Rural Youth (Bee keeping)	1	22
Total	**29**	**922**

Extension Activities of KVK, ICAR-NDRI, Karnal

- **QRT Visit:** The QRT team visited KVK on January 17, 2025, reviewed the last four years' progress, and provided suggestions for improving KVK performance.

- **Prabhat Pheri on Crop Residue Management:** Organized at Dabri village in collaboration with NSS, Dyal Singh College, Karnal on March 5, 2025. KVK experts demonstrated CRM methods and machinery, with participation of 50 students.

- **Poster Making Competition on Crop Residue Management**: Organized at Dyal Singh College, Karnal on March 18, 2025. A lecture on CRM machinery was delivered and 32 students participated.

- **Harvest Mela**: Conducted at Jundla village, Gharuanda block on March 11, 2025. Farmers were sensitized on mustard varieties Radhika and CS 60. A total of 15 farmers and farm women participated.

- **Visual Telecast of PM-Kisan Samman Nidhi Yojana**: Organized at KVK on February 09th, 2025 with participation of 50 farmers and KVK staff.

- **Foundation Stone Laying Ceremony**: The foundation stone for the training hall at KVK was laid by Dr. Himanshu Pathak, DG, ICAR on February 09, 2025 in the presence of the Director, ICAR-NDRI and VC, GBPAUT.

- **Live Telecast of Krishi Choupal**: Organized at KVK-NDRI, Karnal on March 08, 2025 with participation of 43 farmers.

- **National Dairy Mela and Agri Expo**: KVK Karnal participated in the three-day National Dairy Mela and Agri Expo held from February 27 to March 01 2025, and disseminated information on natural farming, fisheries, beekeeping, dairy farming, and crop residue management to farmers.

- **Kisan Sangoshthi:** Organized during the National Dairy Mela and Agri Expo, with participation of 120 farmers who interacted with experts on dairy farming.

- **D.D. Kisan Programme (Kisan Prashn Manch):** Organized at KVK Karnal on March 25, 2025. A quiz competition and expert interaction on crop and dairy management were conducted for 100 farmers.

- **Scientific Advisory Committee (SAC) Meeting 2024-25**: Held in hybrid mode at ICAR-NDRI, Karnal on May 15, 2025 under the chairmanship of Dr. Dheer Singh and Dr. J. P. Mishra. The Annual Report (2024-25) and Annual Action Plan (2025-26) were presented, with participation of 38 stakeholders.

- **Viksit Krishi Sankalp Abhiyan-2025:** KVK Karnal participated in the 15-day mass awareness campaign organized from May 29 to June 12, 2025. Four teams visited 12 villages daily, and KVK experts, scientists, and State Department officers interacted with 17,024 farmers.

- **Visual Telecast of Krishi Chaupal:** The 5th and 6th episodes were organized at KVK, NDRI on April 12 and May 10, 2025 on Makhana and Mango production, with participation of 81 and 26 farmers, respectively.

- **Kisan Chaupal**: Organized at Mannath Palace, Indri on May 06, 2025 in collaboration with the State Department of Horticulture and FPO Nilokheri, where experts from various organizations addressed 350 farmers.

- **Fish Seed Production**: During the monsoon season, IMCs (Catla, Rohu and Mrigal) and Grass carp seed were produced through induced breeding at the Fish Production Unit, KVK. A total of 5.38 lakh fish seed were sold to farmers during July–September.

- **Fish Farmers Day**: Organized on July 10, 2025, featuring farmer-scientist interaction on induced fish breeding. Mr. Pradeep A highlighted the pioneering contributions of Dr. Hiralal Chaudhuri and Dr. K. H. Alikunhi. A total of 35 participants attended.

- **DD Kisan 'Chaupal Charcha'**: DD Kisan Channel recorded Chaupal Charcha at KVK-NDRI, Karnal on July 18, 2025 on Natural and Integrated Farming. The episode featured expert inputs and farmers' experiences, and was telecast on July 21, 2025.

- **Joint Diagnostic Field Visit:** A joint team of experts conducted field visits and interacted with farmers in villages across Karnal district to assess field conditions and provide technical guidance.

- **20th Instalment Release of PM-Kisan Samman Nidhi Yojana**: The visual telecast of the programme was organized at KVK on August 2, 2025, with participation of 1,100 farmers and stakeholders.

- **Scientist–Farmers' Interaction Meet**: Organized at Rambha village on August 7, 2025 on the occasion of World Breastfeeding Week. Dr. Sonia and Dr. Priyanka highlighted the importance of breastfeeding and nutrition among 50 pregnant and lactating women.

- **Visual Telecast of Krishi Chaupal**: Organized at KVK on August 9, 2025 on vegetable cultivation and management, with participation of 21 farmers.

- **Field Experience Training for FOCARS Probationers:** Organized for six FOCARS 114th batch probationers of ICAR-NAARM, Hyderabad from August 11 to September 12, 2025 under the coordination of Dr. V.K. Meena and Dr. Sonia.

- **Parthenium Awareness Week**: Organized from August 16 – 22, 2025 to create awareness on Parthenium management and undertake cleanliness drives at KVK and Farm Section premises.

- **RAWE Training Programme**: Twenty-four students of Galgotias University were trained under the RAWE programme at KVK-NDRI, Karnal from Sept. 1 to October 12, 2025 under the coordination of Dr. V.K. Meena, Dr. Sonia and Mr. Pradeep A.

- **Swachhta Hi Seva**: Organized from September 17th to October 2, 2025, involving cleanliness drives at KVK and NDRI Primary School along with awareness activities.

- **District Level Workshop**: Participated in the District Level Workshop on DSR and Vegetable Cluster Project at Sangoha village on September 24, 2025, where Dr. P. K. Saraswat addressed 60 participants on the importance of soil microbial diversity for sustainable agriculture.

- **Live Telecast of PM Dhan-Dhanya Krishi Yojana and Pulse Self-Reliance Mission**: Organized on October 11, 2025, highlighting self-reliance in pulses and sustainable agriculture, with participation of about 640 farmers and stakeholders.

- **Crop Residue Management (CRM) Programme**: Under the CRM programme, field days, field visits and awareness programmes were conducted across villages of Karnal district during November–December 2025, benefiting a total of 332 farmers.

- **Fisheries FLD Programme**: Field visits, a Fisheries Field Day and a World Fisheries Day awareness programme were organized during October–November 2025, benefiting 67 farmers.

- **Annual Zonal Workshop**: KVK, Karnal participated in the Annual Zonal Workshop held at Udaipur from November 12 -14, 2025. Dr. P. K. Saraswat presented the Annual Report (2024-25), and recommendations were received for strengthening KVK activities and programme implementation.

- **Women-Focused Awareness Programme**: An awareness programme on kitchen gardening, natural farming and small-scale dairy farming was organized at Gondar village on December 16, 2025, with participation of 25 SC women farmers.

- **Kisan Sangoshthi-cum-Exhibition**: The Head, KVK Karnal participated in the programme organized by ICAR-NDRI at Bhagwantpura village, Madhya Pradesh from December 12 –15, 2025, promoting scientific animal husbandry practices among about 2,400 farmers.

- **Live Telecast of PM-Kisan Samman Nidhi Programme**: Organized at KVK Karnal on November 19, 2025, highlighting natural and chemical-free farming practices, with participation of about 670 farmers and stakeholders.

- **National Farmers' Day**: Organized at ICAR-NDRI, Karnal on December 23, 2025, with participation of about 390 farmers and stakeholders. Progressive farmers were felicitated for their innovative and sustainable agricultural practices.

Table. Extension programme/activities of KVK, ICAR-NDRI, Karnal

S. No.	Activity	Number
1	Field day	5
2	Kisan Ghosthi	4
3	Exhibition	6
4	Film Show	0
5	Method Demonstrations	17
6	Group meetings	7
7	Newspaper coverage	76
8	Radio talks /TV talks	6
9	Literature/ articles	16
10	Scientists visit to farmers field	31
11	Farmers visit to KVK	6831
12	Scientist farmers interactions	38
13	Soil/Water samples analysed	30
	Total	**7067**

Performance of Crop Demonstration Unit of KVK

Seed and other bio-products produced at KVK

This KVK is maintaining live demonstration units in fish farming, bee keeping, vermi-culture, horticulture and crop production for imparting practical training for skill development, demonstration of technologies and production of quality seed material of latest varieties for sale to farmers. The products from these units particularly seed are being sold through ATIC to farmers. The performance of instructional farm (Crops production) including seed production during the year 2025 is given in the following table.

Table. Seed production and sale from KVK, ICAR-NDRI, Karnal

Crop	Variety	Area (acre)	Total seed produced (Q)	Sale (₹)
Rice (Grain)	BB-1692	2	19.5	2,08,500
	PB-1509	3	20	2,00,000
	PB-1885	2	13.80	1,38,000
	PR-114	4	46.6	2,79,600
	PR-126	4	34.5	2,07,800
Wheat (Seed) NF	L-306	1	6	21,000
Wheat (Grain)	DBW-327	8	197	8,86,500
	DBW-371	6	129	4,99,438
	DBW-372	6	152	6,56,425
Oats (Seed)	OL-14	1	4	27,600
Barseem (Seed)	BL-44	1	4.48	1,56,800
			Total	**32,81,600**

Table. Income augmentation activities (Revolving Fund) of KVK, ICAR-NDRI, Karnal

S. No.	Source	Total Income (₹)
1	Seed and crop Production	32,81,600
2	Auction of Amla and Lemon	1,00,000
3	Fish Unit	2,07,295
4	Vermicompost	24,350
5	Kisan Bhavan	7,08,372
6	Training programme	3,49,964
7	Bee Keeping	30,800
8	Fodder Supply to LRC	17,56,740
9	**Total revenue in 2025 (₹)**	**64,59,121**

Exposure Visits Cum Short Training Programmes

KVK being located in National Institute for Dairying and having live demonstration units that attracts the attention of various State governments, NABARD and NGOs which send various groups of farmers, farm women and youth on exposure and study visits to KVK. In total 47 visits were organized in which 1670 number of farmers and farm women participated across the nation.

Table. Numbers of visitors from different states of India visited KVK, ICAR-NDRI, Karnal

State	Participants
Uttar Pradesh	570
Delhi	122
Rajasthan	455
Punjab	30
Himachal Pradesh	264
Haryana	100
Madhya Pradesh	67
Jharkhand	23
Bihar	19
Maharashtra	20
Total	**1670**

Linkage of KVK, ICAR-NDRI, Karnal with Different Organizations

During the year 2025, KVK maintained strong linkage with line departments to carry out various activities in the district. The type of linkages with various organizations is shown in the following table:

Table. Linkages of KVK, ICAR-NDRI, Karnal with various organizations

S. No.	Name of organization	Nature of linkage
1	Animal Husbandry Deptt., Govt of Haryana	Planning annual training schedule, organizing dairy activities in villages
2	Agriculture Deptt, Govt of Haryana	Organization of field activities, planning of training schedule.
3	Agriculture Unversities (CCSHAU, Hisar; PAU, Ludhiana; GBPAU Pantnagar)	Field visits, Procurement of latest varieties of seeds and guest speakers, interchange of subject-matter specialists.
4	Haryana Khadi Gramodyog Board, Karnal	Loans for trainees of bee-keeping, guest speakers.
5	ICAR Institutes, Karnal	Field visits, Procurement of latest varieties of seeds and guest speakers, interchange of subject-matter specialists.
6	CCS HAU, Regional Station, Uchani, Karnal	Planning annual training schedule and guest speakers.
7	Krishi Vigyan Kendra (HAU), Karnal	Collaborative training programme and guest lectures
8	Nehru Yuva Kendra, Karnal	Organizing training programmes for their volunteers/extension workers.
9	NGOs (Haryana GyanVigyan samiti, Arpana Trust and others)	Organizing training programmes for their volunteers/extension workers & for utilizing services of field activities
10	Financial Institutions (Banks etc.)	Loans for trainees of dairy farming, bee-keeping etc. and inviting guest lecturers on finance facilities.
11	District Horticulture Department, Karnal	Planning annual training schedule and guest speakers.
12	District Forest Department, Karnal	Planning annual training schedule and guest speakers.
13	District Fisheries Department, Karnal	Sponsoring farmers for training in fisheries & guest speakers
14	Rural Institutions (a) Gram Panchayat (b) Co-operatives (c) Schools	In village training programmes/demonstration work, field activities, Awareness programmes
15	Haryana Agro Industries Corporation Ltd.	Planning, annual training schedule & Guest speakers.

ICAR-KVK (ADDITIONAL), NADIA, NDRI-ERS, KALYANI

Table. Training organized by ICAR-KVK (additional), Nadia, NDRI-ERS, Kalyani for farmers and farm women

S. No.	Topic	No. of trainings	Male	Female	Total
1	Safe handling and utilization of pesticides in agriculture and horticulture	01	19	02	21
2	Scientific use of fungal and bacterial bioagent for plant health management	03	60	20	80
3	Scientific disease management in successful mushroom production	01	16	02	18
4	Installation and utilization of pheromone traps for controlling insect pests	03	64	21	85
5	Training-cum-awareness on role of insect vectors in viral diseases of crops	02	37	10	47
6	Income generating activities for empowerment of rural women	2	20	15	35
7	Mobilization of social capital	1	18	7	25
8	Entrepreneurial development of farmers	2	20	16	36

Table. Training organized by ICAR-KVK (additional), Nadia, NDRI-ERS, Kalyani for rural youth

S.No.	Topic	No. of trainings	Male	Female	Total
1	Utilization of AI-based android applications for disease and insect-pest identification	02	29	09	38
2	Identification and management of insect pests and diseases	03	36	29	65
3	Training on the non-chemical management of insect pests and diseases	01	18	00	18
4	Scientific management of bee-keeping for improved livelihood	02	59	12	71
5	Training Programme on entrepreneurship development for youth	02	26	19	45
6	Training Programme on ICT application in agriculture	02	19	21	40

Table. Skill development programme organized by ICAR-KVK (additional), Nadia, NDRI-ERS, Kalyani

Topic	Date	Duration	Male	Female	Total
Empowering farm women through scientific mushroom cultivation for livelihood and income enhancement	March 6 -8, 2025	03 days	0	150	150
Empowering the livelihood of SC farmers through sustainable mushroom cultivation technology in Nadia district of West Bengal	December 8 -12, 2025	05 days	43	07	50

Table. One-day training programme organized by ICAR-KVK (additional), Nadia, NDRI-ERS, Kalyani

Topic	Venue	Date	Total
Awareness-cum-training programme on natural farming and scientific field visit	Baliachar, Santipur	January 21, 2025	28
Nutrigardens for food security and dietary diversity in collaboration with IFFCO	Raotara	February 13, 2025	50
Farmer-Scientist Interaction-cum-One day training Programme on "Scientific use of fungal and bacterial bioagents for plant health management"	Bhaluka, Krishnagar-I	July 16, 2025	45
Training programme on ICT application in agriculture	Bhaluka Village	July 16, 2025	36
Exposure visit to KVK Nimpith	Nimpith	July 25, 2025	03
RAWE students	KVK and outside campus	July 25 to September 25, 2025	14
farmer-scientist interaction and one-day training programme on "Scientific use of fungal and bacterial bioagents for Plant health management"	Kugachi, Chakdah	July 30, 2025	35
Training cum Input distribution programme on Pulse (Black gram)	Anandanagar village	August 1, 2025	39
Training cum Input distribution programme on Pulse (Black gram)	Khidirpur Village	August 1, 2025	65
Training programme on ICT application in agriculture	Nakashipara	August 1, 2025	32
Farmer-scientist interaction and One-day training on "Role of insect vectors in spread and development of viral diseases"	Arpara, Santipur	August 5, 2025	32
Training cum Input distribution programme on Pulse (Black gram)	Joykrishnapur Village	August 6, 2025	45
Training cum Input distribution programme on Pulse (Black gram)	Raotara Village	August 11, 2025	35
Farmer-Scientist Interaction-cum-one day training Programme on "Installation and Utilization of Pheromone traps for controlling Insect pests"	Khidirpur, Nakashipara	August 13, 2025	43
Farmer scientist interaction cum Input distribution programme on Pulse (Black gram)	Silinda Village	August 20, 2025	56
One-day training programme under MIDH 2025-26 on "Disease pest management of Horticultural crops"	Krishnagar	August 28, 2025	51
Training-cum-input distribution on major horticultural crops and management in Nadia district	Krishnanagar	August 28, 2025	56
Scientific field visit and geo-plotting of the CFLD Black gram plots	Anandanagar village	September 8, 2025	30
One-day training programme under MIDH 2025-26 on "Disease Pest management of major horticultural crops of Rabi season"	Chakdah, Nadia	September 9, 2025	56
Scientific field visit and geo-plotting of the CFLD Black gram plots	Bethuadahari Village	September 22, 2025	17
Scientific field visit and geo-plotting of the CFLD Black gram plots	Raotara Village	October 7, 2025	27
Training cum Input distribution under Cluster Front Line Demonstration programme on Oilseeds (Mustard)	Raotara Village	October 7, 2025	180
On Farm demonstration in coconut cultivation	Raotara and Bhaluka village	October 7, 2025	180
Training cum Input distribution under Cluster Front Line Demonstration programme on Oilseeds (Mustard)	Shitalpur and Sejua	October 8, 2025	152
Scientific field visit and geo-plotting of the CFLD Black gram plots	Gobindapur Village	October 15, 2025	19
Farmer field visits and one training programme on "Scientific management of Bee keeping for improved livelihood" & field visit to Brinjal, marigold, paddy, Mango, cucurbits, etc.	Kadampur, Santipur	October 17, 2025	33

Topic	Venue	Date	Total
Impact assessment of Cluster Front Line Demonstration Pulses (Black gram) programme and geo-plotting of the CFLD Black gram plots	Joykrishnapur village	October 23, 2025	20
One-day training programme on "Installation and utilization of pheromone traps for controlling insect pests"-cum-scientific field visit of paddy and black gram fields	Jaykrishnapur and Kugachi, Chakdah	October 23, 2025	42
Training Programme on Entrepreneurship Development for Farmers/ Youth/Women	Mayapur	October 27, 2025	35
One-day training programme on "Scientific management of Beekeeping for improved livelihood"	Nakashipara	November 3, 2025	38
Field day on CFLD Black gram	Anandanagar village	November 6, 2025	50
Scientific field visit and geo-plotting of the CFLD Black gram plots	Nakashipara	November 14, 2025	22

Table. On Farm Testing (OFTs) conducted by ICAR-KVK (additional), Nadia, NDRI-ERS, Kalyani

S. No.	Title of OFT	No. of Trails	Male	Female	Total
1.	Bio-efficacy evaluation of bacterial bioagents & fungicides in management of panama wilt of Banana	30	13	02	15
2.	On-farm validation of insecticidal efficacy against yellow stem borer in paddy under Nadia agro-ecosystem	26	12	01	13
3.	Evaluation of integrated pest management components for effective control of diamond back moth in Cauliflower	12	06	00	06
4.	Evaluation of the effectiveness of extension interventions of KVK.	03	27	36	63
5.	Evaluation of the effectiveness of different information deliver sources	04	45	33	78

Table. Front Line Demonstration (FLDs) conducted by ICAR-KVK (additional), Nadia, NDRI-ERS, Kalyani

S. No.	Title of FLD	No. of Trails	Male	Female	Total
1.	Popularization of red spider mite management in marigold by employing systemic Insecticides	40	17	03	20
2.	Promotion of sustainable management of root knot nematode (RKN) in pointed gourd in small farming systems	42	16	05	21
3.	Promotion of integrated management of Brinjal shoot and fruit borer	30	13	02	15
4.	Promotion of digital advisory services for farmers via Whatsapp group	3	42	30	75
5.	Promotion of information kiosks for enhancing farm decision making	3	38	22	60

Table. Extension programmes organized by ICAR-KVK (additional), Nadia, NDRI-ERS, Kalyani

Topic	Venue	Date	Total
Input distribution-cum-Scientific field visit to floricultural crops	Nakashipara	January 6, 2025	25
Input distribution programme and field visit	Bahadurpur	January 9, 2025	32
FPO Officials Visit to KVK	KVK	January 13, 2025	10
Farmer scientist interaction cum Field Visit	Chotokulia	January 21, 2025	23
Prime Minister's PM Kisan Samman Nidhi 19th instalment release and Kisan Samman Samaroh	KVK Campus	February 24, 2025	160
Field visits under CFLD	Hanspukuria & Chak Rudranagar	February 4, 2025	32
Scientific field visit to Onion and Garlic fields	Tehatta-2	February 4, 2025	25
Scientific field visit to Banana cultivation	Arpara, Santipur	February 7, 2025	35
Live telecast of 3rd episode of Krishi Chaupal	Bir sidu nagar	February 8, 2025	29
Scientific field visit to Banana cultivation	Bidyanandapur, Ranaghat	February 11, 2025	12
Training programme-cum-input distribution under SCSP	Jaykrishnapur	February 11, 2025	38

Topic	Venue	Date	Total
Participatory Rural Appraisal (PRA)	Different blocks of Nadia district	January and February 2025	100
Nutrigardens for food security and dietary diversity	Raotara	February 13, 2025	50
Zonal Workshop on CFLD Pulses & Pulses Model Village	KVK	March 12, 2025	23
Celebration of International Women's day & Live telecast of 4th episode of Krishi Chaupal	Plassey, Kaliganj	March 8, 2025	150
World Water Day	Santipur	March 22, 2025	80
Live telecast of 5th episode of Krishi Chaupal	Santipur	April 12, 2025	21
Meeting for discussion on Kisan Sarathi 2.0	KVK	May 14, 2025	12
World environment day	Arpara	June 5, 2025	350
World yoga day	KVK	June 21, 2025	15
Certification of Regional Coconut Nursery	KVK	June 24, 2025	9
Viksit Krishi Sankalp Abhiyan Pre-kharif campaign 2025	Nadia district, WB	May 28 to June 12, 2025	~12,000
Scientific advisory committee meeting	KVK	July 4, 2025	27
Krishi Choupal programme	KVK	July 12, 2025	30
Visit to the fertilizer cooperatives and Floricultural cultivation	Ranaghat-2	July 30, 2025	16
20th installment of PM Kisan Samman Nidhi	Nadia	August 2, 2025	22
Technical enrichment programme for agricultural/ horticultural officers by Coconut Development Board, Kolkata centre	Kolkata	August 6, 2025	
Visit to Button mushroom industry	Barrackpore	August 14, 2025	15
20th Parthenium awareness week	Jaykrishnapur	August 16 -22, 2025	45
Farmers-Scientist interaction-cum-Scientific field visits to farmers fields	Silinda, Chakdah	August 20, 2025	38
Participatory Rural Appraisal (PRA)	Jaykrishnapur	August 22, 2025	33
Participatory Rural Appraisal (PRA)	Anandanagar	September 8, 2025	42
Krishi Choupal programme	KVK	September 13, 2025	22
Scientific Field visits to farmers fields	Jaykrishnapur, Kugachi, Arpara and Raotara	September 23, 2025	46
Swacchta Hi Seva Campaign 2025	Different blocks of Nadia district	September 17 to October 2, 2025	195
Swacchta Abhiyan 2025	Different blocks of Nadia district	October 1 to 30, 2025	166
Field day on Rice	Joykrishnapur	October 23, 2025	39
Vigilance awareness week	KVK	October 27 to November 2, 2025	10
National Ektas Diwas pledge	KVK	October 31, 2025	15
Training-cum-Input distribution under CFLD on Oilseeds (Mustard)	Khidirpur and Beldhanga	October 10, 2025	59
live-web telecast of launch of PM-DDKY (PM Dhan Dhaanya Krishi Yojana), Mission for Aatmanirbharta in Pulses and other agricultural schemes	Kalyani	October 11, 2025	120

Topic	Venue	Date	Total
Training-cum scientific field visit to Marigold and Brinjal cultivation	Nakashipara	November 3, 2025	45
Field day on Rice MTU 1156	Anandanagar village	November 6, 2025	60
Field day on Black gram IPU 13-1	Anandanagar village	November 6, 2025	60
Inputs distribution of fodder cuttings were distributed	Anandanagar village	November 6, 2025	32
11th episode of Krishi Choupal programme	KVK	November 8, 2025	26
Celebration for the 150th anniversary of Vande Mataram	KVK	November 7 to14, 2025	86
Janjatiya Gaurav Diwas 2025	Different blocks of Nadia district	November 1 to17, 2025	225
Live viewing of 21st Instalment release of PM-KISAN	KVK campus	November 19, 2025	141
World soil day	KVK	December 5, 2025	85
Scientific field visit and Input distribution programme	Different blocks of Nadia district	December 10, 2025	156
12th episode of Krishi Choupal programme	KVK	December 13, 2025	23
Kisan Diwas	Nakashipara	December 23, 2025	60
Swachhta pakhwada	Different blocks of Nadia district	December 16 to 31, 2025	195

Activities of ICAR-KVK (Additional), Nadia, ICAR-NDRI-ERS, Kalyani

10

WOMEN EMPOWERMENT AND MAINSTREAMING OF GENDER ISSUES

Women-centric vulnerability mapping and participatory climate change adaptation adaptation planning for dairy farmers in Haryana

Participatory Integrated Climate Services for Agriculture (PICSA) was used to assess the perceived impacts of climate hazards and adaptation strategies among women dairy farmers in Haryana. Fuzzy Cognitive Mapping (FCM) was applied to analyse cause–effect relationships between perceived climate impacts and adaptation measures, while scenario analysis identified suitable adaptation pathways for four major hazards—heat stress, drought, cold stress, and floods. Elevated temperature was perceived as the most significant indicator of climate change. Most respondents showed medium to high awareness of climate change effects, with 40% possessing moderate knowledge of climate-resilient dairy practices, while nearly half expressed an unfavourable attitude toward such practices. PICSA identified fifteen, thirteen, and seven adaptation options for heat stress, drought, and cold stress, respectively. Implementation of adaptation plans was perceived to recover over 90% of milk production loss and improve reproductive performance by 44.19% under heat stress. Drought adaptation could restore 77.49% fodder production, while cold stress measures could recover 15.20% milk loss. Flood adaptation strategies could reduce livestock and economic losses by 48.75% and 46.99%, respectively. Overall, the findings highlight the critical need for strengthening climate-resilient capacity and targeted advisory services for women dairy farmers.

Disaggregated gender analysis of dairy farming operations in Haryana

A gender-disaggregated study was conducted in Karnal and Sirsa districts of Haryana to analyse labour division, time use, decision-making, and constraints in dairy farming. Data were collected from 160 dairy farmers (80 male and 80 female) using multistage sampling. Findings revealed a clear gender-based division of labour. Men respondents primarily performed technical and asset-related activities such as shed construction (76.25%), animal trading (100%), feed procurement (100%), fodder cultivation (83.33%), and record keeping (97.97%). Women primarily handled routine and labour-intensive daily activities, including feeding, watering, cleaning sheds, dung cake preparation (98.57%), and milk product preparation (100%). Time-use analysis showed men spent more time on occasional and weekly tasks, while women were engaged more in daily operations. Decision-making remained predominantly male-dominated in 22 out of 30 activities, particularly in capital-intensive areas, whereas women mainly decided on hygiene-related tasks. Institutional constraints, especially lack of training and extension services, emerged as the most critical barrier, disproportionately affecting women and highlighting significant gender gaps in dairy farming systems. The study concludes that gender-responsive training, extension support, and inclusive decision-making opportunities are essential to enhance women's empowerment and overall productivity and sustainability of dairy farming systems.

Women Empowerment Laboratory in Dairy Extension Division

Women Empowerment Laboratory was established in Dairy Extension division in 2013 for the capacity building of self-help groups of NDRI, DRDA and NGOs. This lab was established with the objective to create awareness and impart skills in the field of dairy processing and fruit and vegetable preservation while motivating these groups to take up vocation in these areas. For this lab., all items of Dairy Processing Unit viz. Eco Milk Testing Machine, Refractometer, pH Meter, Moisture Balance were procured. Regular women empowerment trainings and campaigns through this Women Empowerment laboratory were organized to create awareness among rural farm women on value added milk product preparation and also impart skill in these areas so that farm women could generate more income from dairying and maintain a healthy household environment.

On Campus Women Empowerment Training Programme-cum-Demonstrations

Sr. No	Title of the training	Date	No of participant
1	Demonstration-cum-training programme on value added milk product for rural women	January 3, 2025	20
2	Demonstration-cum-training programme on value added milk product for rural women	July 15, 2025	17
3	Demonstration-cum-training programme on value added milk product for rural women	October 16, 2025	30

Climate Resilient Dairy Farm school for women dairy farmers at Padha Village of Karnal district

An exclusively Climate Resilient Dairy Farm School was established for the women dairy farmers of the Padha village of Mulak block, Karnal. A total of 35 smallholder women farmers were enrolled in this farm school. School started in August 2025 and continued till December 2025 with the weekly classes on every Thursday at 12.00 – 2.00 PM.

Climate Resilient Dairy Farm School at Padha Village, Karnal, Haryana

International Women's Day Celebration

ICAR-NDRI, Karnal celebrated International Women's Day on March 8, 2025, featuring Dr. Sarika Gupta as chief guest. She emphasized women's rights and legal safeguards. Dr. Dheer Singh, NDRI Karnal, honored three women achievers and highlighted that over 50% of NDRI students are women. The event, part of academic fortnight, saw participation from more than 750 scientists, faculty, and students.

Celebration of International Women Day on March 8, 2025 at, ICAR-NDRI, Karnal

11

HONOURS/AWARDS

1. Institute Award

NDRI Secured Second Rank in NIRF- 2025

ICAR-NDRI, Karnal secured the second position in the National Institutional Ranking Framework (NIRF) 2025 under the 'Agriculture and Allied' category of the Union Ministry of Education for outstanding performance in teaching, research and professional practices, graduation outcomes/ outreach and inclusivity and quality research papers. The award was announced on September 4, 2025 during the India Rankings ceremony in New Delhi. Dr. Dheer Singh, Director, ICAR-NDRI, Karnal received the award from Shri Dharmendra Pradhan, Hon'ble Union Minister of Education.

Dr. Dheer Singh, Director, ICAR- NDRI receiving NIRF ranking - 2025 award under the 'Agriculture and Allied' category from Shri Dharmendra Pradhan, Hon'ble Union Minister of Education

2. International Recognition

Dr. A. Kumaresan – Ranked among the Top 2% **Most Influential Scientists Globally** (Stanford University & Elsevier).

3. Fellowships

1. **Dr. Dheer Singh,** Director, ICAR–National Dairy Research Institute (NDRI), Karnal, was elected a **Fellow of the Indian National Science Academy (INSA)**, one of India's highest scientific honours, at the Academy's Annual General Meeting held on September 9, 2025. The prestigious recognition acknowledges his outstanding contributions to agricultural and dairy sciences, research, and scientific leadership. His election brings distinction to ICAR-NDRI and the country's scientific community.

Dr. Dheer Singh receiving fellowship of the Indian National Science Academy (INSA)

2. **Dr. Arindam Dhali** was conferred the **Fellow of the National Academy of Veterinary Sciences (India)**.
3. **Dr. Santanu Banik** was elected as **Fellow of the National Academy of Veterinary Sciences (India)**.
4. **Dr. Sohan Vir Singh** was conferred the **ANSI Fellow Award** during the 21st Biennial International Conference on "Global Resilience in Animal Nutrition: Innovations for a Sustainable Future" organized by the Department of Animal Nutrition, College of Veterinary Science & Animal Husbandry, Acharya Narendra Deva University of Agriculture and Technology (ANDUAT), Ayodhya, Uttar Pradesh, during November 19–21, 2025.
5. **Dr. Nishant Kumar** received the **Associate Fellowship of the National Academy of Veterinary Sciences, India (NAVSI)** at the XXIII Convocation-cum-National Scientific Convention on "Strategic Framework for Transformation of

India's Livestock, Poultry and Meat Sector for Viksit Bharat @ 2047," held at Bihar Animal Sciences University, Patna, during December 22–23, 2025.

6. **Dr. Rashmi H. M.** was selected as **Associate of the National Academy of Agricultural Sciences (NAAS), India**, for the year 2025.
7. **Dr. Heena Sharma** was selected as **NAAS Associate** of the **National Academy of Agricultural Sciences (NAAS)** for the year 2025.

4. Professional Society Awards

1. **Dr. A. Kumaresan** received the **Dr. A.S. Kaikini Award–2025 for Lifetime Achievement in Andrology** at the International Symposium on "Animal Reproduction in a Changing World: Addressing Challenges and Embracing Opportunities" organized at Rajiv Gandhi Institute of Veterinary Education and Research, Puducherry, India, during December 10–12, 2025.
2. **Dr. Anurag Saxena** was conferred the **Dr. M. S. Swaminathan Award** by the Indian Society of Agricultural Science & Technology Research (ISASTR) during the 12th International Conference on Agriculture and Veterinary Sciences on "Transformative Approaches, Research, and Innovations", held at Goa during November 16–18, 2025.
3. **Dr. Vikas Vohra** was conferred the **Distinguished Scientist Award (Agricultural Category)** by the Scientific Laurels Society, operated by Peritus Hive Research and Innovations, Government of India.
4. **Dr. Sanjeev Kumar** was conferred the **Distinguished Scientist Award** for outstanding contributions in the field of agronomy by the Society for Scientific Development in Agriculture and Technology during the 10th International Conference on "Global Research Initiatives for Sustainable Agriculture & Allied Sciences (GRISAAS)".
5. **Dr. Narender Raju Panjagari receiving the Best Teacher Award** from Dr. R. S. Paroda, Chairman, TAAS and former Secretary, DARE & DG, ICAR, New Delhi, at the 12th National Seminar organized by NDRI Graduates Alumni Association on September 20, 2025.

Dr. Narender Raju Panjagari received the Best Teacher Award from Dr. R. S. Paroda, Chairman, TAAS and former Secretary, DARE & DG, ICAR, New Delhi on September 20, 2025

6. **Dr. Sunita Meena** received the **Excellence in Teaching Award** at the Xth International Conference on "Global Research Initiatives for Sustainable Agriculture and Allied Sciences (GRISAAS)" held at MPUAT, Udaipur, Rajasthan, during October 5–7, 2025.
7. **Dr. Sohan Vir Singh** was conferred the **ISBD Outstanding Extension Worker Award** by the Indian Society for Buffalo Development during the National Conference on "Buffalo Production and Health in a Changing Climate: Innovations for a Resilient Future" organized at ICAR–Indian Veterinary Research Institute (IVRI), Izatnagar, Uttar Pradesh, during December 15–16, 2025.
8. **Dr. Vairat Amita Dinkar** received the **Outstanding Woman Researcher Award in Agricultural Process Engineering** at the 10th Annual Women's Meet organized by Venus International Foundation, held at Chennai, Tamil Nadu, India, during 2025.
9. **Dr. Diwas Pradhan** received the **Young Scientist Award–2025** for his contribution to the field of fermented foods at the 12th International Conference on "Fermented Foods, Health Status and Social Well-being", organized jointly by SASNET–FF and the West Bengal University of Animal & Fishery Sciences, Mohanpur, Nadia, West Bengal, during December 19–20, 2025.

Dr. Diwas Pradhan received the Young Scientist Award at an International Conference in West Bengal University of Animal & Fishery Sciences, West Bengal on 20.12.2025

10.

11. **Dr. Rashmi H. M.** received the **Young Scientist Award (Faculty Category)** for contribution to fermented foods, sponsored by SASNET-FF, at the 12th International Conference on "Fermented Foods, Health Status and Social Well-being" organized by the Faculty of Dairy Technology, West Bengal University of Animal and Fishery Sciences (WBUAFS) in collaboration with SASNET-FF, held at Mohanpur, Nadia, West Bengal, during December 19–20, 2025.

Dr. Sanchita Garai received the Young Women Scientist Award during the 12th National Seminar on "Futuristic Agriculture: Technology, Sustainability and Beyond" organized by the Society for Community Mobilization for Sustainable Development

12. **Dr. Sanchita Garai** received the **Young Women Scientist Award** at the 12th National Seminar on "Futuristic Agriculture: Technology, Sustainability and Beyond" organized by the Society for Community Mobilization for Sustainable Development (MOBILIZATION) in collaboration with CAU Imphal and ICAR-Research Complex for NEH Region, Umiam, Meghalaya, India, during May 22–24, 2025.
13. **Dr. Seema Karanwal**, Ph.D. student under Dr. Rakesh Kumar, received the **Prof. N.R. Moudgal Young Scientist Award** for her outstanding contribution in Ph.D. research in reproductive health at the International Conference of Medicine organized by ISSRF during February 14–16, 2025.
14. **Sanchi Kamal, Nishant Kumar, Richa Singh, Anusha Kishore, Indu Devi and T. K. Mohanty** received the **Young Scientist Award** for the research titled "Pheromonal Bio-stimulation Accelerates Postpartum Ovarian Cyclicity and Enhances Reproductive Efficiency in Sahiwal Cows" at the 40th Annual Convention of ISSAR and International Symposium on "Animal Reproduction in a Changing World: Addressing Challenges and Embracing Opportunities" held at Rajiv Gandhi Institute of Veterinary Education and Research (RIVER), Puducherry, during December 10–12, 2025.

5. Best Paper Awards

1. **Gunjan Bhandari,** Priyanka Lal, and Binita Kumari received the **Best Research Article Prize** for their research paper entitled *"Impact of COVID-19 Pandemic on Household Consumption Pattern of Dairy Products in India"* during the 51st Dairy Industry Conference held at Patna on March 8, 2025.
2. Shruti Arya, **Indu Devi,** Divyanshu Singh Tomar, Man Singh, T. K. Mohanty, Radhika Warhade and Anshul Gautam received the **Best Research Paper Award (Dairy Production Category)** for the paper entitled *"Development of a Lightweight Deep Learning Model for the Identification and Classification of Indigenous Cattle Breeds"* published in *Indian Journal of Dairy Sciences* (2025), 78(4):344–349.
3. **Dr. Rakendhu Saji** received the **First Best Paper Award** for the article *"Veterinary Drug Residues in Indian Milk: Detection and Safety Measures"* published in *Indian Dairyman* (2024), during the 51st Dairy Industry Conference held at Patna, Bihar, from March 6–8, 2025.
4. **Dr. Rakendhu Saji** received the **Best Paper Presentation Award** for the paper entitled *"Detection of Flunixin Residues in Milk Using ATR–FTIR Spectroscopy Coupled with Chemometrics"* at the International Conference on Transformative Multidisciplinary Research (ICTMR–2025), held at St. Thomas College, Thrissur, Kerala, during February 6–7, 2025.
5. **Gunashekar H. et al.** received the **Best Paper Presentation Award** at the Southern Dairy Summit organized by the Indian Dairy Association–South Zone, held at Bengaluru, India, during January 9–11, 2025.
6. **Priyanka B. N. et al.** received the **Best Paper Presentation Award** at the Southern Dairy Summit organized by the Indian Dairy Association–South Zone, held at Bengaluru, India, during January 9–11, 2025.
7. **Ayana Suresh and Subash S.** received the **Best Paper Presentation Award** at the National Symposium on *"Viksit Bharat: Challenges, Opportunities and Way Forward for the Indian Dairy Sector"* organized at SRS, ICAR-NDRI, Adugodi, Bengaluru, India, on November 28, 2025.
8. **Sampreetha H. N. et al.** received the **Best Paper Presentation Award** at the National Symposium on *"Viksit Bharat: Challenges, Opportunities and Way Forward for the Indian Dairy Sector"* organized at SRS, ICAR-NDRI, Adugodi, Bengaluru, India, on November 28, 2025.
9. Kuntal Roy, **Narender Raju Panjagari** and Deep Narayan Yadav received the **Best Oral Paper Award** at the National Conference on *"Food Innovations, Food Allergies and Traditional Foods (FIFATF-2025)"* held at Sant Longowal Institute of Engineering and Technology, Punjab, during December 11–12, 2025.
10. Shubham Kar, **P. Narender Raju,** Taniya Harchandani, Karpurapu Uma, Sangita Ganguly, Ashish Kumar Singh and Adesh Kumar Sharma received the **Second Best Oral Paper Award (Online)** at the 14th IDEA Convention & National Seminar organized by the Indian Dairy Engineers Association, held at Verghese Kurien Institute of Dairy and Food Technology, Mannuthy, Thrissur, Kerala, during May 8–9, 2025.

6. Best Poster Awards

1. **Shubham Kar**, Narender Raju Panjagari, Taniya Harchandani, Karpurapu Uma, Sangita Ganguly, Ashish Kumar Singh and Adesh Kumar Sharma received **First Best Poster Award** at the 51st Dairy Industry Conference organized by the Indian Dairy Association, held at Patna, Bihar, during March 6–8, 2025.
2. **Nilkanth Pawar**, Richa Singh, Sumit Arora, Rajan Sharma and Heena Kauser received **First Prize in Poster Presentation** during the organization of ZVI Agricultural Science Congress held at GBPUAT, Pantnagar during February 20-22, 2025.
3. **Shalini S. V.**, Manorama Kumari and Pradip Behare received **First Prize in Poster Presentation,** under the theme **"Quality, Safety and Efficacy of Starter Cultures, Beneficial Microbes, Their Metabolites and Fermented Foods" during** the organization of 12th International Conference on "Fermented Foods, Health Status and Social Well-being" (WBUAFSASNETCON-2025) held at WBUAFS, Kolkata during December 19–20, 2025.
4. **Mansi Singh.**, Manorama Kumari and Pradip Behare received **First Prize in Poster Presentation under the theme "Fermented Foods and their Functionality"during** the organization of 12th International Conference on "Fermented Foods, Health Status and Social Well-being" (WBUAFSASNETCON-2025) held at WBUAFS, Kolkata during December 19–20, 2025.

Ms. Salini S V, Ph.D Scholar receiving award during 12th International Conference on WBUAFSASNETCON-2025

Ms. Mansi Singh, Masters Scholar receiving award during 12th International Conference on WBUAFSASNETCON-2025

5. **Kiran Goyat**, Ankit Deep and Nishant Kumar received **First Best Poster Presentation Award (Student Category)** for the poster titled "Development of a Horizontal Compact Thawing Device for Bovine Semen Straws" at the 14th IDEA Convention & National Seminar on 'Engineering Challenges & Strategies for Sustainable Growth in Dairy & Food Processing' held at VKIDFT, KVASU, Mannuthy, Kerala, during May 8–9, 2025.
6. **Arijit Ray**, Chitranayak Sinha, Berry S., Khamrui K., Dabas J. K. and Goyat K. received **First Best Poster Presentation Award** for the poster titled "Solar-Powered Hybrid Fermentation System with Deep Learning–Enabled Automated Process Control for Sustainable Yoghurt Production" at the 12th International Conference ICAVRI-2025, during November 16–18, 2025.
7. **Veldandi A.**, Zade S., Panja A., Pavan P., Chandel A.S., Garai S., and Maiti S. received the **First Best Poster Presentation Award** for the paper titled "Sustaining Livelihoods: Climate-responsive Livestock Rearing Practices in Eastern India" at the National Seminar on "Progressive Agriculture–Vikshit Bharat: Preparedness for Eastern Region" held at ICAR-Research Complex for Eastern Region, Patna, India, February 21–23, 2025.
8. **Veldandi A.**, Reddy A.K., Sirilakshmi Y., Garai S., and Maiti S. received the **First Best Poster Presentation Award** for the paper titled "Mapping Impacts and Adaptation: A Cognitive Approach to Women Farmers' Climate Resilience" at the Global Conference on "Innovations to Impact: Gender Transformative Approach for Sustainable Agri-Food System" held at ICAR-Central Institute for Women in Agriculture, Bhubaneswar, India, March 8–10, 2025.
9. **Dr. Gunjan Bhandari** was awarded the **First Best Poster Award** during the poster session at the 12th National Seminar organized by NDRI Graduates Alumni Association and ICAR–NDRI on September 12, 2025.
10. ***Dr. Suneel Kumar Onteru*** secured **First Best Poster Presentation** under the theme "Smart Livestock Farming" for the poster titled "Innate Immunity in Selected Indian Cattle Breeds Traced from Gene Duplications and Deletions" authored by Mayank Roshan, Ashutosh Vats, Kamlesh Kumari Bajwa, Sanjay Sharma, Menaka Thambiraja, Monika Sodhi, Dheer Singh, Ragothaman M. Yenamalli and Suneel Kumar Onteru at the XVII Agricultural Science Congress (ASC-2025) held at G.B. Pant University of Agriculture and Technology, Pantnagar, during February 20–22, 2025.
11. **Sadhna Tiwari**, S. S. Lathwal, Indu Devi and Rimee Dhakad received **First Best Poster Presentation Award** for the paper titled "Effect of Maternal Programming through Nutritional Supplementation on Behavioural and Productive Performance of Transition Murrah Buffaloes" at the VI Annual Convention of VIPM and National Symposium on "Revolutionizing Veterinary Medicine in Climate Crisis: Harnessing AI for Animal Health (VIPMCON)" held at NDVSU, Jabalpur, during October 8–10, 2025.
12. **Prateek Singh**, Chander Datt, Kuldeep Dudi, Somesh Gaikwad, and Nishant Kumar received the **First Prize in Poster Presentation** for the paper titled "Influence of Supplementing Nanocopper on Haematological Parameters in Alpine × Beetal Male Kids" at the 21st Biennial International Conference on "Global Resilience in Animal Nutrition: Innovations for Sustainable Future (ANSICON)" held at ANDUAT, Kumarganj, Ayodhya, Uttar Pradesh, November 19–21, 2025.
13. **Manya Mathur**, Reeju Rani, Nikunj Tyagi, J.K. Kaushik, and Sudarshan Kumar received the **First Prize in Poster Presentation** for the paper titled "Identification of Differentially Expressed lncRNAs Shaping the Regulatory Pathways Associated with Milk Production in Sahiwal Cattle" at the XII Annual Convention of the Society for Veterinary Sciences and Biotechnology (SVSBT) and International Conference held at Department of Biotechnology, College of Veterinary Sciences, LUVAS, Hisar, December 3–5, 2025.

14. **Shubham Kar** and Narender Raju Panjagari received **Second Best Poster Award** at the International Conference on Food Chemistry, Microbiology, and Process Engineering for Wellness & Health (FCMPE WellH 25) organized by Birla Institute of Technology, Mesra, Jharkhand, during July 10–12, 2025.
15. **Maumita Adhikari**, Kaushik Khamrui and Writdhama Prasad received **Second Best Poster Presentation Award (Online)** at the 8th International Conference on "The Future of Food Science & Technology: Innovations, Sustainability, and Health" held at Amity University, Noida, Uttar Pradesh, during March 27–28, 2025.
16. **Taniya Harchandani**, Narender Raju Panjagari, Shubham Kar, Sangita Ganguly and Adesh Kumar Sharma received **Second Best Poster Award (Offline)** at the 14th IDEA Convention & National Seminar organized by the Indian Dairy Engineers Association, held at Verghese Kurien Institute of Dairy and Food Technology, Mannuthy, Thrissur, Kerala, during May 8–9, 2025.
17. **Dr. Rakendhu Saji** was awarded the **Second Best Poster Award** at the Southern Dairy Summit–2025, organized by the Indian Dairy Association (South Zone), held at NIMHANS Convention Centre, Bengaluru, from January 9–11, 2025.
18. **Dr. A. K. Sharma**, along with co-authors, secured **Second Prize in the Student Poster Presentation** for the poster titled "Machine Learning–Driven Shelf-Life Detection of Sandesh, a Milk-Based Confection, Using On-Package Freshness Indicators" at the International Conference on Food Chemistry, Microbiology, and Process Engineering for Wellness & Health (FCMPE WellH–2025), held at Birla Institute of Technology, Mesra, Ranchi, Jharkhand, from July 10–12, 2025.
19. **Dr. A. K. Sharma** shared **Second Prize (Student Category)** for the poster titled "Quantitative Evaluation of Freshness Indicator of Packaged Sandesh Using Image Analysis and Machine Learning Models" at the 14th IDEA Convention and National Seminar on "Engineering Challenges and Strategies for Sustainable Growth in Dairy and Food Processing", organized by the Verghese Kurien Institute of Dairy and Food Technology, Mannuthy, Thrissur, Kerala, from May 8–9, 2025.
20. **Kanwate Rishikesh**, R. Malik, H. Kour, P. Rana, and A. Goyal received the **Second Prize in Poster Presentation** for the paper titled "Estimation of Methane Emission from Dung of Lactating Tharparkar, Karan Fries Cattle and Murrah Buffaloes" at the World Animal Nutrition Conference (WANACON) held at Nagpur Veterinary College, Nagpur, January 20–22, 2025.
21. **Nishchal Thakur**, Mohammad Rizwan, and Shilpa Vij (2025) secured **Third Prize in poster presentation** at the XVIIth Agricultural Science Congress for the poster titled "Cow colostrum whey-derived proteins and peptides against mucormycosis-causing molds: In silico and *in vitro* study", held at G.B. Pant University of Agriculture and Technology, Pantnagar during February 20–22, 2025.
22. **Rishi Shringi**, Khushbu Kumari, Chitranayak and Anand Kishore received **Third Best Poster Presentation Award (Faculty Category)** for the poster titled "Milk Source Based Electrical Characterisation of Yoghurt" at the 14th IDEA Convention & National Seminar on 'Engineering Challenges & Strategies for Sustainable Growth in Dairy & Food Processing' held at VKIDFT, KVASU, Mannuthy, Kerala, during May 8–9, 2025.
23. **Shivam Kumar Pandey**, P. S. Minz, Chitranayak and J. K. Dabas received **Third Best Poster Presentation Award (Student Category)** for the poster titled "Thermal Analysis of Liquid-Solid Interface for Rapid Milk Cooling" at the 14th IDEA Convention & National Seminar on 'Engineering Challenges & Strategies for Sustainable Growth in Dairy & Food Processing' held at VKIDFT, KVASU, Mannuthy, Kerala, during May 8–9, 2025.
24. **Ms. Priyanka Goyal** secured **Third Prize (Poster Presentation)** under the theme "Smart Livestock Farming" for the poster titled "Harnessing the Potential of Bovine Milk Extracellular Vesicles and their mRNAs in Human Health: A Frontier Science Approach for a Developed India" authored by Priyanka Goyal, Roshan Mohiddin, Suneel K. Onteru and Dheer Singh at the XVII Agricultural Science Congress (ASC) held at G.B. Pant University of Agriculture and Technology, Pantnagar, during February 20–22, 2025.
25. **Harneet Kour**, Raman Malik, Parul Rana, Amandeep Goyal, and Garima Chaudhary received the **Third Prize in Poster Presentation** for the paper titled "Whole Genome Metagenomic Analysis of Microbial Community to Monitor Long-Term Stability in Continuous Rumen Bioreactor" at the 21st Biennial International Conference (ANSICON) held at Kumarganj, Ayodhya, Uttar Pradesh, November 19–21, 2025.
26. **Adithyasukumar** received **Third Prize (with CAD 150 award) in poster presentation** at ALES Graduate Research Conference organized by University of Alberta, held at Edmonton, Canada, during April 1–2, 2025.
27. **Mansi Sahu**, Diwas Pradhan, Raghu H. V., and Namita Narwal received the **Best Poster Award** at AMRNCON-2025 (National Conference on "Strengthening One Health Synergy: Combating Antimicrobial Resistance through Cross-Sectoral Innovation and Integration") for the poster titled "Characterization of antimicrobial resistance in *Staphylococcus aureus* from raw milk", held at Kamdhenu Vishwavidyalaya, Durg, Chhattisgarh during October 6–7, 2025.

Ms. Mansi Sahu, M.Tech Scholar receiving **Best Poster Award** *at a National Conference in Kamdhenu Vishwavidyalaya, Chhattisgarh on 07.10.2025*

28. **Aparna Raj** (PhD student) received **Best Poster Presentation Award** at the International Symposium on "Animal Reproduction in a Changing World: Addressing Challenges and Embracing Opportunities" organized at Rajiv Gandhi Institute of Veterinary Education and Research, Puducherry, India, during December 10–12, 2025.
29. **Vedamurthy G. V.**, Lavanya M., S. Jeyakumar, Heartwin A. Pushpadass, Kumaresan A., F. Magdaline Eljeeva Emerald and Manimaran A. received **Best Poster Presentation Award** for the research titled "Development of Low-cost Progesterone Encapsulated Nanofiber Based Delivery System for Estrus Induction in Deoni Cattle" at the National Symposium on "Viksit Bharat: Challenges, Opportunities and Way Forward for the Indian Dairy Sector" organized by SRS, ICAR-NDRI in collaboration with Indian Dairy Association-South Zone and Alumni Association, ICAR-NDRI, held at Adugodi, Bengaluru, India, on November 28, 2025.
30. **Khushi Singh**, Monika Sharma, Rashmi H. M. and Vandana K. V. received **Best Poster Presentation Award** for the research titled "Optimization of whey-based medium for the production of *Lactiplantibacillus plantarum* Lp91 (MTCC 5690)" at the National Symposium on "Viksit Bharat: Challenges, Opportunities and Way Forward for the Indian Dairy Sector" organized by SRS, ICAR-NDRI in collaboration with Indian Dairy Association-South Zone and Alumni Association, ICAR-NDRI, held at Adugodi, Bengaluru, India, on November 28, 2025.
31. **Dr. S. Jeyakumar** received **Best Poster Presentation Award** for the research titled "Electrospun nanofibre encapsulation: a novel approach for progesterone delivery system for controlled breeding in dairy cattle" at the International Conference on Reproductive Biomedicine (ISSRF) organized at Jaipur, Rajasthan, India, during February 14–16, 2025.
32. **D. N. Das** received **Best Poster Presentation Award** for the research titled "Longitudinal Analysis of Lactation Length and Milk Yield in Deoni cattle" at the National Symposium on "Technological Advancement and Their Application for Management of Native Animal Genetic Resources (AnGR)" and XXII Annual Convention of Society for Conservation of Domestic Animal Biodiversity (SOCDAB) organized at Veterinary College, KVAFSU, Hebbal, Bengaluru, India, during January 21–22, 2025.
33. **Deepak *et al.*** received **Best Poster Presentation Award** for the research titled "Immobilization of β-galactosidase on activated bentonite clay nanoparticles and galactooligosaccharides production from paneer whey" at the Southern Dairy Summit organized by Indian Dairy Association-South Zone, held at Bengaluru, India, during January 9–11, 2025.
34. **Kauser Banu** et al. received **Best Poster Presentation Award** at Southern Dairy Summit-2025 organized by Indian Dairy Association-South Zone, held at NIMHANS Convention Centre, Bengaluru, India, during January 9–11, 2025.
35. **Neha R. Petare** et al. received **Best Poster Presentation Award** for the research titled "Purification of GOS produced from paneer whey using activated charcoal and selective microbial

fermentation" at the National Symposium organized by SRS, ICAR-NDRI, Adugodi, Bengaluru, India, on November 28, 2025.

36. **Pratik Ramesh Wankhade** received **Best Poster Presentation Award** at ISAPM National Conference organized at Department of Animal Production, RCA, MPUAT, held at Udaipur, Rajasthan, India, during February 26–28, 2025.
37. **Spoorthy G. S.** et al. received **Best Poster Presentation Award** for the research titled "Statistical modelling for shelf life prediction of packaged dairy product – ghee" at Southern Dairy Summit organized by Indian Dairy Association-South Zone, held at NIMHANS Convention Centre, Bengaluru, India, during January 9–11, 2025.
38. **Usha S.** et al. received **Best Poster Presentation Award** for the research titled "Properties of *Curcuma angustifolia* starch-PVA composite films loaded with ZnO nanoparticles and polyphenols" at the National Symposium on "Viksit Bharat: Challenges, Opportunities and Way Forward for the Indian Dairy Sector" organized at SRS, ICAR-NDRI, Adugodi, Bengaluru, India, on November 28, 2025.
39. **Varun K.** et al. received **Best Poster Presentation Award** for the research titled "From Udder to Lab: Characterization of MRSA resistance and biofilm genes" at the National Milk Day Symposium organized at SRS, ICAR-NDRI, Adugodi, Bengaluru, India, on November 28, 2025.
40. **Dr. Ajoy Mandal** received the **Best Poster Presentation Award** for the poster titled "Genetic Insights on Test-Day Milk Compositional Traits in Jersey Crossbred Cattle" at the XIX Annual Convention and International Conference on "Precision Animal Breeding through Genomics, Artificial Intelligence and Machine Learning", organized by the Indian Society of Animal Genetics and Breeding (ISAGB) at WBUAFS, Kolkata, during November 13–14, 2025.
41. **Adityasukumar P.**, F. Magdaline Eljeeva Emerald, Heartwin A. Pushpadass and M. S. Roopesh received **Best Poster Presentation Award** for the research titled "Relative humidity-controlled atmospheric cold plasma as a non-thermal intervention for enhancing the shelf-life of whey" at the National Symposium on "Viksit Bharat: Challenges, Opportunities and Way Forward for the Indian Dairy Sector" organized by SRS, ICAR-NDRI in collaboration with Indian Dairy Association-South Zone and Alumni Association, ICAR-NDRI, held at Adugodi, Bengaluru, India, on November 28, 2025.

7. Best Oral Presentation Awards

1. **Aparna V. P.,** Kaushik Khmarui, Prasad and Kuntal Roy received **First Best Oral Presentation Award** at the 8th International Conference on "The Future of Food Science & Technology: Innovations, Sustainability, and Health" held at Amity University, Noida, Uttar Pradesh, during March 27–28, 2025.
2. **Hitesh K. Rohit,** Chitranayak, P. S. Minz, Hima John, J. K. Dabas and Ravi Prajapati received **First Best Oral Presentation Award** for the paper titled "Study on Ice Slurry Based Milk Cooling System" at the 14th IDEA Convention & National Seminar on 'Engineering Challenges & Strategies for Sustainable Growth in Dairy & Food Processing' held at VKIDFT, KVASU, Mannuthy, Kerala, during May 8–9, 2025.
3. **P. Barnwal,** Ankit Deep, Tamanna Chambyal and Ravi Kumar received **First Best Oral Presentation Award** for the paper titled "Recent Innovations in Mechanization of Animal Husbandry" at the 59th Annual Convention of Indian Society of Agricultural Engineers and International Symposium on 'Mechatronics and Robotics in Pre and Post Production Agriculture' held at ICAR-CIAE, Bhopal, during November 10–12, 2025.
4. **Veldandi A.,** Garai S., Zade S., Pavan P., Chandel A.S., Panja A., and Maiti S. received the **First Best Oral Presentation Award** for the paper titled "Adaptation Effectiveness of Dairy Production System of Women Dairy Farmers across the Coastal Region of Andhra Pradesh" at the Second International Extension Education Congress (IEEC) organized by the Society of Extension Education at SOA, Bhubaneswar, Odisha, India, November 24–26, 2025.
5. **Dr. Rajani Kumar Paul** secured **First Prize (Oral Presentation)** for the paper titled "Functional Characterization of Recombinant Buffalo Cysteine-rich Secretory Protein 1 on Sperm Physiology" at the 9th Annual Convention of SVBBI and National Symposium on "Advancing Animal Health and Production through Biochemical and Biotechnological Innovations" (SVBBICON) held at WBUAFS, Kolkata, during November 28–29, 2025.
6. **Renu Rani,** PhD student under Dr. Sudarshan Kumar, received **First Prize in Oral Presentation** for the paper titled "Aptamer-Based Non-invasive Approach for Sex-Specific Sperm Sorting in Bovine" at the XII Annual Convention of the Society for Veterinary Sciences and Biotechnology (SVSBT) and International Conference held at Department of Biotechnology, College of Veterinary Sciences, LUVAS, Hisar, December 3–5, 2025.
7. **Sharanabasava,** Chitranayak, Nagaratna, Kiran N., Minz P. S. and Hima John received **Second Best Oral Presentation Award** for the paper titled "Advancements in Fermentation Technology: Integrating Renewable Energy for Yogurt & Dahi" at the International Conference organized by DSLD, CHEFT, University of Horticultural Sciences, Bagalkot, Karnataka, during January 22–24, 2025.

8. **Mr. Mrinmoy Das** received the **Second Best Oral Presentation** at the National Conference on "Digital Interventions and Sustainable Livelihoods in Hill Ecosystem Towards Vision Viksit Bharat 2047", organized by the Department of Agricultural Economics, Visva-Bharati, Sriniketan, West Bengal, and ICSSR, New Delhi, from January 10–11, 2025.
9. **Tejeshwari Satpute,** Pawan Singh, A. Ukey, M. Chitkara, A. Gurao and R. S. Kataria received **Second Prize (Oral Presentation)** for the paper titled "Optimizing Semen Quality through Microclimatic Modification and Nutritional Strategies with Insights into Heat-Stress Related Gene Expression in Murrah Buffalo Bulls" at the National Conference of Indian Society for Buffalo Development (ISBD) on "Buffalo Production and Health in a Changing Climate: Innovations for a Resilient Future" organized by ICAR-IVRI, Izatnagar, Uttar Pradesh, during December 15–16, 2025.
10. **S. K. Verma,** Indu Devi, Bharati Pandey, Vikas Vohra and Pawan Singh received **Second Best Oral Presentation Award** for the paper titled "Development of Deep Learning Based Biometric System for Automated Individual Identification of Cows Using Muzzle Images" at the 12th National Seminar on "Globalization of Indian Dairy Industry" organized by NGAA and ICAR-NDRI, Karnal, on September 20, 2025.
11. **Ritika,** Shavi, Hanshika Pal, N.L. Selokar, and M.K. Singh received the **Second Best Oral Presentation Award** for the paper titled "Induced pluripotent stem (iPS) cells of cattle: generation and their characterization" at the 40th Annual Convention & International Symposium on "Animal Reproduction in a Changing World: Addressing Challenges and Embracing Opportunities" held at Rajiv Gandhi Institute of Veterinary Education & Research, Puducherry, December 10–12, 2025.
12. **Harneet Kour,** Raman Malik, Parul Rana, Amandeep Goyal, and Garima Chaudhary received the **Second Prize in Oral Presentation** for the paper titled "Continuous Rumen Bioreactor: Standardization and Evaluation of Methane Inhibiting Feed Additives" at the 21st Biennial International Conference (ANSICON) held at ANDUAT, Kumarganj, Ayodhya, Uttar Pradesh, November 19–21, 2025.
13. **Dr. Saroj Rai** received **Second Best Oral Presentation Award** at the 12th International Conference on "Fermented Foods, Health Status and Social Well-being", organized by the Faculty of Dairy Technology, WBUAFS, Nadia, in collaboration with the Swedish South Asian Network on Fermented Foods (SASNET–FF) held from December 19–20, 2025.
14. **Alok Ahale,** Neelam Upadhyay, Tamal Sarkar, Abdul Hussain, Ashish Kumar Singh and Suman Kapila received **Third Prize (Oral Presentation)** for the paper titled "Functional processed cheese spread combining Moringa oleifera: Insights in physico-chemical characteristics and consumer acceptability" at the International Conference on Recent Advances in Food Science and Technology: A Way Forward organized by DSLD CHEFT, Devihosur-Haveri and Karnataka Science and Technology Academy, DST, Government of Karnataka, during January 22–24, 2025.
15. **Deepti Arya,** Rubina K. Baithalu, M. Akram, V. Gohil, A. Fernandes, C. Purthi and S. Ruhil received **Third Prize (Oral Presentation)** at the XII Annual Convention of the Society for Veterinary Sciences and Biotechnology and International Conference on "Bridging Science and Society: Biotechnology for Sustainable One Health" held at LUVAS, Hisar, during December 3–5, 2025.
16. **A. Fernandes,** Rubina K. Baithalu, C. Purthi, M. Pandey, A. Akram and T. K. Mohanty received **Third Prize (Oral Presentation)** at the National Conference of Indian Society for Buffalo Development (ISBD) on "Buffalo Production and Health in a Changing Climate: Innovations for a Resilient Future" held at ICAR-IVRI, Izatnagar, Bareilly, Uttar Pradesh, during December 15–16, 2025.
17. **Anusmita Baishya,** Pawan Singh, Manishi Mukesh and Ramesh Chandra received **Third Prize (Oral Presentation)** for the paper titled "Proteome Driven Insights into Thermotolerance: A Roadmap for Climate-Smart Buffalo Breeding" at the National Conference of Indian Society for Buffalo Development (ISBD) on "Buffalo Production and Health in a Changing Climate: Innovations for a Resilient Future" organized by ICAR-IVRI, Izatnagar, Uttar Pradesh, during December 15–16, 2025.
18. **Sakshi Payasi** (MVSc student) received **Best Oral Presentation Award (Third Prize)** at the 40th Annual Convention of ISSAR and International Symposium on "Animal Reproduction in a Changing World: Addressing Challenges and Embracing Opportunities" organized at Rajiv Gandhi Institute of Veterinary Education and Research, Puducherry, India, during December 10–12, 2025.
19. **Vedamurthy G. V.,** Naresh Kumar K., Kumaresan A., Sulochana M., Lavanya M. and S. Jeyakumar received **Best Oral Presentation Award** for the abstract "GAPDHS: Potential Biomarker of Sperm Progressive Motility" at the 40th Annual Convention of the Indian Society for the Study of Animal Reproduction (ISSAR) and International Symposium on "Animal Reproduction in a Changing World: Addressing Challenges and Embracing Opportunities" organized at Rajiv Gandhi Institute of Veterinary Education and Research, Puducherry, India, during December 10–12, 2025.

20. **Hency Rose,** Heena Sharma, Ashish Kumar Singh, Gaurav Kr Deshwal and Yogesh Khetra received **Best Oral Presentation Award** at the XII Annual Convention of the Society for Veterinary Sciences and Biotechnology and International Conference on "Bridging Science and Society: Biotechnology for Sustainable One Health" held at LUVAS, Hisar, during December 3–5, 2025.

Ms. Hency Rose, PhD Scholar receiving **Best Oral Presentation Award** *at the XII Annual Convention of the Society for Veterinary Sciences and Biotechnology and International Conference*

21. **Poornima,** Ashish Kumar Singh, Heena Sharma, P. N. Raju, Sumit Arora and Praveen Kumar Tiwari received **Best Oral Presentation Award** at the International Conference on Global Research Initiatives for Agriculture, Science and Technology (GRIAST-2025) held at IGKV, Raipur, during January 20–22, 2025.
22. **Soumya Sangam** received the **Best Oral Presentation Award** at the International Conference on "Recent Advances in Food Science and Technology: A Way Forward" for the presentation titled "Recent Advances in Food Science and Technology", organized by DSLD CHEFT and Karnataka Science and Technology Academy, during January 22–24, 2025.
23. **Soumya Sangam** received the **Best Oral Presentation Award** at the XII Annual Convention of the Society for Veterinary Sciences and Biotechnology (SVBT) and International Conference for the presentation titled "Integrative metagenomic and metabolomic analysis of milk fat globule membrane from Sahiwal, Jamunapari and human in DSS-induced colitis mice model", held at LUVAS, Hisar, during December 3–5, 2025.
24. **Soumya Sangam** received the **Best Oral Presentation Award** at the XII Annual Convention of the Society for Veterinary Sciences and Biotechnology (SVBT) and International Conference for the presentation titled "Milk fat globule membrane from cow, goat and human differentially modulate LGG: proteomic insights from human MFGM", held at LUVAS, Hisar, during December 3–5, 2025.

Ms. Soumya Sangam, ICAR-NDRI student receiving Best Oral Presentation Award in the National Conference of the Indian Society for Sheep and Goat Production and Utilization (ISSGPUCON 2025)

25. **Soumya Sangam** received the **Best Oral Presentation Award** in the National Conference of the Indian Society for Sheep and Goat Production and Utilization (ISSGPUCON 2025), on Transforming Small Ruminant Production: Empowering Precision Farming and Genomic Innovations for Enhanced Productivity and Sustainable Development, held at ICAR-CIRG, Mathura, during March 5–7, 2025.
26. **Nishchal Thakur** and Shilpa Vij received the **Best Oral Presentation Award** at the 66th Annual International Conference and Research Conclave of the Association of Microbiologists of India (AMI) for the presentation titled "Integrating fermentation, peptidomics, and molecular simulations to identify cow colostrum whey-derived antifungal peptides effective against mucormycosis pathogens", held at Dev Bhoomi Uttarakhand University, Dehradun during November 12–15, 2025.
27. **Nishchal Thakur,** Mohammad Rizwan, and Shilpa Vij received the **Best Oral Presentation Award** at the Xth International Conference GRISAAS-2025 for the presentation titled "Cow colostrum-derived lactoferrin and colostrum whey-derived peptides fermented with probiotic Lacticaseibacillus rhamnosus C25: An anti-mucor study", held at MPUAT, Udaipur during October 5–7, 2025.
28. **Maiti S.,** Manjunath K.V., Garai S., Kumar R., Mondal G., Aggarwal A., and Sankhala G. received the **Best Oral Presentation Award** for the paper titled "NDRI Climate Services: An Extension Model for Promoting Climate Smart Dairy Farming in Haryana" at the 12th National Seminar on "Futuristic Agriculture: Technology, Sustainability and Beyond" organized by MOBILIZATION in collaboration with CAU Imphal and ICAR-Research Complex for NEH Region, Umiam, Meghalaya, India, May 22–24, 2025.
29. **Garai S.,** Lakshmi S., Veldandi A., Maiti S., Panja A., and Sankhala G. received the **Best Oral Presentation Award** for the paper titled "Achieving Dairy Aspiration in Climate Realities: Women-Centric Climate Adaptation Plan for Rural Haryana using Fuzzy Cognitive Approach" at the 12th National Seminar on "Futuristic Agriculture: Technology, Sustainability and Beyond" organized by MOBILIZATION in collaboration with CAU Imphal and ICAR-Research Complex for NEH Region, Umiam, Meghalaya, India, May 22–24, 2025.
30. **Veldandi A.,** Zade S., Panja A., Sirilakshmi Y., Pavan P., Garai S., and Maiti S. received the **Best Oral Presentation Award** for the paper titled "Cognitive Mapping of Perceived Climate Resilience of Dairy Production System of Women Dairy Farmers in Coastal Region of Andhra Pradesh" at the 2nd International Conference on "Frontiers in Science and Technology for Agricultural Transformation" held at ICAR-National Academy for Agricultural Research Management, Hyderabad, India, September 25–26, 2025.
31. **Ms. Diksha Sharma** received **Best Oral Presentation Award** for the paper titled "Therapeutic Potential of Milk Fat Globule Membrane in Restoring Metabolic, Reproductive, and Bone Health in Polycystic Ovary Syndrome" authored by Diksha Sharma, Rajeev Kapila and Suman Kapila at the 12th International Conference on Emerging Issues in Agricultural, Food Technology, Biological & Applied Sciences for Global Development (EIAFTBASGD) held at Maharana Pratap University of Agriculture and Technology, Udaipur, Rajasthan, India, during November 15–17, 2025.
32. **Dr. Sohan Vir Singh** along with Apeksha Ukey, T. Satpute, P. Singh and M. Vaidya received **Best Oral Presentation Award** for the research titled "Exploring the Impact of Similar Range of Temperature–Humidity Index on Testicular Thermal Profiles and Semen Quality Parameters of Murrah Bulls under Heat Stress" at the National Conference of Indian Society for Buffalo Development on "Buffalo Production and Health in a Changing Climate: Innovations for a Resilient Future" organized at ICAR–IVRI, Izatnagar, Uttar Pradesh, India, during December 15–16, 2025.
33. **Rubina K. Baithalu** received **Best Oral Presentation Award** at the International Symposium and XXXX Annual Convention of ISSAR held at Rajiv Gandhi Institute of Veterinary Education & Research, Puducherry, during December 10–12, 2025.
34. **Chanchal Rana,** PhD student under Dr. S. De, received the **Best Oral Presentation Award** for the paper titled *"Global Prevalence Pattern of Antimicrobial Resistance in Extended Spectrum Beta-lactamase-Producing E. coli"* at the *XII Annual Convention of the Society for Veterinary Sciences and Biotechnology (SVSBT) and International Conference on "Bridging Science and Society: Biotechnology for Sustainable One Health"* held at LUVAS, Hisar, Haryana, **December 3–5, 2025.**
35. **Jahnvi Ahlawat,** MSc student under Dr. J.K. Kaushik, received the **Best Oral Presentation Award** for the paper titled *"Optimizing Recombinant Expression and Purification of Self-cleaving Buffalo SAS1B: Challenges and Insights"* at the *International Conference on "Innovations in Science and Technology: A Perspective of Viksit Bharat @ 2047"* organized by Deen Dayal Upadhyaya College, University of Delhi, **March 19–20, 2025.**
36. **Diksha Sethi,** PhD student under Dr. D. Malakar, received the **Best Oral Presentation Award** for the paper titled *"CRISPR/Cas9-Mediated MSTN Knock-In of Human Erythropoietin Gene for Generation of Transgenic Goat Embryos via SCNT"* at the *5th Biotechnology Conclave cum International Conference on "Harnessing Biotechnology for*

Sustainable BioE3 Future" held at UCB, Patwadangar, Nainital, Uttarakhand, **November 19–21, 2025.**

37. **Nidhi Kumari,** PhD student under Dr. Dharmendra Kumar (CIRB), received the **Best Oral Presentation Award** at the *ISSGPUCON 2025 Conference* held at ICAR-Central Institute for Research on Goats (CIRG), Mathura, India, **February 5–7, 2025.**
38. **Ramprasad,** PhD student under Dr. Sonika Ahlawat (NBAGR), received the **Best Oral Presentation Award** for the paper titled *"Integrating Multiomics to Understand the Genetic Basis of High-Altitude Adaptation in Changthangi Goats"* at the *ISSGPUCON 2025 Conference* held at ICAR-Central Institute for Research on Goats (CIRG), Mathura, India, **February 5–7, 2025.**
39. **Mukund A. Kataktalware,** Uppiretla Tony, Priyanka Meena, Umang Vashisth, Menon Rekha Ravindra, Sakthivel Jeyakumar, M. Sivaram, Letha Devi G. and Arindam Dhali received **Best Presentation Award** for the research titled "AI-Driven Multimodal Systems for Proactive Lameness Detection in Crossbred Dairy Cattle under Indian Production Systems" at the 7th Annual Convention and National Conference of the National Academy of Veterinary Nutrition and Animal Welfare jointly organized by ICAR-NIANP and the National Academy of Veterinary Nutrition and Animal Welfare, held at Bengaluru, India, during October 16–17, 2025.
40. **Ameenabenazir P.,** Monika Sharma, Menon Rekha Ravindra and Devaraja H. C. received **Best Oral Presentation Award** for the research titled "Comparative study on ultrasound and microwave-assisted extraction of phospholipids from industrial ghee residue" at the International Conference on "Recent Trends in Transforming Global Production Systems: Cutting-Edge Technologies in Penta 'F' (Food, Fibre, Feed, Fuel and Fertilizers)" organized by Thiagarajar College, held at Madurai, Tamil Nadu, India, during December 18–19, 2025.
41. **Amandeep S.,** Devaraja H. C. and Monika Sharma received **Best Oral Presentation Award** for the research titled "Development of active vitamin B12 rich ready to drink composite fruit beverage" at the 8th AMIFOST International Conference on "The Future of Food Science and Technology: Innovation, Sustainability and Health" organized at Amity University, Noida, Uttar Pradesh, India, during March 27–28, 2025.
42. **Arulkumar M.,** Nidawanbiang Najiar, Amandeep Singh and Devaraja H. C. received **Best Oral Presentation Award** for the research titled "In-situ produced Vitamin B12 rich ready to reconstitute Nutri mix" at the 9th International Conference on "Advances in Agricultural, Biological and Biodiversity Conservation for Sustainable Development (ABCD)" organized at University of Mysore, Karnataka, India, during November 13–15, 2025.
43. **Helna Pious** *et al.* received **Best Oral Presentation Award** for the research titled "Physico-chemical, textural and nutritional characteristics of skim milk yogurt organogel" at the International Conference on "Recent Advances in Food Science and Technology: A Way Forward" organized by DSLD-CHEFT, held at Haveri, Karnataka, India, during January 22–24, 2025.
44. **Dr. Saroj Rai** received **Best Oral Presentation Award** at the 14th National Symposium on Coastal Agriculture (NSCA) on *"Harnessing Fragile Coastal Ecosystems for Food and Environmental Security"*, organized at ICAR–Central Research Institute for Jute and Allied Fibres from February 28 to March 3, 2025.

8. Other Individual Awards and Recognition

A. National Technology Recognition and ICAR Technology Recognition

1. The ICAR–NDRI technology titled "A New Strip-Based Test for Detection of Urea in Milk" was recognized among the **Top Five Technologies in the Animal Science Division** in 2025.The certificate was received by Dr. Rajan Sharma, Joint Director (Research), from Shri Shivraj Singh Chouhan, Hon'ble Union Minister of Agriculture & Farmers Welfare and President of the ICAR Society, during the 96th ICAR Foundation Day celebrations held in New Delhi.
2. Naresh Kumar, Kriti Dua, Bhawani N., and Raghu H. V. received an ICAR Technology Certificate for the technology titled "Strip-based technology for early detection of sub-clinical and clinical mastitis" during ICAR Foundation Day, held at New Delhi on July 16, 2025 (ICAR-AS-NDRI-2025-029).
3. Naresh Kumar, A. Khan, S. Arora, Raghu H. V., M. Balhara, P. K. Sharma, and S. Shaikh received an ICAR Technology Certificate for the technology titled "Spore-based kit for detection of antibiotic residues in milk at dairy farm" during ICAR Foundation Day, held at New Delhi on July 16, 2025 (ICAR-AS-NDRI-2025-032).
4. Naresh Kumar, N. Tehri, R. Gopaul, P. K. Sharma, and Raghu H. V. received an ICAR Technology Certificate for the technology titled "Paper strip assay for rapid detection of pesticide residues" during ICAR Foundation Day, held at New Delhi on July 16, 2025 (ICAR-AS-NDRI-2025-031).
5. Naresh Kumar, Anand S. P., Shukla R., Suman, P. K. Sharma, and Raghu H. V. received an ICAR Technology Certificate for the technology titled "Paper strip-based assay for detection of antibiotic residues in milk" during ICAR Foundation Day, held at New Delhi on July 16, 2025 (ICAR-AS-NDRI-2025-030).

6. Dr. Subhasis Mandal received a Co-Developer Certificate for the ICAR technology titled "A Modified Spectral Index Approach for Delineating Coastal Soil Salinity" (ICAR–NRM–CSSRI–2025–107), developed in collaboration with Dr. U. K. Mandal (Lead Developer), Dr. T. D. Lama, Dr. D. Burman, Dr. K. K. Mahanta, and Dr. S. Rout in 2025.
7. Dr. Subhasis Mandal received a Co-Developer Certificate for the ICAR technology titled "A Novel System for Boosting Land Productivity and Income of Smallholder Farmers by Intercropping Vegetables in Waterlogged Paddy Fields (Rice + Veg Tech)" (ICAR–NRM–CSSRI–2025–046), developed in collaboration with Dr. M. Maniruzzaman, Dr. M. Mainuddin, Dr. J. C. Biswa, Dr. R. W. Bell, Dr. M. B. Hossain, Dr. P. L. C. Paul, Dr. Md. J. Kabir, Dr. S. Digar, Dr. S. Mandal, Dr. B. Maji, Dr. D. Burman, Dr. U. K. Mandal, and Dr. K. K. Mahanta in 2025.

B. Editorial Appointments, National Committee Memberships and Professional Assignments

1. Dr. P. Barnwal served as Chairman, BIS Dairy Equipment Sectional Committee (FAD 33).
2. Dr. Raghu H. V. served as Member, FAD 19/Panel IV 'Review of Indian Standards on Dairy Products', Bureau of Indian Standards, New Delhi, in 2025.
3. Dr. Raghu H. V. served as Committee Member, ISO/TC 34/SC 9/WG 33 – "Detection of Cronobacter" (BIS Appointee), in 2025.
4. Dr. Diwas Pradhan served as Member, FAD 31 (Food & Agriculture Division), Sectional Committee, Bureau of Indian Standards, New Delhi, in 2025.
5. Dr. Chitranayak and Dr. P. S. Minz served as Members, BIS Dairy Equipment Sectional Committee (FAD 33).
6. Dr. Chand Ram served as a Member of the Editorial Board of the International Journal of Medical and Allied Health Sciences (ISSN: 2583-1879) in 2025.
7. Dr. Sadeesh E. M. was appointed as an Editorial Board Member for the journal Molecular Biology Reports (Springer Nature) for an initial term of two years, effective July 2025.
8. Dr. Subhasis Mandal was nominated as Associate Editor of the journal "Agricultural Economics Research Review", effective January 20, 2025.

C. Academic and Professional Nominations, Administrative Responsibilities and Professional Assignments

1. Dr. Subhasis Mandal, Principal Scientist & Head, DES&M Division, was nominated as a Member of the **42nd Advisory Committee/Governing Body of AERC**, Visva-Bharati University, Shantiniketan, West Bengal, in 2025.
2. Dr. A. K. Sharma was nominated as a Member (Alumni/Industry Professional) of the Board of Undergraduate Studies in Statistics and Operations Research at Kurukshetra University, Kurukshetra, for a two-year tenure effective from April 2025.
3. Dr. Shilpa Vij, Principal Scientist & Head, Dairy Microbiology Division, served as Nodal Officer, Women's Grievance Redressal Committee, ICAR–NDRI, Karnal, in 2025.
4. Dr. Diwas Pradhan served as Treasurer, Probiotics Association of India (PAi), in 2025.
5. Dr. Sohan Vir Singh's Ph.D. student Dr. Apeksha Ukey received **Young Scientist Award** conferred by the Society of Agriculture, Allied Sciences and Technology during the Second International Conference on Modern Agriculture and Allied Sciences (ICMAAS–2025) organized at West Bengal University of Animal and Fishery Sciences (WBUAFS), Kolkata, West Bengal, India, during December 20–21, 2025.
6. Dr. Raghu H. V., Senior Scientist, Dairy Microbiology Division, was appointed as External Examiner for the 10th Food Analyst Practical Examination conducted by Food Safety and Standards Authority of India (FSSAI), New Delhi, in 2025.
7. Dr. Raghu H. V., Senior Scientist, Dairy Microbiology Division, served as Technical Manager, Microbiology Section, NRCMQS, ICAR–NDRI, Karnal for **NABL accreditation activities under ISO/IEC 17025:2017** NABL accreditation activity as per ISO 17025:2017, up to August 12, 2025.

D. Thesis Awards

1. **H. K. Rohit** received **Second Ph.D. Thesis Award** at the 14th IDEA Convention & National Seminar on 'Engineering Challenges & Strategies for Sustainable Growth in Dairy & Food Processing' held at VKIDFT, KVASU, Mannuthy, Kerala, during May 8–9, 2025.
2. **Dr. Sohan Vir Singh's** Ph.D. student Dr. Apeksha K. Ukey received the **PPKS Best Ph.D. Thesis Award** conferred by the National Academy of Veterinary Nutrition and Animal Welfare during the 7th Annual Convention and National Conference organized at ICAR–NIANP, Bengaluru, Karnataka, India, during October 16–17, 2025.
3. **Dr. Sohan Vir Singh's** M.V.Sc. student Dr. Roohani Sharma received the **Sushila Memorial Award for Best M.V.Sc. Thesis** conferred by the National Academy of Veterinary Nutrition and Animal Welfare during the 7th Annual Convention and National Conference organized at ICAR–NIANP, Bengaluru, Karnataka, India, during October 16–17, 2025.
4. **Dr. Alok Kumar** received **APA Best Ph.D. Thesis Award** (Major Advisor: Dr. Nishant Kumar) at

the 5th Annual Conference of Animal Physiology Association and National Symposium on "Next Generation Physiological Approaches for Climate Adaptive Livestock Production (APACON-2025)" held at KVAFSU, Bidar, Karnataka, in 2025.

5. **Dr. Dileep Kumar Yadav** received the **Best Ph.D. Thesis Award** (Major Advisor: Dr. Nishant Kumar) at the 4th International Conference on Recent Advances in Agriculture, Food Security, Veterinary and Allied Sciences for Livelihood and Environmental Sustainability held at University of Agricultural Sciences, Raichur, Karnataka, during April 25–27, 2025.
6. **Saurabh (M.Tech., Dairy Engineering)** received the **Best Thesis Award** at the 14th IDEA Convention and National Seminar organized at Verghese Kurien Institute of Dairy and Food Technology (VKIDFT), KVASU, Mannuthy, Thrissur, Kerala, India, during May 8–9, 2025.
7. **Harneet Kour** received the **Dr. S.K. Ranjhan Best Doctorate Thesis Award** conferred by the Animal Nutrition Society of India (ANSI) at the 21st Biennial International Conference (ANSICON) held at ANDUAT, Kumarganj, Ayodhya, Uttar Pradesh, November 19–21, 2025.

E. Appreciation / Honour / Invited Lectures / Session Chairmanship

1. **Dr. Raghu H. V.** received a **Certificate of Appreciation** from WBUAFSASNETCON-2025, the 12th International Conference on "Fermented Foods, Health Status and Social Well-being", for contributing as a speaker in the technical session, held during December 19–20, 2025.
2. **Dr. Raghu H. V.** delivered an **Invited Extramural Lecture** titled "Direct Vat Set Starters Production by Spray Drying: Boon to Dairy Sector" at the Faculty of Science, Maharaja Sayajirao University of Baroda, Vadodara, on November 24, 2025.
3. **Rubina K. Baithalu** received an **Appreciation Certificate** for delivering an expert lecture titled "Biomolecules Discovery in Biofluid for Developing Diagnostic Assay for Effective Monitoring of Reproductive Health of Dairy Animals" at the 10 Days International e-Refresher Course on "Latest Innovative Reproductive Techniques in Veterinary Science" organized by Bihar Animal Sciences University, Patna, during April 21–30, 2025.
4. **Rubina K. Baithalu** received a **Certificate of Honour** for serving as Co-Chairman in a technical session at the International Symposium and XXXX Annual Convention of ISSAR held at Rajiv Gandhi Institute of Veterinary Education & Research, Puducherry, during December 10–12, 2025.
5. **Harneet Kour** received an **Appreciation Certificate for Innovative Research Work** for outstanding contribution in Dairy Production at the *21st Convocation of ICAR-NDRI*, **April 22, 2025.**
6. **Dr. Sanjeev Kumar** served as **Co-Chairman of a Technical Session** at the 10th International Conference on "Global Research Initiatives for Sustainable Agriculture & Allied Sciences (GRISAAS)", held at Udaipur, during October 5–7, 2025.

9. Awards on Hindi Publications

1. **Neelam Purohit**, Indu Devi, Ankita Bhosale and Pawan Singh received **First Prize (Excellent Hindi Article Publication)** for the article titled "Effect of Drinking Water Temperature on Dairy Animals Production Performance" published in *Dugdh Ganga* Rajbhasha Magazine, in 2025.
2. **Sanjeet Kumar Verma**, Indu Devi, H. P. Kour and Radha Mittal received **First Prize (Excellent Hindi Article Publication)** for the article titled "Advanced Methods for Animal Identification" published in *Dairy Samarika* Magazine, in 2025.
3. **Kiran Goyat**, Gurdeep Singh, Ankit Deep and Nishant Kumar received **First Prize (Hindi Shodh Patra Poster Pratiyogita)** at the Rajbhasha Vibhaag event organized at ICAR-NDRI, Karnal, on September 23, 2025.
4. **Kiran Goyat**, Gurdeep Singh, Ankit Deep, Nishant Kumar and Chitranayak Sinha received **First Best Poster Presentation Award (Hindi)** for the poster titled "Portable Vigalan Upkaran: Dugdh Pashupalan me Prajanan Dakshata ki Kunji" at the Rajbhasha Pakhwara organized at ICAR-NDRI, Karnal, on September 23, 2025.
5. **Dr. Sohan Vir Singh** along with Nirmal Singh and Rajkumar received **First Prize in Hindi Poster Presentation Competition** for the poster titled "Technological Intervention for Enhancing Farmers' Income under Farmer FIRST Project" during Hindi Pakhwada organized at ICAR–Central Soil Salinity Research Institute (CSSRI), Karnal, Haryana, India, during September 14–18, 2025.
6. भा.कृ.अनु.प.–राष्ट्रीय डेरी अनुसंधान संस्थान, करनाल की वैज्ञानिक एवं तकनीकी विषयों पर हिंदी में प्रकाशित प्रकाशनों की पुरस्कार योजना के अंतर्गत "पुस्तिका श्रेणी" में डॉ. अजय कुमार डांग, डॉ. हीना शर्मा, डॉ. चाँद राम एवं डॉ. आदेश कुमार शर्मा द्वारा प्रकाशित "दूध में दैहिक कोशिकाओं की संख्या कम करने और उच्च गुणवत्ता प्राप्त करने के लिए प्रयासों का पैकेज" नामक पुस्तिका को प्रथम पुरस्कार प्रदान किया गया।
7. **Indu Devi and S. K. Verma** received **Second Prize (Hindi Poster Presentation)** for the poster title "Bovine Biometrics for Individual Animal Identification Using Muzzle Images" at the Hindi Pakhwada 2025 organized at ICAR-NDRI, Karnal, in 2025.
8. **Dr. Sohan Vir Singh** received **Second Prize under the Excellent Hindi Article category** for the article title "पशुधन पर मौसम की चरम घटनाओं का प्रभाव और उनकी सुधारात्मक रणनीतियाँ" during Hindi Diwas Programme organized at ICAR–NDRI, Karnal, Haryana, India, on September 22, 2025.

9. **Dr. Sohan Vir Singh** along with Nikita Bhalkiya, Pawan Singh, Gaurav Kumar and Apeksha Ukey received **Second Prize under Excellent Hindi Article category** for the article titled "भूतापीय ऊर्जा: पृथ्वी का सर्वोत्तम उपहार" during Hindi Diwas Programme organized at ICAR–NDRI, Karnal, Haryana, India, on September 22, 2025.
10. **Shruti Arya,** Indu Devi, D. S. Tomar and Radhika Warhade received **Third Prize (Excellent Hindi Article Publication)** for the article titled "Role of Renewable Energy in Dairy Farming: Need of Hour" published in *Dugdh Ganga* Rajbhasha Magazine, in 2025.
11. **डॉ. ए. के. शर्मा** एवं सह-लेखकों को भा.कृ.अनु.प.–राष्ट्रीय डेरी अनुसंधान संस्थान, करनाल में हिंदी पखवाड़ा (सितंबर 23, 2025) के दौरान आयोजित हिंदी शोधपत्र/पोस्टर प्रतियोगिता में "सौर ऊर्जा आधारित AI नियंत्रित स्वचालित तापीय मॉड्यूलेशन प्रणाली तथा समन्वित गुणवत्ता निगरानी इकाई" शीर्षक पोस्टर के लिए तृतीय पुरस्कार प्रदान किया गया।
12. **Ankit**, Shaik Abdul Hussain, Ajay Yadav and Rajesh Kumar Bajaj received the **Third Best Poster Presentation Award** for the paper titled "दूध प्रोटीन आधारित संपुटित करक्यूमिनॉइड्स पूरकता का पनीर की गुणवत्ता पर प्रभाव" in the Hindi Poster Presentation Competition organized by Hindi Cell, ICAR-NDRI, Karnal, on September 23, 2025.
13. **Arijit Ray**, Chitranayak, J. K. Dabas, P. S. Minz, Khushbu Kumari, Kiran Goyat and A. K. Sharma received **Third Best Poster Presentation Award (Hindi)** for the poster titled "Saur Urja Aadharit AI Niyantrit Swachalit Tapiya Modulation Pranali tatha Samanvit Gunavatta Nigarani Ekayee" at the Rajbhasha Pakhwara organized at ICAR-NDRI, Karnal, on September 23, 2025.
14. **Dr. Bharati Pandey** received the **Hindi Publication Award** for the article titled "डेयरी फार्मों में कृत्रिम बुद्धिमत्ता (AI) के उदाहरण और अवसर" published in *Dugdh Ganga* (ICAR-NDRI, Karnal), Issue 13(1), pp. 80–82 (2023), awarded in 2025.

10. Professional Appointments, Nominations and Expert Assignments

1. **Dr. Rajan Sharma** served as a Member, Expert Committee of Food Safety and Standards Authority of India.
2. **Dr. Santanu Banik** served as a Member, National Advisory Committee for Animal Husbandry and Dairying (Piggery Sector), Ministry of Fisheries, Animal Husbandry and Dairying, Government of India**.**
3. **Dr. Mohan Mandal** was nominated as a Member of the Indian Expert Panel for the Indo–UK Joint Panel to review proposals under the Farm Animal Disease & Health (FADH) programme of DBT, Government of India, for a three-year term.
4. **Dr. Chander Datt** serves as Vice President (North Zone) of the Animal Nutrition Society of India**.**
5. **Dr. Mohan Mandal** served as a Government of India–nominated Member of the Institutional Biosafety Committee (IBSC), IIT Kharagpur**.**
6. **Dr. Santanu Banik** serves as a Member, General Body, Paschim Banga Go-Sampad Bikash Sanstha, West Bengal**.**
7. **Dr. Chander Datt** served as a Member of the Institute Management Committee of ICAR–Central Institute for Research on Buffaloes (ICAR-CIRB), Hisar, Haryana, during its meeting held on December 16, 2025.
8. **Dr. Sachin Kumar** was invited as an expert to deliver a talk titled *"Sustainable Family Farming in Livestock to Achieve the SDGs in South Asia: Challenges and Opportunities"* at the SAARC Expert Consultation Meeting on *"UN Decade of Family Farming 2019–2028: Sustainable Family Farming in Livestock Sector for Attaining the SDGs in South Asia"* held at Kathmandu, Nepal, during August 11–13, 2025.
9. **Dr. Mohan Mandal** served as a Mentor (Physiology & Medicine Category) for young researchers under the Lindau Nobel Laureate Meetings Mentoring Programme.

Hon'ble Shri Shivraj Singh Chauhan, Union Minister of Agriculture and Farmers Welfare & Rural Development, Government of India and other dignitaries along with students and faculty of the Dairy Extension Division, winner of the best division award in 21st Convocation of ICAR-NDRI on April 22, 2025

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PUBLICATIONS

Animal Biotechnology

Sr. No.	Research Papers	Impact factor	NAAS rating
1.	Behera, M., Singh, P., Verma, A. K., De, S., & Ghorai, S. M. (2025). Activity of GS-linked chimeric endolysin CHAPk-SH3bk against methicillin-resistant Staphylococcus aureus biofilms: an in-vitro, ex-vivo and in-vivo study. *npj Biofilms and Microbiomes*, *11*(1), 94.	9.20	-
2.	Gaur, V., Kashyap, P., Chera, J. S., Josan, F., Patel, A., Karanwal, S., Yadav, S., Chauhan, V., Badrhan, S., Bhakat, M., Kumaresan, A., & Kumar, R. (2025). Lectin based differential profiling of sperm membrane glycans for assessment of buffalo (*Bubalus bubalis*) bull fertility. *International Journal of Biological Macromolecules*, *313*, 143955.	8.50	14.50
3.	Singh, S. K., Kumar, R., Vats, P., Gangwar, D. K., Mathur, M., Rani, R., Kaushik, j. k., Mohanty, A. K., & Kumar, S. (2025). Aptamer-based selective enrichment of X and Y sperm: A new frontier in livestock breeding. *International Journal of Biological Macromolecules*, 147816.	8.50	14.50
4.	Behera, M., De, S., & Ghorai, S. M. (2025). The synergistic and chimeric mechanism of bacteriophage endolysins: opportunities for application in biotherapeutics, food, and health sectors. *Probiotics and Antimicrobial Proteins*, *17*(2), 807-831.	4.40	10.40
5.	Selokar, N. L., Singh, P., Jose, B., Gautam, D., Patel, K., Verma, R., De, S., Singh, M. K., & Singh, D. (2025). A Myostatin (mstn−/−) knockout buffalo produced by CRISPR-CAS9 mediated genome editing and somatic cell nuclear transfer. *The CRISPR Journal*, *8*(6), 436-442.	4.00	-
6.	Vats, P., Kumar, R., Kumar, R., Kaushik, J. K., Mohanty, A. K., & Kumar, S. (2025). Deciphering the role of MFGE8 in lactation using CRISPR-CAS9 based gene editing in Buffalo mammary epithelial cells. *Scientific Reports*, *15*(1), 30194.	3.90	9.90
7.	Pal, A., Karanwal, S., Habib, M. A., Josan, F., Gaur, V., Patel, A., Garg, M., Bhakat, T., Datta & Kumar, R. (2025). Extracellular vesicles in seminal plasma of Sahiwal cattle bulls carry a differential abundance of sperm fertility-associated proteins for augmenting the functional quality of low-fertile bull spermatozoa. *Scientific Reports*, *15*(1), 3587.	3.90	9.90
8.	Selokar, N. L., Singh, M. K., Tripathi, G., Patel, K., Verma, R., Singh, P., Aswal, A., & Chauhan, M. S. (2025) Birth of India's first cloned cattle and analysis of its health and reproduction status: A case study. *Scientific Reports*, 15, 26957.	3.90	9.90
9.	Pandey, B., & Singh, M. (2025). DeepBovC2H2-ZF: deep learning-guided prediction and molecular dynamics validation of C2H2 zinc finger transcription factors in Bovidae. *Journal of Genetic Engineering and Biotechnology*, *23*(4), 100620.	3.60	8.80
10.	Pandey, B., Sonkusale, L., & Mishra, A. K. (2025). Computational strategies for elucidating plant disease resistance proteins. *Physiological and Molecular Plant Pathology*, 102940.	3.30	9.30
11.	Solanki, S., Kumar, A., Kashyap, P., Kumar, R., & Datta, T. K. (2025). Bovine β-defensin 129 (BBD129) polymorphisms associated with differential posttranslational O-glycosylation and phosphorylation modifications perturb the sperm functions and their fertilizing potential. *Animal Reproduction Science*, 107996.	3.30	9.30
12.	Chera, J. S., Gaur, V., Kumar, A., Josan, F., Patel, A., Yadav, S., Verma, P., Verma, V., Kumar, S., Bairagi, A. K., Kamal, S., Datta, T. K., & Kumar, R. (2025). Surface N-or O-linked glycans on bovine spermatozoa play minimal role in evading macrophage mediated phagocytosis. *Frontiers in Veterinary Science*, *12*, 1550100.	2.90	8.90

Sr. No.	Research Papers	Impact factor	NAAS rating
13.	Bhushan, V., Parashar, A., Mahanandia, N. C., Mohanty, T. K., Kaushik, J. K., Kumar, S., & Mohanty, A. K. (2025). Evaluation of aptamers binding ability towards bovine X-specific sperm. *Molecular Biology Reports*, *52*(1), 619.	2.80	8.80
14.	Singh, S. K., Mathur, M., Kamboj, H., Kaushik, J. K., Mohanty, A. K., & Kumar, S. (2025). Deciphering aptamer-protein interactions for bovine sperm sorting through in silico and in vitro studies. *Molecular Biology Reports*, *52*(1), 300.	2.80	8.80
15.	Pandey, B., Shelke, R., Tripathi, G., Singh, M. K., & Selokar, N. L. (2026). Applications of artificial intelligence in bovine reproductive assessment: focus on oocytes and blastocysts. *Journal of Assisted Reproduction and Genetics*, *43*(3), 689-714.	2.70	8.70
16.	Anand, V. J., Jaswal, S., Jena, M. K., Kumar, S., Kaushik, J. K., & Mohanty, A. K. (2025). Novel interacting partners of MGP-40, a chitinase-like protein in buffalo mammary epithelial cells. *Cell Biochemistry and Biophysics*, *83*(2), 2127-2137.	2.50	8.50
17.	Kumar, R., Vats, P., Panchal, P., & Kumar, S. (2025). Phospholipases: paving the way for a new life. *Reproductive Sciences*, *32*(7), 2080-2097.	2.50	-
18.	Pandey, B., & Singh, R. (2025). Evaluation of ADP Glucose pyrophosphorylase subunit interaction in wheat by binding free energy calculations. *Molecular Biotechnology*, 1-15.	2.50	8.50
19.	Behera, M., Singh, G., De, S., & Ghorai, S. M. (2025). Molecular Docking and molecular dynamics simulation insight of Amidase_2 endolysin domain as an antifungal enzyme. *Chemistry Africa*, *8*(2), 487-503.	2.20	-
20.	Pal, P., Aggarwal, A., Josan, F., Grewal, S., Deb, R., & De, S. (2025). Field validation of an in-house epitope-specific ELISA for age-specific profiling of anti-müllerian hormone in indigenous cows (Bos indicus). *Proceedings of the Indian National Science Academy*, 1-10.	2.10	8.10
21.	Mahajan, D., Sarova, N., Rustagi, J., Prajapati, S., Kaushik, J. K., Mohanty, A. K., Jena, M. K., & Kumar, S. (2025). Strategic truncation improves recombinant expression of buffalo Fibulin-5 (FBLN5) in Escherichia coli. *Protein Expression and Purification*, 106858.	1.20	7.20
22.	Singh, M. K., Ritika, Krishnaveni, P., Shavi, & Selokar, N. L. (2025). Epigenetic modifiers oxamflatin and ascorbic acid modulate the proliferation, viability, and gene expression in buffalo foetal fibroblast cells. *Acta Scientific Veterinary Sciences,* 7.9, 02-14.	1.00	-
23.	Shavi, Ritika, Tripathi, G., Selokar, N. L., & Singh, M. K. (2025). Aquaporin gene expression in cultured buffalo cumulus and fibroblast cells. *Indian Journal of Animal Research,* 1-7.	0.50	6.50
24.	Tripathi, G., Gupta, S., Rinka, K., Gupta, T., Selokar, N. L., & Singh, M. K., (2025). MicroRNA-449b reduces methylation and apoptosis-related gene expression in fibroblast cells containing human insulin gene. *Indian Journal of Animal Research*. 10.18805/IJAR.B-5478	0.50	6.50
25.	Vats, P., Rawat, N., Singh, M. K., & Chauhan, M. S. (2025). Expression of pluripotency-related genes in goat transgenic embryos with GFP genes targeted at the Rosa 26 locus. *International Journal of Advanced Biochemistry Research*, 9(2): 628-632.	-	5.29

Animal Genetics & Breeding

Sr. No.	Research Papers	Impact factor	NAAS rating
1.	Misztal, I., & Gowane, G. (2025). Estimation of heritabilities and genetic correlations by time slices using predictivity in large genomic models. *Genetics*, *230*(2).	5.10	11.10
2.	Ilayaraja, I., Chitra, A., Vyas, J., Kumar, I., Muansangi, L., Singh, S. P., Gowane, G. R., Mukherjee, A., & Mukherjee, S. (2025). Improved genetic evaluation in Karan Fries cattle using multi-trait single-step genomic best linear unbiased prediction method. *Animal, 19*(12), 101692.	4.20	10.20
3.	Muansangi, L., Tiwari, J., Ilayaraja, I., Kumar, I., Vyas, J., Chitra, A., Singh, S. P., Pal, P., Gowane, G. R., Mishra, A. K., Mukherjee, A., & Mukherjee, S. (2025). Differential selection signatures in transboundary Sahiwal cattle. *Scientific Reports, 15*, 15685.	3.90	9.90
4.	Sahana, V. N., Gowane, G. R., Nayee, N., Khan, K. D., Yadav, A., Paul, R., Vohra, V., & Alex, R. (2025). Shared SNP effects across breeds increase the genomic prediction accuracy for numerically small breeds. *Scientific Reports*, *15*(1), 31421.	3.90	9.90

Sr. No.	Research Papers	Impact factor	NAAS rating
5.	Khan, K. D., Alex, R., Yadav, A., Sahana, V. N., Upadhyay, A., Mani, R. V., Kumar, T. S., Pillai, R. R., Vohra, V., & Gowane, G. R. (2025). Optimizing the genomic evaluation model in crossbred cattle for smallholder production systems in India. *Agriculture*, *15*(9), 945.	3.60	9.60
6.	Raja, T. V**.,** Rani, A., Umesh, S., Sushil, K., Kumar, D.A., Sowmya, P., Kesavan, M., Singh R.B., Panchasara, H.H., Kumar, S.A., & Chhaya, R. (2025). Genome-wide scan for SNPs and selective sweeps reveals candidate genes and QTLs for milk production and reproduction traits in Indian Kankrej cattle. *3 Biotech. 15*(4):90.	3.10	8.90
7.	Patil, A., Gaur, P., Pal, P., Alex, R., Chhotaray, S., Gandham, R. K., & Vohra, V. (2026). Genome-wide insights into intermittent milking behavior of Pandharpuri buffalo. *Current Issues in Molecular Biology*, *48*(1), 101.	3.00	9.00
8.	Trujano, Z., Hidalgo, J., Gowane, G., Retallick, K., Garcia, A., Lourenco, D., & Misztal, I. (2025). Impact of genomic selection for growth and carcass traits on foot structure in Angus cattle. *Journal of Animal Science*, *103*, skaf158.	2.90	8.90
9.	Chavan, S. P., Khan, K. D., Yadav, A., Gahlyan, R. K., Vohra, V., Alex, R., & Gowane, G. R. (2025). Exploring genomic signatures of selection for adaptation and resilience in nomadic Belahi cattle in the tropical climate. *Molecular Biology Reports*, *52*(1), 676.	2.80	8.80
10.	Togla, O., Bhardwaj, S., Kadyan, S., Wani, Y. M., Mukherjee, S., & Mukherjee, A. (2025). Mapping copy number variable regions correlated with reproduction and production traits in Karan Fries cattle mammalian genomics. *Mammalian Genome*, *36*(4), 1141-1152.	2.70	-
11.	Das, P., Alex, R., Gowane, G. R., Vohra, V., Paul, D., Khan, K. D., Upadhyay, A., De, S., & Ludri, A. (2025). Chronic heat stress alters metabolic and immune responses in Sahiwal cattle. *International Journal of Biometeorology, 69*, 195–208.	2.60	8.60
12.	Paul, R., Alex, R., Narayanaswamy, S. V., Yadav, A., Khan, K. D., Chavan, S. P., Vohra, V., & Gowane, G. R. (2025). Exploring genetic diversity and population structure of field crossbred cattle using genome-wide SNP markers in Indian conditions. *The Nucleus*, 1-14.	2.60	8.60
13.	Santhosh, A., Vohra, V., Gandham, R. K., Alex, R., & Gowane, G. R. (2025). Mitochondrial genome of Bhadawari buffalo. *BMC Veterinary Research, 21*(1), 202.	2.60	8.60
14.	Vyas, J., Kumar, I., Chitra, A., Ramola, G., Mukherjee, S., Ganguly, I., Mishra, A. K., Singh, P., Chaudhary, U., & Mukherjee, A. (2025). Longitudinal genomic and pedigree inbreeding metrics reveal inbreeding depression in milk quality traits of Sahiwal cattle maintained in organised herd. *The Nucleus*, https://doi.org/10.1007/s13237-025-00611-9	2.60	8.60
15.	Gurao, A., Kumar, A., Kumari, N., Vasisth, R., Mukesh, M., Vohra, V., Kumar, S., Kumar, N., & Kataria, R. S. (2025). Identification of most stably expressed internal control genes for normalization of target gene expression in buffalo skin tissue. *Environmental and Molecular Mutagenesis*.https://doi.org/10.1002/em.70038	2.30	8.30
16.	Rahim, A., Chaudhary, R., Pourouchottamane, R., Chauhan, P., Rajaravindra, K. S., Gowane, G. R., & Kumar, A. (2026). Genetic parameters for direct and maternal effects on pre-weaning growth and efficiency-related traits in inter-cross lamb. *Journal of Animal Breeding and Genetics*, *143*(1), 1-12.	1.90	7.90
17.	Surati, U., Niranjan, S. K., Pundir, R. K., Koul, Y., Vohra, V., Gandham, R. K., & Kumar, A. (2026). Comprehensive whole genome sequence analysis unravels QTLs and genes under selection in Indian native riverine buffalo. *Genome*, *69*, 1-10.	1.80	7.70
18.	Mahar, K., Gurao, A., Kumar, A., Chitkara, M., Gowane, G. R., Ahlawat, S., Niranjan, S. K., Pundir, R. K., Arora, R., Kataria, R. S., & Dige, M. S. (2025). Genomic insights into high-altitude adaptation and evolutionary dynamics of Indian yaks in the Trans-Himalayan region. *Conservation Genetics*, *26*(1), 49-62.	1.70	7.70
19.	Gowane, G. R., Alex, R., Worku, D., Mukherjee, A., & Vohra, V. (2025). Optimizing multi-breed joint genomic prediction for sex-limited traits. *Tropical Animal Health and Production, 57*, 149.	1.70	7.70
20.	Priyadharshini, P., Rani, A., Gopal, G., Sabyasachi, M., Lalremruati, P. C., Vikas, V., & Raja, T. V. (2025). Genetic analysis of novel resilience indicators for heat stress-induced milk loss in Indian Sahiwal cattle. *Tropical Animal Health and Production*, *57*(9), 494.	1.70	7.70
21.	Vyas, J., Kumar, I., Chitra, A., Mukherjee, S., Ganguly, I., & Mukherjee, A. (2025). Variation in genetic diversity evaluated under different breeding schemes in Sahiwal herd. *Tropical Animal Health and Production*, *57*(7), 318.	1.70	7.70

Sr. No.	Research Papers	Impact factor	NAAS rating
22.	Rahim, A., Rajaravindra, K. S., Chaudhary, R., Pourouchottamane, R., Chauhan, P., Gowane, G. R., & Kumar, A. (2025). Comparison of different models for the estimation of genetic parameters of wool traits in intercross sheep. *Small Ruminant Research*, *245*, 107462.	1.40	7.40
23.	Kumar, I., Mukherjee, A., Gowane, G. R., Kamboj, M. L., Malhotra, R. K., & Mukherjee, S. (2025). Assessing the importance of linear type traits and their association with functional, production and reproduction traits in Karan Fries cattle through multi-trait Bayesian method. *Acta Agriculturae Scandinavica, Section A—Animal Science*, *74*(1), 1-12.	0.90	6.90
24.	Chitra, A., Ilayaraja, I., Vyas, J., Mukherjee, S., & Mukherjee, A. (2025). Genetic evaluation of reproductive performance and milk production in Sahiwal cows. *Indian Journal of Animal Research*. https://doi.org/10.18805/ijar.b-5689	0.50	6.50
25.	Chhotaray, S., Vohra, V., Kumar, S., Bharadwaj, A., & Datta, T. K. (2025). Economic impact of systematic sire selection on livelihoods of Murrah buffalo farmers. *Dairy Science and Management*, *2*(1), 20.	–	–
26.	Nonglang, I., Patil, A., & Vohra, V. (2025). Differential expression of lactation-associated genes in cattle. *Dairy Science and Management, 2*(1), 8.	–	–
27.	Vohra, V., & Patil, A. (2025). Advancing education reforms in animal genetics and breeding. *Indian Journal of Animal Genetics and Breeding, 44*(1), 56–59.	–	–

Animal Biochemistry

Sr. No.	Research Papers	Impact factor	NAAS rating
1.	Kumari, N., Prakash, O., & Paul, R. K. (2025). Prokaryotic expression, purification, and functional characterization of recombinant buffalo (Bubalus bubalis) cysteine-rich secretory protein 1 on sperm physiology. *International Journal of Biological Macromolecules*, 148807.	8.50	14.50
2.	Kumar, J., Sharma, P., Onteru, S. K., & Singh, D. (2025). Small milk extracellular vesicles potentiate β-lactam antibiotic activity for combating pathogenic Staphylococcus aureus. *Journal of Drug Delivery Science and Technology*, 106952.	4.90	10.90
3.	Goyal, P., Joshi, M., Mohiddin, R., Onteru, S. K., & Singh, D. (2025). Unique miRNAs of bovine milk extracellular vesicles and their plausible role in regulating intricate pathways of milk consumers: A bioinformatics study. *International Dairy Journal*, 106451.	3.40	9.40
4.	Kalyan, S., Raman, R. K., & Meena, S. (2025). Impact of Low-Molecular-Weight (< 3 kDa) Camel Milk Casein and Whey Protein Hydrolysates on Hyperglycemia and Associated Hyperlipidemia, Oxidative Stress, and Reproductive Health in Type 2 Diabetic Male Rats. *ACS Food Science & Technology*, *5*(9), 3507-3519.	2.80	-
5.	Sharma, D., Rani, P., Onteru, S. K., & Singh, D. (2025). Relevance of Aryl hydrocarbon receptor signalling in the inhibitory effect of environmental pollutant TCDD on promoter-specific aromatase (CYP19A1) expression in granulosa cells. *Reproductive Toxicology*, 109085.	2.80	8.80
6.	Roshan, M., Vats, A., Bajwa, K. K., Sharma, S., Thambiraja, M., Sodhi, M., Singh, D., Yennamalli, M., & Onteru, S. K. (2025). Kangayam and Tharparkar cattle exhibit higher duplications in innate immune genes compared to Sahiwal, Gir, Karan Fries, and Holstein Friesian: insights from an array comparative genomic hybridization. *Mammalian Genome*, 1-15.	2.70	-
7.	Sadeesh, E. M., Lahamge, M. S., Kumari, S., & Singh, P. (2025). Tissue-specific diversity of nuclear-encoded mitochondrial genes related to lipid and carbohydrate metabolism in buffalo. *Molecular Biotechnology*. https://doi.org/10.1007/s12033-025-01386-9	2.50	8.50
8.	Sadeesh, E. M., Lahamge, M. S., Singh, P., & Mohiddin, R. (2025). Tissue-specific transcriptomic profiling of vitamin-dependent mitochondrial pathways in female buffalo. *Cell Biochemistry and Biophysics.* doi.org/10.1007/s12013-025-01979-w	2.50	8.50
9.	Roshan, M., Vats, A., Bajwa, K. K., Moses, T., Singh, D., Yennamalli, R. M., & Onteru, S. K. (2025). Comparative transcriptome profiling of Peripheral Blood Mononuclear Cells suggests Protocadherin-1 (PCDH1) as a distinctive innate immunity signature in Sahiwal, Tharparkar and Gir compared to Karan Fries cattle. *Developmental & Comparative Immunology*, 105512.	2.40	8.40
10.	Sadeesh, E. M., & Lahamge, M. S. (2025). Unveiling the tissue-specific landscape of nuclear-encoded mitochondrial genes involved in amino acid metabolism in buffalo. *Amino Acids*, 57(1) 17.	2.40	8.40

Sr. No.	Research Papers	Impact factor	NAAS rating
11.	Mate, P. S., Jasmin, AT, F., Nagpal, A., Onteru, S. K., Rajput, S., Ashutosh, & Meena, S. (2025). Expression and Immunolocalization of Aquaporins in the Buffalo Liver and Adipose Tissue. *Journal of Molecular Histology*, *56*(1), 39.	2.20	-
12.	Kumari, S., & Sadeesh, E. M. (2025). Comparative assessment of mitochondria isolation buffers for optimizing tissue-specific yields in buffalo. *Cells Tissues Organs*, 214(3), 206–218.	1.90	7.90
13.	Thambiraja, M., Karthikeyan, P. P., Sezen, M., Senthilkumar, S., Singh, D., Onteru, S. K., & Yennamalli, R. M. (2025). ImmFinder: A Multiomics-Based Neural Network Approach for Predicting the Immune Genes in Livestock. *OMICS: A Journal of Integrative Biology*, *29*(11), 551-559.	1.60	7.60
14.	Yennamalli, R. M., & Onteru, S. K. (2025). Immunoinformatics: A Veritable Toolbox for Livestock Omics and Veterinomics. *OMICS: A Journal of Integrative Biology*, *29*(2), 32-35.	1.60	7.60
15.	Devi, S., Kapila, R., & Kapila, S. (2025). Indigenous milk promoted the immunomodulatory effect via altering inflammatory markers and metabolites. *Nutrition and Health*, *32*(3), 1073–1085.	1.40	-
16.	Devi, S., Kapila, R., & Kapila, S. (2025). Interbreed variation of dairy cow milk in terms of specific proteome and lipidome for establishing criteria of milk selection. *Nutrition and Health*, *31*(4), 1523-1532.	1.40	-
17.	Murikipudi, N.S., Singh, P., Kumar, P., Singh, C., Bhardwaj, A., Saxena, N., Nayan, V. (2025). Serum amino acids are differentially present in the buffalo estrous cycle. *Indian Journal of Animal Research*, 1-7.	0.50	6.50
18.	Rani, P., Vashisht, M., Onteru, S.K., Singh, D. (2025). Comparative analysis of the effect of ultra-heat and ultraviolet treatment on milk exosomes and their miRNAs. *Food Research.* 9 (6): 268 – 273.	-	-
19.	Pachera, S., Khilwani, B., Chansoriya, T., Paul, R. K., Priyadarshi, S., Sadasukhi, T.C., Lohiya, N. K., & Ansari, A. S. (2025). Seminal plasma proteome modulation in male fertility and contraceptive interventions. *American Journal of Biomedical Science & Research*, 28(6).	-	-

Animal Physiology

Sr. No.	Research Papers	Impact factor	NAAS rating
1.	Somagond, Y.M., Das, P., Dang, A.K., Yadav, D.K., Kittur, P.M., Panda, B.S.K., Devi, P., Kamboj, A. & Alhussien, M.N. (2025). Parenteral micronutrient supplementation enhances mammary immune function and colostrum–milk quality by modulating cytokine profiles and oxidative stress in transition crossbred cows. *Frontiers in Immunology*, *16,* p.1669246.	5.90	11.90
2.	Kittur, P. M., Satheesan, L., Gunturu, N. T., Somagond, Y. M., Madhusoodan, A. P., Gandham, R. K., & Dang, A. K. (2025). Proteomic analysis of Buffalo milk somatic cells reveals metabolomic and immunological transitions during early lactation. *Scientific Reports*, *15(1),* 22704.	3.90	9.90
3.	Manisha, Pal, P., Aggarwal, A., Mondal, G., & Kumar, S. (2025). Waste to worth: Ramie and mango seed kernel for methane mitigation and rumen fermentation modulation in ruminants. *Waste and Biomass Valorization*, *1-15*.	2.80	8.80
4.	Satheesan, L., Dang, A. K., Venkatesan, R. T., & Kamboj, A. (2025). Temporal dynamics and climatic factors on milk yield, milk quality and mammary stress biomarkers in tropical Sahiwal cows (*Bos indicus*) reared under semi-intensive production system. *Theoretical and Applied Climatology*, *156*(7), 370.	2.70	8.70
5.	Choudhary, M., Satheesan, L., Kamboj, A., Pal, P., Kumar, D., Singh, P. & Dang, A.K. (2025). Effect of different heat mitigation strategies on the thermography of lactating water buffaloes during summer seasons under tropical conditions. *International Journal of Biometeorology*, pp.1-12	2.60	8.60
6.	Ukey, A. K., Singh, S. V., Biswal, S., Misra, A. K., Somagond, Y. M., Kumar, G., & Bhalakiya, N. (2025). Seasonal effects of *Moringa oleifera* as a concentrate replacement on health parameters and production performance in Barbari goats. *Animal Production Science*, *65*(9).	1.20	7.20
7.	Kaur, J., Singh, S.V., & Ukey, A. (2025). Scrotal thermography for evaluating temperature gradients and their association with semen quality and stress biomarkers of Karan Fries (Holstein Friesian× Tharparkar) and Tharparkar bulls under tropical climatic conditions. *Biological Rhythm Research*, *1-25*. DOI: 10.1080/09291016.2025.2563869.	0.90	6.00

Sr. No.	Research Papers	Impact factor	NAAS rating
8.	Vaidya, M. M., Dhenge, S. A., Dongre, V. B., Gadegaonkar, G. M., Amrutkar, S. A., Channa, G. R., Ramteke, S. S. & Singh, S. V. (2025). Evaluating growth profiles and adaptability of Deccani sheep: insights for summer season management. *Journal of Livestock Science,16*, 136-143.	0.40	6.50
9.	Ukey, A., Singh, S. V., Biswal, S., Misra, A., Gujjalkar, P., Kumar, G., Vaidya, M. & Bhalakiya, N. (2025). Moringa oleifera as a concentrate replacer for enhancing immune status and ameliorating stress of Barbari goats during thermal stress. *Journal of Livestock Science, 16,* 536-544.	0.40	6.50
10.	Vaidya, M., Dhenge, S., Dongre, V., Chandra, G., Amrutkar, S., Gadegaonkar, G., Ramteke, S. & Singh, S. V. (2025). Assessing growth patterns and adaptability of Osmanabadi goats during summer season. *Journal of Livestock Science, 16*, 261-269.	0.40	6.50
11.	Ukey, A., Singh, S. V., Satpute, T., Singh, P., Sharma, R., & Muhhamad, A. N. V. (2025). Seasonal dynamics of scrotal infrared profile and its relationship with seminal attributes of Murrah buffalo bulls. *Indian Journal of Dairy Science*, *78(4)*, 350-357.	0.20	6.20
12.	Vaidya, M., Dhenge, S., Dongre, V., Gadegaonkar, G., Singh, S. V. & Amrutkar, S. (2025). Seasonal correlation of biometric and physiological parameters in Osmanabadi goats under farm and field conditions in Maharashtra. *Journal of Veterinary and Animal Sciences, 56(3)*, 488-495.	--	4.50
13.	Bhalakiya, N., Singh, S. V., Singh, P., Kumar, G., Kaur, J., & Ukey, A. (2025). Geothermal Energy: Revolutionary Initiative in Indian Dairy Sector and Its Effect on Physiological Parameters of Growing Murrah Buffaloes. *The Indian Journal of Veterinary Sciences and Biotechnology*, *21(4),* 109-115.	-	5.25

Livestock Production and Management

Sr. No.	Research Paper	Impact factor	NAAS rating
1.	Gupta, V. K., Mohanty, T. K., Bhakat, M., Baithalu, R. K., Kumar, N., Dewry, R. K., Nain D., Soe A., & Arunkumar, R. (2025). Meloxicam and levamisole administration ameliorates FMD vaccination stress on frozen semen attributes in Sahiwal bulls. *Scientific Reports*, *15*(1), 11863.	3.90	9.90
2.	Kumar, A., Prasad, J. K., Kumar, N., Verma, S., Anand, M., Behera, A., Kumar, A., Tiwari, J., Dhariya, R., Singhal, S., & Yadav, V. (2025). Quercetin modulates transcription of the apoptotic and CatSper genes and optimises post thaw viability and kinematics of buck spermatozoa. *Scientific Reports*, *15*(1), 22818.	3.90	9.90
3.	Tiwari, S., Devi, I., Tomar, D. S., & Dhakad, R. (2025). Effect of maternal programming through polyherbal, multimineral, and multivitamin supplementation on behavioural and productive performance in transition murrah buffaloes. *Scientific Reports*, *15*(1), 39404.	3.90	9.90
4.	Paul, A., Singh, P., Samanta, A. K., Kalita, G., Malik, R., & Roy, S. (2025). Standardization of different ensiling method for bamboo leaves (Melocanna baccifera) silage preparation and its nutritive, storage quality evaluation. *Discover Applied Sciences*, *7*(5), 412.	2.8	---
5.	Chitkara, M., Kaur, H., Vasisth, R., Sriranga, K. R., Gurao, A., Mahar, K., Dige, M.S., Aggarwal, R.A.K., Mukesh, M., Kumar, P. & Kataria, R. S. (2025). Evaluation of mitochondrial copy number and gene expression changes in the spermatozoa of buffalo bulls under heat stress. *Reproductive Biology*, *25*(2), 101014.	2.00	8.00
6.	Gupta, V. K., Mohanty, T. K., Bhakat, M., Kumaresan, A., Baithalu, R. K., Kumar, N., Dewry, R. K., Nain, D., Yadav, R., Arunkumar, R., & Soe, A. (2025). Effect of age-associated oxidative stress on sperm viability, acrosomal integrity and sperm apoptosis and DNA fragmentation in Sahiwal breeding bulls. *Veterinary Research Communications*, *49*(2), 71.	2.00	8.00
7.	Nain, D., Mohanty, T. K., Bhakat, M., Kumar, N., Baithalu, R. K., Yadav, R., Gupta, V. K., & Yadav, R. K. (2025). Sephadex filtration in conjunction with preputial washing: A strategy to minimize bacterial load and enhance cryo-survival in Murrah buffalo bull semen. *Journal of Microbiological Methods*, 107365.	1.90	7.90
8.	Jamwal, S., Singh, P., Kamboj, M. L., Lathwal, S. S., Kataria, R. S., Gowane, G. R., & Haskell, M. (2025). Weaning impact: Evaluating growth, behavior, and production performance in Sahiwal cows and their calves. *Tropical Animal Health and Production*, *57*(2), 30.	1.70	7.70

Sr. No.	Research Paper	Impact factor	NAAS rating
9.	Lakhanpal, D., Mohanty, T. K., Bhakat, M., Arunkumar, R., Nain, D., & Baithalu, R. (2025). Testicular thermoregulation and blood perfusion score as markers of sperm quality in summer-stressed breeding bulls. *Tropical Animal Health and Production*, *57*(8), 419.	1.70	7.70
10.	Thakur, A., Kamboj, M. L., Vanita, B., & Raza, M. (2025). Behavioral adaptations of Gaddi Goats: Validation of seasonal resource utilization in transhumant pastoralism of the North-western Himalayan region. *Journal of Veterinary Behavior*, *79*, 25-34.	1.60	7.60
11.	Vasisth, R., Sriranga, K. R., Chitkara, M., Gurao, A., Singh, L. P., Dige, M. S., Sodhi, M., Mukesh, M., Kumar, P., Singh, P., & Kataria, R. S. (2025). Serum biochemical and gene expression changes in the spermatozoa of buffalo bulls under heat stress. *Biochemical Genetics*, 1-28.	1.60	7.60
12.	Purohit, N., Devi, I., Tomar, D. S., & Dudi, K. (2025). Optimizing drinking water temperature for water buffaloes (Bubalus bubalis) during winter: implications for productivity under subtropical climate. *Animal Production Science*, *65*(12), AN25087.	1.20	7.20
13.	Devi, I., Dahiya, N. K., Ruhil, A. P., Singh, Y., & Tomar, D. S. (2025). Prediction of different physiological conditions of riverine buffaloes (bubalus bubalis) based on their vocal cues through machine learning algorithms and a conventional statistical model. *Journal of Dairy Research*, *92*(1), 56-60.	1.20	7.20
14.	Thakur, A., Kamboj, M., Dogra, P. K., & Vanita, B. (2026). Development of a welfare assessment protocol for migratory goats in the North-Western Himalayan region. *Journal of Applied Animal Welfare Science*, *29*(2), 264-278.	1.10	-
15.	Sethi, M., Kumar, N., Mohanty, T. K., Shah, N., Yadav, D. K., (2025). Curcumin and Vitamin E in combination improves scrotal temperature and semen traits in FMD vaccinated Murrah bulls. *Journal of Livestock Science.* 16:740—749	0.40	6.50
16.	Arya, S., Devi, I., Tomar, D. S., Singh, M., Warhade, R., Gautam, A., & Mohanty, T. K. (2025). Development of a lightweight deep learning model for the identification and classification of indigenous cattle breeds. *Indian Journal Dairy Sci*, *78*(4), 344-349.	0.20	6.20
17.	Kumar, C., Kamboj, M. L., & Chandra, S. (2025). Welfare Assessment of Dairy Farms Based on Animal-based Indicator of Welfare. *Archives of Current Research International*, *25*(7), 862-868.	-	5.13
18.	Sethi, M., Shah, N., Meena, M., Sindhu, V. K., Kumar N. (2025) Papyraceous mummification in a cow with prolonged gestation. *International Journal of Veterinary Sciences and Animal Husbandry. 10*(7):190-191.	-	4.61
19.	Sethi, M., Shah, N., Yadav, D. K., Meena, M., & Kumar, N. (2025). Rare case of dicephalus monster in a jersey crossbred heifer. *International Journal of Veterinary Sciences and Animal Husbandry.10*(7): 243-244.	-	4.61

Animal Nutrition

Sr. No.	Research Papers	Impact Factor	NAAS Rating
1.	Rana, P., Malik, R., Kour, H., Goyal, A., & Rishikesh, K. (2025). Optimization of densified paddy straw-based total mixed ration in form of briquette for sustainable livestock feeding. *Journal of Cleaner Production*. 522:146294	10.00	16.00
2.	Gohar, V., Srivastava, R., Mishra, D., Chauhan, N., Kumar, S., Behare, P.V., & Tyagi, N. (2025). Xylanase and lactic acid bacteria mediated bioconversion of rice straw co-ensiled with pea waste and wet brewers' grains as potential livestock feed. *Biomass Conversion and Biorefinery*, 15(1):671-686	4.10	10.10
3.	Kore, K.B., Pattanaik, A.K., & Kumar, S. (2025). Biofunctional assessment of chicory as a prebiotic in dogs: effects on nutrient metabolism, hindgut health biomarkers, and immune response. *Biocatalysis and Agricultural Biotechnology*. 71:103904	3.80	9.80
4.	Srivastava, R., Chamadia, B., Behare, P.V., Chauhan, K., Kumar, S., Mondal, G., & Tyagi, N. (2025). Characterization and probiotic potential of thermotolerant lactic acid bacteria from silage for ensiling crop residues. *AMB Express*, 15(1):140	3.70	9.70
5.	Dhaigude, V., Chaudhary, P., Nair, P.M., Naliyapara, H., Bhakat, M., & Mondal, G. (2025). Effects of specific micronutrients on semen quality and reproductive outcomes in peripubertal Sahiwal bulls. *Biological Trace Element Research.* 204(2), 1113-1129.	3.60	9.60

Sr. No.	Research Papers	Impact Factor	NAAS Rating
6.	Kuraichya, P., Nair, P.M., Srivastava, R., Dhaigude, V., Chaudhary, P., Bhakat, M., & Mondal, G. (2025). Effect of dietary micronutrient supplementation on growth and reproductive parameters in bull calves. *Journal of Thermal Biology*, 132:104225	2.90	8.90
7.	Thanippilly, A.J., Kumar, S., Balaga, S., & Samanta, A.K. (2025). Synergistic effects of *Emblica officinalis* with optimized synbiotic formulation on growth and neonatal health of Murrah buffalo calves. *Animal Feed Science and Technology*. 217:116423	2.70	8.70
8.	Kumar, S., Chauhan, N., Chauhan, T., Balaga, S., Tyagi, N., & Samanta, A.K. (2025). Evaluation of techno-functional properties of lactobacilli strains originated from *Bos indicus* and *Bubalus bubalis* calves for probiotic potential. *International Microbiology*. 28(7):1649-1668	2.30	8.30
9.	Naveen, P., Kour, H., Malik, R., Naliyapara, H., Gabbur, A., Rana, P., & Goyal, A. (2024). Influence of different taste feed additives on feed intake and growth performance in growing goats. *Flavour and Fragrance Journal*. 40(3):440-444	2.00	8.00
10.	Kour, H., Malik, R., Datt, C., & Rana, P. (2025). A low-cost continuous rumen simulation system for sustainable in vitro fermentation and feed evaluation in ruminant production. *MethodX*	1.90	-
11.	Chavan, N., Gupta, M., Bahiram, K.B., Korde, J.P., Kadam, M., Dhok, A., & Kumar, S. (2025). *Ligilactobacillus salivarius* and *Limosilactobacillus reuteri* improve growth and intestinal health in broilers via modulating gut microbiota and immune response. *Research in Veterinary Science*. 194:105837	1.80	7.80
12.	Kumari, N., Chauhan, N., Pradhan, D., Kumar, S., & Tyagi, N. (2025). Lactic acid bacteria and propionic acid affect fermentation quality and deterioration rate of maize silage after aerobic exposure. *Range Management and Agroforestry*. 46(02):340-350	0.80	6.40
13.	Goyal, S., Sankhla, G., & Datt, C. (2025). Predicting farmer's inclination towards adoption of anionic mineral mixture in Haryana: A case study. *Indian Journal of Animal Science*. 95(8):732-738	0.30	6.30
14.	Chauhan, N., Kumar, S., Balaga, S., Singh, O., Kundgir, S., & Samanta, A.K. (2025). Impact of LAB consortia supplementation and teat dipping on haematological parameters, antioxidant activity, and total immunoglobulin in subclinical mastitis Sahiwal cows. *Indian Journal of Dairy Science*. 79(1)	0.20	6.20
15.	Dudi, K., Datt, C., Devi, I., Rajoriya, H.S., Toijam, L., & Malik, R. (2025). Effects of varying levels of aflatoxin B1 and its ameliorant on feed intake and nutrient digestibility in crossbred lactating cows. *Indian Journal of Dairy Science*. 98(6):580-585	0.20	6.20
16.	Saini, J., Kumar, S., Verma, R., Padalia, R.C., Chanda, D., & Mondal, G. (2025). Assessing deoiled plants biomass of lemon and palmarosa as novel feed resources under in vitro condition. *Indian Journal of Dairy Science*. 78(3):278-284	0.20	6.20
17.	Bhatt, N., Misra, D.B., Misra, A., & Tyagi, N. (2025). Analysing the effect of silage feeding on blood metabolites of different producing Murrah buffaloes. *Indian Journal of Animal Research*. 59(5):811-817	0.50	6.50
18.	Babu, A.S., Mohini, M., Thakur, S.S., & Mondal, G. (2025). Evaluation of complementary effects of exogenous fibrolytic enzymes and fumaric acid on methane emission and ruminal fermentation by in vitro method. *Indian Journal of Veterinary Science and Biotechnology*. 21(6):144	-	5.58
19.	Singh, R., Saini, A.K., Pathak, A., & Dhial, K. (2025). Carry-over rate of Aflatoxin B1 from feed to milk and its impact on haemato-biochemical parameters in Nili-Ravi buffaloes. *Indian Journal of Veterinary Sciences and Biotechnology*. 21(6):120-125	-	5.58
20.	Dey, D., Kour, H., Rana, P., Malik, R., Naliyapara, H., & Goyal, A. (2025). Influence of repartum plane of nutrition on nutrient utilization and performance in Murrah buffaloes. *Indian Journal of Animal Nutrition*. 42(3):343-350	-	5.19
21.	Mishra, A., Datt, C., Dudi, K., Shambvi, & Singh, D. (2025). Nano zinc supplementation: its influence on growth performance, feed intake and haematobiochemical parameters in male Wistar rats. *Indian Journal of Animal Nutrition*. 42(2):261-269	-	5.19
22.	Nair, P.M., Kamboj, S., Jasmin, A.T.F., Arulkumar, S., & Mondal, G. (2025). Effects of fenugreek seeds and areca nut powder supplementation on rumen fermentation and enteric methane production in vitro. *Indian Journal of Animal Health*	-	5.01
23.	Kumar, S., Chauhan, N., Chauhan, T., Tyagi, N., Rizwan, M., & Samanta, A.K. (2025). Calf-derived lactic acid bacteria as antimicrobial agents against enteric pathogens: a clustering approach. *Dairy Science Management*. 2(1):13	-	-

Agronomy

Sr. No.	Research Papers	Impact Factor	NAAS rating
1.	Onte, S., Fiskey, V.V., Melavanki, M.S., Angadi, A.P., Pyati, P.S., Singh, M., Kumar, D., Kochewad, S.A., Kumar, S., Om, H., Meena, V.K., Garg, K., Karunakaran, V., Kanwat, M., Meena, B.L., Boregowda, Y.S., Bellagi, R., Naveena, K., Chandersheker, S., Azman E.A., and Kumar S. (2025). Optimizing fodder yield and quality through integrated organic nutrient amendments in multi-crop system. *Frontiers in Plant Science*, 16:1517399.	4.80	10.80
2.	Onte, S., Kumar, D., Dhar, S., Kumar, S., Kumar, S., Meena, V.K., Malakar, D., Singh, S., Giri, B.S., Rajawat, M.V.S., and Kumar, S. (2025). Integrated nitrogen fertilization using plant growth promoting rhizobacteria, farmyard manure and panchagavya formulation improves soil health, crop quality, and yield of fodder maize. *Land Degradation & Development*, *37*(4), 1491-1506.	3.70	9.70
3.	Onte, S., Kumar, D., Kochewad, S., Kumar, S., Dhar, S., Kumar, S., Singh, S., Giri, B.S., Rajawat, M.V.S. and Kumar, S. (2025), Enhancing Soil Health, Fodder Energy Fractions, and Fodder Yield in Maize–Berseem Cropping Sequence Through Integrated Organic Nitrogen Fertilization. *Land Degradation and Development*, *36*(13), 4605-4625.	3.70	9.70
4.	Kumar, S., Onte, S., Boregowda, Y.S., Angadi, A.P., Pyati, P.S., Naveena, K., Garg, K., Meena, V.K., Chandra, R., Meena, B.L., Reddy, M.B., Kochewad, S.A., Kumar, S., Om, H., Karunakaran, V., Chandersheker, S., Azman, E.A., Mukherjee, S., Hashim, M., and Meena, R. (2025). Organic farming for a sustainable future: soil and yield improvement through integrated nitrogen management. *Frontiers in Sustainable Food System* 9:1564945.	3.10	9.10
5.	Onte, S., Fiskey, V.V., Dadhich, D.K., Guglawath, A.K., Rajkumari, P., Kothuru, B., Veda, T.V., Yadav, R., Singh, H., Puttaswamaiah, P., Singh, M., Kumar, D., Boregowda, Y.S., Kumar, S., Garg, K., Halagundegowda, G.R., Singh, A.G., Pyati, P.S., Kanwat, M., Chandra, R., Mukherjee, S. and Kumar, S. (2025). Effect of integrated organic nutrient management on growth, yield, and soil fertility under a maize–berseem–cowpea cropping system. *Frontiers in Sustainable Food System* 9:1678536.	3.10	9.10
6.	Yadav, M.R., Singh, M., Kumar, R., Behera, B., Kumar, D., Yadav, R.K., Raza, M.B., Lal, M.K., Meena, R.K., Makarana, G. and Baral, K., (2025). Energy-carbon footprint, productivity, and profitability of fodder-based cropping patterns under different nutrient management options in north-west India. *Crop and Pasture Science*, 76(2).	1.9	7.90
7.	Pyati, P. S., Bhattacharjee, S., Kumar, R., Ram, H., Meena, R. K., Hindorya, P. S., Bhakuni, K., Kashyap, S., Biswal, B., S. K., M., Yadav, M., Makarana, G., & Min, D. (2025). Optimizing oat (*Avena sativa* l.) production strategies to mitigate nitrate toxicity without compromising fodder quality. *International Journal of Agronomy*, *2025*(1), 9767875.	1.50	-
8.	Ram, H., Kumar, R., Saxena, A., Meena, R. K., & Kumar, R. (2026). Productivity and Profitability of Diversified Legume-based Cropping Systems in the Indo-gangetic Plains of India as Influenced by Nutrient Management. *Legume Research*, 49 (1), 109-114.	-	6.00
9.	Veda, T.V., Mudalagiriyappa, Vasanthi, B.G., Sneha, M.A., Hardev Ram and Rajkumari, Preety. (2025). Influence of Sulphur Sources on Productivity, Profitability, Quality and use Efficiency of Soybean [*Glycine max (L.) Merrill*]. *Legume Research*, *7*, 1–8.	-	6.00
10.	Saxena, A., Raghuwanshi, M.S., Landol, S., Raza, M. and Stanzin, J. 2025. Performance of Buckwheat Genotypes in Leh-Ladakh. *Annals of Arid Zone* 64(2): 267-272.	-	4.86

Dairy Microbiology

Sr. No.	Research Papers	Impact Factor	NAAS Rating
1.	Park, G., Johnson, K., Miller, K., Kadyan, S., Singar, S., Patoine, C., ... & Nagpal, R. (2025). Almond snacking modulates gut microbiome and metabolome in association with improved cardiometabolic and inflammatory markers. *NPJ Science of Food*, 9(1), 35.	7.80	-
2.	Das, R., Pradhan, D., Kishore, A., Singh, R., & Tamang, B. (2025). Identification of potential histone deacetylase 3 inhibitors from fermented bamboo shoots using GC-MS metabolomics, molecular docking, pharmacokinetics and molecular dynamics simulations approaches. Food Bioscience, 69, 106849.	5.90	11.90
3.	Gong, X., Lin, J., Park, G., Kadyan, S., Sun, Q., Nagpal, R., & Cui, L. (2025). Pea Protein and p-Coumaric Acid Conjugates: New Evidence on In Vitro Digestion, Modulation of Gut Microbiota, and Anti-Inflammatory Activity. *Food Hydrocolloids for Health*, 100245.	5.10	-

Sr. No.	Research Papers	Impact Factor	NAAS Rating
4.	Narwal, N., Amarlapudi, M. R., Vinchurkar, R. V., Behera, M., De, S., Vishweswaraiah, R. H., & Pradhan, D. (2025). Molecular characterization of antimicrobial resistance in *Escherichia coli* from dairy farm environment. *International Journal of Hygiene and Environmental Health*, 268, 114607.	4.40	10.40
5.	Hochuli, N., Kadyan, S., Park, G., Patoine, C., & Nagpal, R. (2025). A Gut Microbial Metabolite Alleviates Stress-Induced Neurobehavioral Dysfunction in an Alzheimer's Disease Model. *Molecular Neurobiology*, 1-15.	4.30	10.80
6.	Minj, J., & Vij, S. (2025). Determination of synbiotic mango fruit yogurt and its bioactive peptides for biofunctional properties. *Frontiers in Chemistry*. 12:1470704.	4.20	10.20
7.	Yadav, P., Debnath, N., Pradhan, D., Mehta, P. K., Kumar, A., Yadav, M. L., & Yadav, A. K. (2025). Probiotic *Lactobacillus*-Derived Extracellular Vesicles: Insights into Disease Prevention and Management. *Molecular Nutrition & Food Research*, e70013.	4.20	10.20
8.	Rokade, V.B., Vishweswaraiah, R., & Vij, S. (2025). Green Synthesis of Magnesium Oxide Nanoparticles: optimisation, characterisation and Antibacterial Potential Against Listeria monocytogenes. *Journal of Cluster Science*, 36, 190.	3.60	-
9.	Kouser, S., Talan, S., Balhara, M., Goel, P., Kumar, N., & Raghu, H. V. (2025). A Novel Two-Stage Enzyme Substrate Assay for Rapid Screening and Detection of *Listeria monocytogenes* in Milk and Dairy Products. *International Dairy Journal*, 106431.	3.40	9.40
10.	Majumder, R., Salini, S. V., Basavaprabhu, H. N., Kumari, M., & Behare, P. V. (2025). Development and evaluation of thermophilic Direct-Vat-Set liquid starter culture blends for dahi production. *Journal of Food Science and Technology*, 1-9.	3.30	9.30
11.	Pradhan, D., Avadhani, R., Rashmi, H.M., Sowmya, K., & Gupta, S. (2025). Comparative Evaluation of Anti-inflammatory Effects of Postbiotic and Probiotic Lactobacilli in HT-29 Cells and Colitis Mouse Model, *Food Biotechnology*. *39*(4), 414-435.	1.60	7.60
12.	Pal, U., Saifi, R., Pal, S., & Vij, S. (2025). Isolation of Multi Stress Tolerant Yeast for Ethanol Production at Elevated Temperature. *Journal of Scientific & Industrial Research (JSIR)* 84(10) 1069-1075.	0.80	6.00
13.	Iram, D., Sansi, M.S., & Vij, S. (2025). Genome sequence of *Lactobacillus rhamnosus* C25, isolated from an Indian dairy cheese. *Microbiology Resource Announcements*. 10.1128/mra.00534-24.	0.60	6.60
14.	Kashung, P., Devi, K., & Grover, C.R. (2025). Response surface optimization of *Prunus napaulensis* yoghurt for improved nutrition and sensory attributes. *Indian Journal of Dairy Science*, 78(4); 320-327.	0.20	6.20
15.	Narwal, N., Rana, C., Amarlapudi, M. R., Puniya, A. K., Vishweswaraiah, R. H., Mallappa, R. H., ... & Pradhan, D. (2025). Genetic comparison of virulence and resistance factors in phylogenetically diverse *Escherichia coli* from dairy cattle. *Science of The Total Environment*, 1002, 180539.	8.00	14.0
16.	Ganga, A., & Vij, S. (2025). Synthesis, Characterization and Antimicrobial Evaluation of Zinc Oxide Nanoparticle Peptide Conjugates. *Journal of Advances in Biology & Biotechnology*, 28 (6): 564-577	-	5.30
17.	Fadare, O. S., Enabulele, O. I., Singh, V., & Pradhan, D. (2025). GC-MS based metabolomic profiling of synbiotic action of probiotic Lactobacilli with aqueous garlic extract against *Salmonella* spp. *The Microbe*, 100494.	--	--
18.	Dasriya, V. L., Kumari, M., Ranveer, S., Behare, P., Vij, S., & Puniya, A. K. (2025). Ameliorative action of probiotics on the neurotoxicological effect of Aluminium chloride and D-galactose. *Discover Toxicology*, 2(1), 6.	--	--

Dairy Chemistry

Sr. No.	Research Papers	Impact Factor	NAAS Rating
1.	Sen, C., Arora, S., Singh, R., Sharma, V., Meena, G. S., & Singh, A. K. (2025). Impact of polysaccharide addition on the technological aspects of low lactose milk powders. *Food Research International*, *201*, 115592. 92	8.00	14.00
2.	Singh, D., Sharma, R., Shivanna, S. K., Gandhi, K., Singh, R., & Sharda, T. (2025). Detection of adulteration in ghee using Raman Spectroscopy in combination with Chemometrics. *Food Control*, 111481.	6.30	12.30
3.	Saji, R., Gandhi, K., Sharma, R., Rajput, Y.S., Bajaj, R., & Ramani, A. (2025). Development of gold nanoparticles based competitive lateral flow immunoassay for the detection of 5-hydroxyflunixin in milk. *Microchemical Journal*, 208, 112307.	5.10	11.10

Sr. No.	Research Papers	Impact Factor	NAAS Rating
4.	Gaikwad, O., Gandhi, K., Shivanna, S. K., Sharma, R., & Bajaj, R. K. (2025). Detection of buffalo body fat in ghee using ATR-FTIR spectroscopy coupled with chemometrics. *Discover Food*. 1-30.	3.70	-
5.	Shivanna, S.K., Naik, L. & Rao, P.S. (2025). Evaluation of physicochemical and bio-functional properties of flavoured milk fortified with Moringa pod pulp powder during storage. *Discover Food* 5, 433.	3.70	-
6.	Rout, P., Sharma, V., Arora, S., Kapila, R., Singh, A.K. (2025). Influence of seasonal changes on the positional distribution of fatty acids in milk fat triglycerides of indigenous cow (sahiwal) and crossbred cow (Karan Fries). *International Dairy Journal,* 167: 106257	3.40	9.40
7.	Sen, C., Arora, S., Singh, R., Sharma, V., Hussain, S. A., & Singh, A. K. (2025). Influence of polysaccharides on mitigating Maillard reaction-induced browning during spray drying of low-lactose milk systems. *Journal of Food Measurement and Characterization*, 1-13.	3.30	9.30
8.	Singh, V. P., & Arora, S. (2025). A rapid method for analysis and evaluation of stability of solvent extracted aspartame in sports formulation of Whey. *Journal of Food Science and Technology*, 1-11.	3.30	9.30
9.	Bothara, R., Singh, R., Sharma, R., & Arora, S. (2025). Development of a sequential extraction strategy for native B vitamins from milk using protein precipitation, solid-phase extraction, and magnetic molecularly imprinted polymers for RP-HPLC analysis. *International Journal of Dairy Technology*, 78(4), e70069.	2.80	8.80
10.	Sonvanshi, V., Gandhi, K., Ramani, A., Sharma, R., & Seth, R. (2025). Detection of palmolein oil adulteration in milk fat using ATR-FTIR Spectroscopy and Chemometrics. *Indian Journal of Dairy Science*, *78*(2). 156-164.	0.20	6.20
11.	Singh, P., Arora, S., Kathuria, D., Singh, R., Rao, P. S., Sharma, V., & Singh, A. K. (2025). Influence of multi-enzyme approach and spray drying on physico-chemical, browning and protein digestibility of lactose-hydrolyzed milk powder. *Food and Humanity*, 5:100901.	-	-

Dairy Technology

Sr. No.	Research Papers	Impact factor	NAAS Rating
1.	Akhila, P. P., Sunooj, K. V., Nemțanu, M. R., Sakshi, T., Aaliya, B., Navaf, M., Annamalai, A., Indumathy, B., Yugeswaran, S., Sinha, S. K., Yadav, D. N., Joshi, M. C., Jebreen, A., Sudheer, K. P., & George, J. (2025). 3D printing of hausa potato starch: Assessing a new dimension of cold plasma treatment using varied feed gas. *International Journal of Biological Macromolecules*, *302*, 140655.	8.50	14.50
2.	Rao, P. S., Deshmukh, N., Saipriya, K., Bihola, A., & Sharma, H. (2025). Insights into the comparative analysis of metabolite profile of paneer whey, acid whey, and cheese whey. *Food Research International*, 117210.	8.00	14.00
3.	Saipriya, K., Singh, A. K., Singh, R., Meena, G. S., Pradhan, D., Kumar, S., & Sharma, H. (2025). A comprehensive comparative analysis of fatty acid profiles and GC–MS based metabolomics in Barbari and Beetal goat milk. *Food Research International*, 116760.	8.00	14.00
4.	Yadav, A., Sharma, S. P., Fawole, O. A., & Kaushik, N. (2025). Biopolymer based composite packaging: A sustainable approach for fruits and vegetables preservation. *Applied Food Research 5*, 101211.	6.20	-
5.	Deshwal, G. K., van der Meulen, L., Fenelon, M., Gómez-Mascaraque, L. G., & Huppertz, T. (2025). Properties of processed cheese made from cagliata cheese: Influence of fat content and ripening of cagliata cheese and homogenization of cheese milk. *Food Structure*, *43*, 100406.	5.90	-
6.	AS, F. S., Sharma, H., Singh, A. K., Yadav, D. N., Pradhan, D., Bihola, A., & Dang, A. K. (2025). Impact of somatic cell count on milk and dahi: Changes in physico-chemical, microbiological, rheological and metabolic characteristics. *International Dairy Journal*, 106487.	3.40	9.40
7.	Bihola, A., Singh, A. K., Deshwal, G. K., & Sharma, H. (2025). Membrane-Based Isolation of Milk Bioactive Compounds: Technological Advances, Nutritional Value, and Biological Significance. *International Dairy Journal*, 106481.	3.40	9.40
8.	Deshwal, G. K., Fenelon, M., Gómez-Mascaraque, L. G., & Huppertz, T. (2025). Effect of calcium level of fat-free and full-fat cheese curds on the properties of processed cheese prepared therefrom with different calcium sequestering salts. *International Dairy Journal*, *160*, 106081.	3.40	9.40

Sr. No.	Research Papers	Impact factor	NAAS Rating
9.	Kumawat, V., Sadera, G., Kumar, S., Pande, S., Sandeep, N., Devi, U., Kapila, S., Kumar, M.H.S., & Hussain, S.A. (2025). Immunomodulatory activity of proline rich polypeptides of indigenous cattle (Bos indicus family) and Holstein Friesian (Bos taurus) and their crossbred Karan Fries cattle: A comparative study. *International Dairy Journal*, 106482.	3.40	9.40
10.	Aparnna, V. P., Khamrui, K., & Prasad, W. G. (2025). Rheological properties and printability of a cane sugar added milk Solid-Based food ink for extrusion 3D printing. *Journal of Food Science and Technology*, 1-13.	3.30	9.30
11.	Yadav, A., Kumar, N., Upadhyay, A., Pratibha, & Kieliszek, M. (2025). Mango kernel starch-based edible coating with lemongrass oil: a sustainable solution for extending tomato shelf life. *Journal of Food Measurement and Characterization*, *19*(3), 1929-1945.	3.30	9.30
12.	Dularia, C., Meena, G. S., Hossain, S., Khetra, Y., Singh, A. K., & Arora, S. (2025). Hydrocolloids induced changes of processed cheese product matrix from milk protein concentrate 80 (MPC80). *International Journal of Dairy Technology*, *78*(3), e70029.	2.80	8.80
13.	Hussain, S. A., Sharma, P., Garavand, F., Gómez-Mascaraque, L.G., & Hogan, S.A. (2025). Effect of processing conditions on rheology, texture, and microstructure of paneer. *International Journal of Dairy Technology*, 78(1), e13142.	2.80	8.80
14.	Meena, S. K., Deshwal, G. K., Khetra, Y., Arora, S., Singh, A. K., & Meena, G. S. (2025). Influence of high shear treatment and sodium bicarbonate addition to ultrafiltered retentate of skimmed buffalo milk on the properties of milk protein concentrate prepared therefrom. *International Journal of Dairy Technology*, *78*(4), e70059.	2.80	8.80
15.	Yadav, A., Kumar, N., Upadhyay, A., Pavlic, B., Kumar, A., & Kaushik, N. (2025). A Sustainable Approach to Turning Mango Kernel Waste Starch into Edible Coating with Lemongrass Essential Oils for Shelf-Life Extension of Guava Fruits. *Starch□Stärke*, *77*(10), e70107.	2.70	8.70
16.	Vats, D., Khamrui, K., Prasad, W., Sahu, J. K., & SSM, S. (2025). Assessment of 3D Printability of Sweetened Heat Desiccated Concentrated Milk-based Formulations for Preparation of Dairy Sweetmeat (Burfi). *Indian Journal of Dairy Science, 78(4).*	0.20	6.20
17.	Manik, S., Meena, G. S., Khetra, Y., Singh, A. K., Singh, R., Arora, S., & HV, R. (2025). Estimation of production cost for Indian artisanal sour buttermilk powder. *Indian Journal of Dairy Science*, *78*(2).	0.20	6.20

Dairy Engineering

Sr. No.	Research Papers	Impact Factor	NAAS Rating
1	Chopde, S. S., Minz, P. S., Sinha, C., Sharma, A. K., Kumari, K., & Hussain, S. A. (2025). Novel approach to monitor yoghurt fermentation process using selected color parameters. *Food Control, 178*, 111480.	6.30	12.30
2	Ray, A., Sinha, C., Sharma, A. K., Khamrui, K., Hussain, S. A., Dabas, J. K., & Mohanty, T. K. (2025). AI-driven real-time monitoring and predictive control system for yoghurt fermentation. *Food Control, 182*, 111857.	6.30	12.30
3	Ray, A., Sinha, C., Dabas, J. K., & Berry, S. (2025). Experimental investigation of a sustainable solar-powered automatic yoghurt fermentation system: A comprehensive year-round performance analysis. *Thermal Science and Engineering Progress*, 104308.	5.40	-
4	Kumar, K., Minz, P. S., Chopde, S., Chitranayak, & Sharma, R. (2025). Electrical characterisation of fermentation process from milk to yogurt: A monitoring approach. *Journal of Food Science and Technology*, 1–9.	3.30	9.30
5	Ray, A., Sinha, C., Berry, S., Minz, P. S., Khamrui, K., & Sharma, A. K. (2025). Simulation and experimental based optimization of an innovative smart dahi fermentation system and its effect on product attributes. *Journal of Food Science and Technology*, 1–16.	3.30	9.30
6	Ray, A., Sinha, C., Minz, P. S., Berry, S., Dabas, J. K. & John, H. (2025). Kinetics study and characterization of the changes in physicochemical properties of curd during processing. *Journal of Food Measurement and Characterization*, 1–17.	3.30	9.30
7	Sinha, C., Prateek, Ray, A., Minz, P. S., Priyanka, Kumari, K. & Dabas, J. K. (2025). Investigation of thermal performance of phase change materials-integrated solar yogurt incubation system and its effect on product's characteristics. *Journal of Food Science and Technology, 62*(6), 1–12.	3.30	9.30
8	Kumar, R., Kumar, N., Saini, S., Singh, C., Barnwal, P. & Panghal, A. (2025). Ethanol from lignocellulosic biomass: Pretreatment challenges and opportunities in sustainable waste management and energy production. *Biofuels, Bioproducts and Biorefining, 19*(6), 2712–2738.	2.90	8.90

Sr. No.	Research Papers	Impact Factor	NAAS Rating
9	Ray, A., Minz, P. S., Sinha, C. & John, H. (2025). Development and investigation of a novel freezer attachment for rapid freezing of frozen dairy products. *Journal of Food Process Engineering, 48*(8), e70202.	2.90	8.90
11	Saini, G. S., Minz, P. S. & Sinha, C. (2025). Benchmarking of infrared emitters for small-scale milk heating: Performance and heat flux analysis. *Journal of Food Process Engineering, 48*(7), e70173.	2.90	8.90
12	Sharma, V. K., Barnwal, P. & Deep, A. (2025). Experimental feasibility study of a three-stage scraped surface heat exchanger for manufacturing of Dhap Khoa-A heat desiccated milk product. *Journal of Food Process Engineering, 48*(4), e70118.	2.90	8.90
13	Ray, A., Sinha, C., Minz, P. S., Dabas, J. K., John, H. & Kumari, K. (2025). Automatic pH-controlled thermal modulation unit for yoghurt production. *Journal of Food Process Engineering, 48*(1), e70050.	2.90	8.90
14	Ray, A., Sinha, C., Berry, S., Dabas, J. K. & Sharma, A. K. (2025). Exploring the impact of various processing conditions and fermentation methods on the selected physicochemical properties of sweetened dahi (misti doi). *Food Science and Technology International*, 10820132251384805.	1.60	7.60
15	Parameswari, P. L., Priyanka, Barnwal, P., Deep, A., Vij, S. & Prasad, W. (2025). Optimization of mass of rasogolla ball and cooking time in an indirectly heated cum conveying machine for rasogolla preparation. *Indian Journal of Dairy Science, 78*(6), 502–510.	0.20	6.20
16	Ray, A., Minz, P. S., Chitranayak, John, H. & Rohit, H. K. (2025). Optimization of frozen yoghurt based on fat content and product temperature for superior sensorial attributes. *Indian Journal of Dairy Science, 78*(3), 208–215.	0.20	6.20
17	Ray, A., Minz, P. S., Sain, M. & Berry, S. (2025). Prediction modelling of Kulfi freezing: A regression analysis approach. *Indian Journal of Dairy Science, 78*(4), 328–334.	0.20	6.20
18	Sinha, C., Manjunatha, M., Minz, P. S., John, H., Kumari, K. & Priyanka (2025). Impact of microwave treatment on paneer: A study of image analysis and quality. *Indian Journal of Dairy Science, 78*(1), 16–23.	0.20	6.20
19	Sinha, C., Ray, A., Minz, P. S. & Kumari, K. (2025). Comparative analysis of phase change materials as solar thermal energy storage for yogurt incubation. *International Journal of Bio-Resource and Stress Management, 16*(1).	-	5.40
20	Rohit, H. K., Chitranayak, Minz, P. S., Deshmukh, A. K. & Prajapati, R. J. (2025). Factors affecting ice fraction during freezing of aqua glycol salt solution. *Journal of Scientific Research and Reports, 31*(11), 592–604.	-	5.17
21	Rohit, H. K., Sinha, C., Minz, P. S., Deshmukh, A. K. & Ray, A. (2025). Effect of salt and glycol on ice crystal nucleation and growth during freezing. *Archives of Current Research International, 25*(11), 15–25.	-	5.13

Dairy Economics, Statistic & Management

Sr. No.	Research Papers	Impact Factor	NAAS Rating
1.	Balaganesh, G., Malhotra, R., & Sendhil, R. (2025). Development of household vulnerability index to climate change induced drought: Empirical evidence from rural farm households in Tamil Nadu, India. *Environment, Development and Sustainability*, 1–28.	4.20	10.20
2.	Mandal, U. K., Ghosh, A., Karim, F., Mallick, S., Nayak, D. B., Bhutia, R. N., Bhardwaj, A. K., Lama, T. D., Burman, D., Choudhury, P., Mahanta, K. K., Raut, S., Mandal, S. & Mainuddin, M. (2025). Land use change and soil salinization in the Sundarbans: A machine-learning based analysis of long-term transformation and future projections. *Environmental Monitoring and Assessment, 197*, 1380.	3.00	9.00
3.	Sharma, M., Majumder, D., Dixit, A. K., Sen, B. & Maiti, S. (2025). Climate shocks and India's agricultural export performance. *Agribusiness.*1-4.	2.00	8.00
4.	Mohapatra, S., Sainath, B., Anirudh, K. C., Lal, H., Raj, N. K., Bhandari, G., Nyika, J. & Sendhil, R. (2025). Application of blockchain technology in the agri-food system: A systematic bibliometric visualization analysis and policy imperatives. *Journal of Agribusiness in Developing and Emerging Economies, 15*, 288–310.	1.80	7.80
5.	Raj, N. K., Dixit, A. K., Singh, A., Bhandari, G., Sen, B. & Verma, A. (2025). Narrowing the credit divide: Strategies to bridge credit gap among the dairy farming community of Tamil Nadu, India. *Journal of Investment, Banking and Finance, 3*, 1–7.	0.92	-
6.	Rajkumar, Kumar, S., Fagodiya, R. K., Singh, A., Sheoran, P., Yadav, G., Singh, N., Mandal, S. & Yadav, R. K. (2025). A multi-dimensional analysis of integrated farming system in salt-affected ecologies. *The Indian Journal of Agricultural Sciences, 95*, 316–322.	0.70	6.70

Sr. No.	Research Papers	Impact Factor	NAAS Rating
7.	Sruthi, P., Bhandari, G., Chaudhary, U., Maiti, S., Kumar, S. & Onteru, S. K. (2025). Prevalence and determinants of false pregnancy diagnosis in buffaloes: Field evidence from Andhra Pradesh, India. *The Indian Journal of Animal Sciences, 95*, 512–519.	0.30	6.30
8.	Chaudhary, U. & Malhotra, R. (2025). Determinants and impacts of dairy farmer collective action in India. *Indian Journal of Dairy Sciences, 78*, 370–378.	0.20	6.20
9.	Dhasarathan, M., Sen, B. & Singh, A. (2025). Analyzing the drivers and preferences of functional dairy food consumption: A socioeconomic perspective from Tamil Nadu. *Indian Journal of Dairy Sciences, 78*, 470–477.	0.20	6.20
10.	Mondal, I., Bhandari, G., Sen, B., Mandal, S. & Chaudhary, U. (2025). Perception and preferences of urban consumers for liquid milk in North India. *Indian Journal of Economics Development, 21*(1), 77–86.	0.20	6.20
11.	Reddy, K. R., Sankar, U. R., Sen, B. & Singh, A. (2025). Understanding household expenditure: Milk and milk products consumption. *Indian Journal of Economics and Development, 21*, 586–592.	0.20	6.20
12.	Bhandari, G., Chaudhary, U. & Mandal, S. (2025). Assessment of unrealised export potential, regulatory barriers and rejection patterns in the Indian dairy sector. *Indian Journal of Agricultural Economics, 80*, 1032–1049.	-	5.66
13.	Das, M., Bhandari, G., Mandal, S., Chaudhary, U., Garai, S., Prasad, W. & Sen, B. (2025). Analysis of the performance and determinants of Indian dairy exports to Asian markets. *Indian Journal of Agricultural Economics, 80*, 335–352.	-	5.66
14.	Das, M. & Bhandari, G. (2025). Unlocking dairy export potential: An elasticity-based study of India's trade with Asia. *Economic Affairs, 70*, 283–293.	-	5.45
15.	Acharya, K. K. & Dixit, A. K. (2025). Perceived climate change risks and constraints faced by dairy farmers in Odisha. *Indian Journal of Ecology, 52*, 217–221.	-	5.38
16.	Naresha, N. & Dixit, A. (2025). Utilization pattern of milk and milk products by different consuming units in Andhra Pradesh, India: A comparative analysis. *Journal of Scientific Research and Reports, 31*, 420–426.	-	5.17

Dairy Extension

Sr. No.	Research Papers	Impact Factor	NAAS Rating
1.	Panja, A., Garai, S., Maiti, S., Goswami, R., Zade, S., Veldandi, A., Gangopadhyay, D., & Sankhala, G. (2026). Mapping resilience pathway of smallholder farming community to cyclone-led climate disasters in coastal West Bengal, India. *Global Environmental Change, 96*, 103108.	9.10	15.10
2.	Singh, R., Maiti, S., Garai, S., Bhakat, M., Jha, S. K., Dixit, A. K. & Aggarwal, A. (2025). Assessment of climate resilience index: Insight from Murrah buffalo-based livestock production system of Western India. *Agricultural Systems, 228*, 104390.	6.10	12.10
3.	Panja, A., Garai, S., Maiti, S., Choudhary, B. B., Zade, S., Veldandi, A. & Sankhala, G. (2025). Exploring determinants of climate change adaptation by smallholder livestock farmers in coastal West Bengal, India using a double hurdle econometric approach. *Scientific Reports.*	3.90	9.90
5.	Manjunath, K. V., Maiti, S., Garai, S., Reddy, D. A., Zade, S., Mondal, G., Bhakat, M. & Aggarwal, A. (2025). Adaptation strategies to climate change followed by the Murrah buffalo farmers of Haryana. *Indian Journal of Dairy Science, 78*(4), 364–369.	0.20	6.20
6.	Patnaik, N. M., Meena, B. S., Das, U., Das, A., Acharya, P., Kar, P. & Kumar, V. (2025). Productive and reproductive performance of livestock reared in drought and flood prone areas of Odisha: A comparative analysis. *Indian Journal of Dairy Science, 78*(5).	0.20	6.20
7.	Ranjan, A., Sankhala, G., Jha, S. K., Maiti, S., Bhakat, M. & Singh, P. (2025). An exploratory study on existing bovine breeding and management practices in Jharkhand State. *Indian Journal of Dairy Science, 78*(3), 285–290.	0.20	6.20
9.	Raj, M., Sankhala, G. & Samaddar, S. (2025). Unveiling and prioritizing dairy constraints faced by scheduled caste households. *Gujarat Journal of Extension Education, 40*(1), 165–171.	-	5.30
10.	Sruthi, C. O., Meena, B. S. & Pandya. (2025). Evaluating the role of feedback in enhancing learning outcomes at farmers farm school in Karnal district, Haryana. *International Journal of Advanced Biochemistry Research, 9*(1), 381–384.	-	5.29
11.	Pabba, A. S., Ponnusamy, K., Gunashekar, H., Ashok, K. & Sankhala, G. (2025). Customer satisfaction towards the Farmer Producer Companies' products/ services in Telangana and Andhra Pradesh, India. *Journal of Scientific Research and Reports, 31*(2), 382–390.	-	5.17

Sr. No.	Research Papers	Impact Factor	NAAS Rating
12.	Behera, J., Jha, S. K., Maiti, S. & Garai, S. (2025). Measuring livelihood vulnerability to floods among livestock rearers using a composite index in Odisha, India. *International Journal of Environment and Climate Change, 15*(7), 58–68.	-	5.16
13.	Abrar, F. P. N., Maiti, S., Jha, S. K., Garai, S., Bhakat, M., Dixit, A. K. & Roy, S. K. (2025). Farmers' willingness to pay for climate-resilient agriculture technologies: A case study from the coastal low-lying region of Kerala. *Journal of Community Mobilization and Sustainable Development, 20*(2), 539–546.	-	5.02
14.	Ali, W., Garai, S., Maiti, S., Lepcha, C. Y., Chandra, S., Ranjan, A. & Tiwari, S. (2025). Belahi cattle management practices followed by farmers in Shivalik foothills with special reference to indigenous knowledge-based practices. *Journal of Community Mobilization and Sustainable Development, 20*(3), 748–754.	-	5.02
15.	Meena, D. C., Meena, B. S., Priyanka, B. N., Singh, N., Chadda, A., Kumar, S. & Chaudhary, M. V. (2025). Perceptions of human–wildlife interactions and conservation outcomes among communities residing near Ranthambore Tiger Reserve, India. *Asian Journal of Agricultural Extension, Economics and Sociology, 43*(12), 98–108.	-	4.73
16.	Hridya, S., Meena, H. R., Vijayakrishnan, S., Maiti, S. & Meena, B. S. (2025). Ecology–economy interface: Understanding protected area awareness among forest-fringe dairy farming communities in Kerala. *Indian Journal of Extension Education, 62*(1), 8–14.	-	4.48
17.	Yadav, P., Meena, B. S., Saurav, S. K., Pavan, P., Barman, B., Anu, J. & Bishnoi, S. (2025). Effectiveness of climate resilient interventions on performance of dairy animals in Karnal district of Haryana. *Indian Journal of Extension Education, 61*(3), 52–57.	-	4.48

Southern Regional Station

Sr. No.	Research Papers	Impact Factor	NAAS Rating
1	Ravichandran, A., Dhali, A., Kolte, A. P., & Sridhar, M. (2025). Cloning and expression of a short manganese peroxidase from *Lentinus squarrosulus* and its potential in enhancing the digestibility of crop residues. *International Journal of Biological Macromolecules, 304*, 140909.	8.50	14.50
2	Manimaran, A., Desingu, P. A., Kumaresan, A., Singh, P., Subramanya, K., Dodamani, P., & Dineshbhai, P. A. (2025). The metagenomic and whole-genome metagenomic detection of multidrug-resistant bacteria from subclinical mastitis-affected cow's milk in India. *Frontiers in Cellular and Infection Microbiology, 15*, 1549523.	4.80	10.80
3	Ammu, V. K., Pushpadass, H. A., Franklin, M. E. E., & Duraisamy, R. (2025). Biosynthesis of zinc oxide nanoparticles using *Carica papaya* and *Cymbopogon citratus* leaf extracts: A comparative investigation of morphology and structures. *Journal of Molecular Structure, 1323*, 140737.	4.70	10.70
4	Amarlapudi, M. R., Balasubramaniam, C., Singh, H., Yadav, A., Vishweswaraiah, R. H., Pradhan, D., Kumar, N., Dhotre, D., Kolte, A. P., & Mallappa, R. H. (2025). Microbiome and antibiotic resistance profile of milk and faeces from cattle in an organized dairy production system. *International Journal of Antimicrobial Agents*, 107590.	4.60	10.60
5	Rajendran, D., Shobha, M., Mohana, S., Gopi, M., Ramachandran, N., Franklin, M. E. E., Manimaran, A., Huliyurdurga Shameeulla, H., Selvaraju, S., & Sahoo, A. (2025). Comprehensive characterization and biological and safety evaluation of zinc oxide–curcumin nanoconjugates: Unraveling synergistic effects for enhanced therapeutic applications. *ACS Omega, 10*(25), 27045–27057.	4.30	10.30
6	Meena, P., Kataktalware, M. A., Praveen, S., Patoliya, P., Ravindra, M. R., Jeyakumar, S., Sivaram, M., Chauhan, M., Ramesha, K. P., & Dhali, A. (2025). Sustainable transformation of recycled manure solids: Effects of lime and neem oil-based bedding conditioners on physicochemical and microbial properties. *Biomass Conversion and Biorefinery, 15*, 29107–29120.	4.10	10.10
7	Raghavendra, K. J., Kumara, T. K., Gowda, C., Kandpal, A., Bhat, S., Amrutha, T., Shivaswamy, G. P., Nithyashree, M. L., & Ravisankar, N. (2025). A meta-analysis on economic performance of organic vis-a-vis conventional farming in India. *Clean Technologies and Environmental Policy, 27*(8), 3589–3600.	3.90	9.90
8	Banu, S., Kishor, P. V., Krishnappa, S., Periyasamy, T. S. R., Sakthivel, J., Joyappa, D. H., Patel, B. M., Teggi, H., Somagond, A., Vijayapillai, U., & Gowane, G. R. (2025). Effect of vaccination against foot-and-mouth disease during mid-pregnancy on the neutralizing antibody response in the cow. *Vaccine, 48*, 126738.	3.50	9.50

Sr. No.	Research Papers	Impact Factor	NAAS Rating
9	Kumar, V., Nayakvadi, S., Prakash, K., Revanasiddappa, S. T., Ranjitha, G., Kalyan, N. P., & Mamta. (2025). Isolation, antimicrobial resistance and biofilm gene analysis of MRSA in clinical and sub-clinical bovine mastitis. *Microbial Pathogenesis*, 107851.	3.50	9.50
10	Nataraj, B. H., Ramesh, C., & Mallappa, R. H. (2025). Probiotic and postbiotic interference exhibit anti-adhesion effects against clinical methicillin-resistant *Staphylococcus aureus* (MRSA) and impede MRSA-induced intestinal epithelial hyper-permeability in HT-29 cell line. *Microbial Pathogenesis, 199*, 107215.	3.50	9.30
11	Kumar, K. N., Veerappa, V. G., Kumaresan, A., Lavanya, M., King, J. E. S., Sulochana, M., Patil, S., & Jeyakumar, S. (2025). Localization and expression analysis of sperm-specific glyceraldehyde 3-phosphate dehydrogenase in bull spermatozoa with contrasting sperm motility. *Andrology, 13*(7), 1880–1890.	3.40	9.40
12	Kumari, M., Devi, U., Amrutha, T. M., Sandeep, N., Sathish Kumar, M. H., Kapila, S., Hussain, A. S., & Manoj Kumar, C. T. (2025). Compositional characterisation of colostrum and proline rich polypeptides of indigenous cattle (*Bos indicus* family), Holstein Friesian (*Bos taurus*), and their crossbred Karan Fries cattle. *International Dairy Journal, 167*, 106264.	3.40	9.40
13	Marak, T. R., Kumar, C. M., Kumar, M. S., Naik, N. L., Rashmi, H. M., & Ashritha, B. (2025). Encapsulation of piperine in metal organic frameworks and evaluation of its stability, characteristics, in vitro digestion and product fortification. *Food and Bioproducts Processing*, 152, 64–73.	3.40	9.40
14	Mili, B., Chutia, T., Buragohain, L., Palanisammi, A., & Kumaresan, A. (2025). Liquid storage of boar semen: Current approaches to reducing sperm damage using antioxidants and nanotechnology. *Animal Reproduction Science, 278*, 107871, 1–16.	3.30	9.30
15	Neethu, K. C., Pushpadass, H. A., Franklin, M. E. E., & Krishnamurthy, H. (2025). Exploring oil absorption and distribution in immersion-fried pantoa (Indian dairy dessert): Effects of frying media. *Journal of Food Science and Technology, 62*(1), 155–166.	3.30	9.30
16	Sharanabasava, R. M., Nagajjanavar, K., Manjunatha, M., & Kumar, G. M. (2025). Application of vacuum impregnation in the potential acceleration of mass transfer phenomenon during soaking of traditional Indian sweet Gulabjamun. *Journal of Food Science and Technology, 63*, 462–471.	3.30	9.30
17	Nataraj, B. H., Srivastava, S. K., Vishwakarma, S., Rashmi, H. M., & Parmar, A. S. (2025). Hydrothermal synthesis and characterization of carbon quantum dots from paneer whey and evaluation of their *in vitro* safety, anti-oxidant and antagonistic properties. *Journal of Food Measurement and Characterization, 19*, 5958–5970.	3.30	9.30
18	Kumaresan, A., Yadav, P., Hofmann, A., Sinha, M. K., King, J. P. E. S., Nag, P., Mishra, J. S., & Kumar, S. (2025). Unveiling the reproductive risks of PFOS: Testicular proteome disruption and hormonal imbalance in male rats. *Biology of Reproduction, 113*(3), 686–703.	3.00	9.00
19	Deshmukh, N., Arora, S., Kumar, C. T., Naik, N. L., Kumar, M. H., & Rao, P. S. (2025). Bioconversion of paneer whey lactose into galactooligosaccharides by dual enzyme approach. *Waste and Biomass Valorization*, 1–12.	2.80	8.80
20	Nataraj, B. H., Chette, R., & Mallappa, R. H. (2025). Cell surface proteins of indigenous probiotics render antagonistic and protective effect on gut barrier integrity against extended-spectrum beta-lactamase (ESBL) *Escherichia coli*. *Letters in Applied Microbiology, 78*(8), ovaf110.	2.10	8.10
21	Fataniya, K. K., Kumaresan, A., Yadav, A. K., King, J. P. E. S., Sivaram, M., Talluri, T. R., Manimaran, A., Vedamurthy, G. V., Jeyakumar, S., & Payasi, S. (2025). Identification of fertility associated sperm sub-populations and development of quality control assays for cryopreserved semen in buffaloes (*Bubalus bubalis*). *Veterinary Research Communications, 49*(6), 335.	2.00	8.00
22	Kishor, P. V., Patel, B. H., Banu, S., Periyasamy, T. S. R., Teggi, H., Sakthivel, J., Jayaprakash, A. M., Joyappa, D. H., Hosamani, M., Mahadappa, P., & Singh, M. (2025). Decay of maternal neutralizing antibodies against foot and mouth disease virus (FMDV) in the calves born to the dam vaccinated for FMD during 80–110 days of gestation. *Veterinary Research Communications, 49*(6), 1–7.	2.00	8.00
23	Yadav, A. K., Kumaresan, A., Fataniya, K. K., Sinha, M. K., King, J. P. E. S., Manimaran, A., Jeyakumar, S., Sivaram, M., Vedamurthy, G. V., & Das, D. N. (2025). High-throughput proteomic profiling reveals dysregulated serum proteins in low fertility bulls linked to nutrient-autophagy-inflammation-extracellular matrix axis. *Veterinary Research Communications, 49*(6), 1–17.	2.00	8.00

Sr. No.	Research Papers	Impact Factor	NAAS Rating
24	Allu, T., Jeyakumar, S., Rao, K. A., Krishnaswamy, N., Chintalapati, G. V., Mula, R. K., Veerappa, V. G., Kumaresan, A., Ramesha, K. P., Sivaram, M., & Kataktalware, M. A. (2025). Infrared thermal imaging of muzzle surface region and its temperature profile associated with calving process in buffalo (*Bubalus bubalis*). *Tropical Animal Health and Production, 57*(8), 410.	1.70	7.70
25	Fataniya, K. K., Kumaresan, A., Yadav, A. K., King, J. P. E. S., Sivaram, M., Talluri, T. R., Manimaran, A., Vedamurthy, G. V., Jeyakumar, S., & Payasi, S. (2025). Identification of sperm parameters linked to fertility and development of fertility prediction models for zebu (*Bos indicus*) and crossbred (*Bos taurus* × *Bos indicus*) cattle bulls. *Tropical Animal Health and Production, 57*(7), 304.	1.70	7.70
26	Teja, A., Jeyakumar, S., Rao, K. A., Krishnaswamy, N., Chintalapati, G. V., Veerappa, V. G., Kumaresan, A., Ramesha, K. P., Sivaram, M., Kataktalware, M. A., & Das, D. N. (2025). Thermal signatures of vulval skin surface: A potential non-invasive diagnostic technology to monitor the calving process in water buffalo (*Bubalus bubalis*). *Reproduction in Domestic Animals, 60*(5), e70065.	1.70	7.70
27	Karimpat, A., Mishra, A., Dhali, A., & Roy, S. C. (2025). Sex-specific differences in expression of pluripotency-related transcription factors in sheep embryos produced *in vitro*. *Small Ruminant Research, 255*, 107682.	1.40	7.40
28	Rahila, M. P., Nath, B. S., Naik, L., Shinde, D., & Pushpadass, H. A. (2025). Gamma-oryzanol as a natural antioxidant to enhance the autoxidative and thermal stability of clarified butterfat (ghee). *Journal of Dairy Research*, *92*(2), 280-287.	1.20	7.20
29	Verma, A., Kumaresan, A., Patil, S., Sinha, M. K., King, J. P. E. S., Nag, P., Vedamurthy, G. V., Jeyakumar, S., Manimaran, A., & Ramesha, K. (2025). Comprehensive proteomic profiling and functional network analyses of indigenous zebu (*Bos indicus*) cattle spermatozoa. *Agricultural Research*, *15*, 405-415	1.10	7.10
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Sr. No.	Research Papers	Impact Factor	NAAS Rating
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Eastern Regional Station

Sr. No.	Research Papers	Impact Factor	NAAS Rating
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2	Das, P.J., Kumar, S., Choudhury, M., Pegu, S.R., Meera, K., Deb, R., Kumar, S., Banik, S. & Gupta, V.K. (2025). Complete Mitochondrial Genome Sequence Analysis Revealed Double Matrilineal Components in Indian Ghoongroo Pigs. *Scientific Reports*. 15, 2219.	3.90	9.90
3	Singh, A. K., Bhakat, C., Kisku, U., Karunakaran, M. & Dutta T. K. (2025). Effect of supplementation of phyto-additive mixtures on live weight, blood indices, hormonal profile and reproductive performance in Black Bengal goats. *Scientific Reports*. *15*(1), 4442.	3.90	9.90
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Sr. No.	Research Papers	Impact Factor	NAAS Rating
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Sr. No.	Research Papers	Impact Factor	NAAS Rating
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Book

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2. Maiti S., Garai, S., Veldandi A, Vamshi M, S., Panja, A., Kumar, R., & Sankhala, G. (2025). *Socio-Climatology: Exploring social dimensions of climate change* in Dairy Extension Division, ICAR-National Dairy Research Institute, Karnal, Haryana. (pp.1-312). ISBN- 978-81-984794-9-5.
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164. श्रेयश बगरेचा, राजेश कुमार मीणा, हरदेव राम एवं अनुराग सक्सेना, 2025. चारा उत्पादन के लिए बीजचार सह कम्पोस्टिंग के उपयोग के साथ मिटटी प्रबंधन. डेरी स्मारिका: 149-152.

Institute Publications/Technical Bulletin/ Training Manuals/ Compendia

1. Aggarwal, A., Maiti, S., & Garai, S. (2025). *Impact of heat stress on dairy animal: Effect, measurement indicator and coping mechanism*. ICAR–National Dairy Research Institute, Karnal, Haryana, India (Hindi ed., p. 41).
2. Berry, S., Rai, A., Kadian, K. S., & Maiti, S. (2025). A holistic approach to promote farmer finance in hilly areas. In G. Sankhala et al. (Eds.), *Scientific techniques of animal husbandry* (pp. 167–168). ICAR–NDRI. (In Hindi).
3. Berry, S., Sankhala, G., Rai, A., Maiti, S., & Sharma, A. K. (2025). Empowering farmers' decisions with Artificial Intelligence-powered dairy advisory services. In G. Sankhala et al. (Eds.), *Technical information for dairy stakeholders* (pp. 5–6). ICAR-NDRI. (In Hindi)
4. Chander Datt, Narayan, S., Patel, A., Gaikwad, S., & Singh, S. (2025). Dairy pashuwon ke aarhar mein kanij mishran milayien - utpadou kshamata badayein. In *Pashu palan ki vaigynik taknikiyau* (pp. 224-228). ICAR-NDRI, Karnal. ISBN: 978-81-970997-4-8.
5. Deep, A., & Barnwal, P. (2025). Traditional dairy products: Mechanised production. In *Training manual of a training programme on 'Milk and Milk Products Processing'* (January 20-25, 2025). Agri Business Incubation Centre, ICAR-NDRI, Karnal.
6. Devi, I., & Soni, A. (2025). दूध दुहने का प्रबंधन: स्वच्छ दूध प्रथायें, दूध दुहने की प्रणाली, दूध दुहने का कक्ष और दूध दुहने के उपकरणों की स्वच्छता. In *Training manual on 'Dairy Farming'* (December 8–13, 2025). Agri Business Incubation Centre, ICAR-NDRI, Karnal.
7. Devi, I., & Verma, S. K. (2025). भारत में डेयरी फार्मिंग का महत्व. In *Training manual on 'Dairy Farming'* (December 8-13, 2025). Agri Business Incubation Centre, ICAR-NDRI, Karnal.
8. Emerald, F. M. E., Shruthi, P. A., Harshitha, M., & Pushpadass, H. A. (2025). Characterisation of bioactive compounds and peptides through differential scanning calorimetry. In M. H. Sathish Kumar, P. S. Rao, & A. Dhali (Eds.), *Compendium of winter school on milk derived high value bioactive compounds: Agro-industrial prospects, challenges and way forward* (pp. 111–115). National Dairy Research Institute. ISBN 978-81-973229-3-8.
9. Gupta, A., Khatri, Y., Chauhan, K., Trivedi, T., & Tyagi, N. (2025). डेरी पशुओं के लिए राशन संतुलन. *डेरी मेला स्मारिका*, ICAR-NDRI, Karnal, 98-100.
10. Jesika, Maiti, S., Singh, H., Garai, S., Zade, S., Veldandi, A., & Panja, A. (2025). Nutrition management measures to maintain fertility and milk productivity of buffaloes to prevent heat stress. In G. Sankhala et al. (Eds.), *Technical information for dairy stakeholders* (pp. 163–165). ICAR-NDRI. (In Hindi)
11. Jose, N., & Ravindra, M. R. (2025). Microencapsulation approaches for the development of novel thermal energy storage systems and their applications. Solar Energy Materials and Solar Cells, 280, 113271. https://doi.org/10.1016/j.solmat.2024.113271.
12. Kataktalware, M. A., Meena, P., Tony, U., Vashistha, U., Kumar, A., Meena, N., & Devi, L. G. (2025). AI-driven multimodal lameness detection for advancing precision dairy cattle management in a Viksit Bharat. In Balasubramanyam et al. (Eds.), *National symposium on Viksit Bharat: Challenges, opportunities and way forward for Indian dairy sector* (pp. 28–32). Organized jointly by ICAR–NDRI, SRS Bengaluru, IDA-SZ, and Alumni Association, SRS of ICAR–NDRI, Bengaluru.
13. Kumar, R., Kumar, A., Maiti, S., Garai, S., Gurjar, L. R., & Sankhala, G. (2025). Farmers' questions and answers about lumpy skin disease. In G. Sankhala et al. (Eds.), *Scientific techniques of animal husbandry* (pp. 221–223). ICAR-NDRI. (In Hindi)
14. Kumar, R., Maiti, S., Garai, S., Kumar, S., & Singh, H. (2025). Good Animal Husbandry Practices: Do's and Don'ts. In G. Sankhala et al. (Eds.), *Technical information for dairy stakeholders* (pp. 34–36). ICAR-NDRI. (Ln Hindi)
15. Kumar, S. M. H., Rao, P. S., & Dhali, A. (Eds.). (2025). *Compendium of ICAR sponsored winter school on milk derived high value bioactive compounds: Agro-industrial prospects, challenges and way forward*. ICAR–National Dairy Research Institute. ISBN 978-81-973229-3-8.
16. Maiti, S., Mounika, B., Garai, S., Meena, B.S., Mondal, G., Aggarwal, A., Bhakat, M. and Sankhala, G. (2025) Curriculum for Climate Resilient Dairy Farm School. Dairy Extension Division, ICAR-National Dairy Research Institute, Karnal, Haryana, Pin-132001. Pp: 96. (Bilingual: Hindi and English).
17. Padaliya, N., Maiti, S., Dubey, A., Mishra, S., & Veldandi, A. (2025). Rural development and dairy industry: Role and empowerment of women. In G. Sankhala et al. (Eds.), *Technical information for dairy stakeholders* (pp. 54–56). ICAR-NDRI. (In Hindi)
18. Panja, A., Zade, S., Veldandi, A., Bhattacharya, S., & Garai, S. (2025). Measures to achieve carbon balance in agriculture sector. In G. Sankhala et al. (Eds.), *Technical information for dairy stakeholders* (pp. 90–92). ICAR-NDRI. (In Hindi)
19. Panjagari, N. R., & Ghosh, S. (2025). Nanocomposite materials for dairy and food packaging: An update on recent applications. In *Souvenir of ICAR sponsored short course on*

'Emerging Trends in Nanotechnology for Dairy and Food Applications' (January 7-16, 2025). SRS of ICAR-NDRI, Bengaluru.

20. Pawan, P., Garai, S., Veldandi, A., Zade, S., Panja, A., & Maiti, S. (2025). Management practices adopted for climate friendly dairy production. In G. Sankhala et al. (Eds.), *Scientific techniques of animal husbandry* (pp. 214–216). ICAR-NDRI. (In Hindi)
21. Pushpadass, H. A., & Emerald, F. M. E. (2025). Characterisation of encapsulated bioactives through Fourier transform-infrared spectroscopy (FTIR). In M. H. Sathish Kumar, P. S. Rao, & A. Dhali (Eds.), *Compendium of winter school on milk derived high value bioactive compounds: Agro-industrial prospects, challenges and way forward* (pp. 24–30). National Dairy Research Institute. ISBN 978-81-973229-3-8.
22. Pushpadass, H. A., Devaraju, R., Emerald, F. M. E., & Surendra Nath, B. (2025). Application of electrospinning for encapsulation of casein-derived peptides. In M. H. Sathish Kumar, P. S. Rao, & A. Dhali (Eds.), *Compendium of winter school on milk derived high value bioactive compounds: Agro-industrial prospects, challenges and way forward* (pp. 175–178). National Dairy Research Institute. ISBN 978-81-973229-3-8.
23. Ravindra, M. R., & Sharma, G. (2025). Hygienic engineering for processing equipment and process lines. In *Souvenir of the National Symposium on "Viksit Bharat: Challenges, Opportunities, and Way Forward for the Indian Dairy Sector"* organized at SRS of ICAR–NDRI on 28 November 2025.
24. Ravindra, M. R., Rajesh, K., Sharma, M., & Birwal, P. (2025). Pulsed electric field technology for extraction of bioactives from dairy products. In *Compendium of the ICAR sponsored winter school on milk derived high value bioactive compounds: Agro-industrial prospects, challenges and way forward* held during January 31 to February 20, 2025.
25. Sathish Kumar, M. H., Devaraja, H. C., & Manoj Kumar, C. T. (2025). *e-Technical bulletin on ice cream and frozen desserts*.
26. Selokar, N. L., & Singh, M. K. (2025). *Lab manual on CRISPR technology in farm animals* (1st ed., p. 96). ICAR–National Dairy Research Institute, Karnal. ISBN 978-81-984794-3-3.
27. Singh, D., Selokar, N. L., Singh, M. K., & Chauhan, M. S. (2025). *CRISPR/Cas technology: Fundamentals, applications, and success stories in farm animals* (1st ed., 182 pp.). ICAR-National Dairy Research Institute, Karnal. ISBN: 978-81-984794-0-2.
28. Singh, M. K., & Selokar, N. L. (2025). *Lab manual on genome editing technology: Basics and applications* (p. 59). ICAR–National Dairy Research Institute, Karnal.
29. Singh, M. K., Gupta, T., Ritika, & Selokar, N. L. (2025). In vitro embryo production in buffalo. In *Optimized reproductive management of dairy animals: Maximizing profitability* (pp. 106-110). ICAR-NDRI, Karnal. ISBN: 978-81-984794-8-8.
30. Singh, M. K., Tripathi, G., & Selokar, N. L. (2025). Buffalo cloning: Multiplication of superior animals for sustainable milk production. In *Optimized reproductive management of dairy animals: Maximizing profitability* (pp. 26-32). ICAR-NDRI, Karnal. ISBN: 978-81-984794-8-8.
31. Singh, P., Yadav, S., Patel, K., Verma, R., Singh, M. K., & Selokar, N. L. (2025). Genome editing technology for production of animals with desired traits. In *Optimized reproductive management of dairy animals: Maximizing profitability* (pp. 111-124). ICAR-NDRI, Karnal. ISBN: 978-81-984794-8-8.
32. Sirilakshmi, Y., Zade, S., Gogoi, B. P., & Garai, S. (2025). Management of heat stress in dairy cattle: An emerging need in climate resilient animal husbandry. In G. Sankhala et al. (Eds.), *Technical information for dairy stakeholders* (pp. 7–9). ICAR-NDRI. (In Hindi)
33. Srinivas, V. M. V., Shalini, G., Hemalatha, H., Kumaresan, A., Kantharaj, S., & Murugavel, K. (2025). Compendium of abstracts of International Symposium on *Animal Reproduction in a Changing world: Addressing Challenges and Embracing Opportunities* (pp. 363). ISBN 978-81-986250-0-7.
34. Srinivas, V. M. V., Shalini, G., Hemalatha, H., Kumaresan, A., Kantharaj, S., & Murugavel, K. (2025). Souvenir of 40th Annual Convention of ISSAR and International Symposium (pp. 58).
35. Vairat, A. D. (2025). High pressure processing and its influence on the bioactive compounds of milk. In *Winter school on milk derived high value bioactive compounds: Agro-industrial prospects, challenges and way forward* (pp. 163–168). National Dairy Research Institute. ISBN 978-81-973229-3-8.

Oral Poster Presentation

1. A., C. B., Sharma, M., Ravindra, M. R., S., C. S., & Devaraja, H. C. (2025, November 28). Development of phospholipid-rich powder from industrial ghee residue using vacuum drying technology [Poster presentation]. National Symposium on "Viksit Bharat: Challenges, Opportunities and Way Forward for Indian Dairy Sector", ICAR-NDRI, Southern Regional Station, Bengaluru, Karnataka, India.
2. Akshata, S., Anoff, M. F., Shivaswamy, G. P., & Sivaram, M. (2025, January 9–11). Implications of dairy foods consumption on nutritional status in Karnataka [Poster Presentation]. IDA-Southern Dairy Summit 2025, Bengaluru.

3. Ameenabenazir, P., Sharma, M., Ravindra, M. R., & Devaraja, H. C. (2025, December 18–19). Comparative study on ultrasound and microwave-assisted extraction of phospholipids from industrial ghee residue [Oral presentation]. International Conference on Recent Trends in Transforming Global Production Systems: Cutting-Edge Technologies in Penta 'F' Food, Fibre, Feed, Fuel, and Fertilizers, Thiagarajar College, Madurai, Tamil Nadu, India.
4. Ameenabenazir, P., Sharma, M., Ravindra, M. R., & Devaraja, H. C. (2025, November 28). Optimization of spray drying process parameters for obtaining phospholipid-rich extract powder from industrial ghee residue [Poster presentation]. National Symposium on "Viksit Bharat: Challenges, Opportunities and Way Forward for Indian Dairy Sector", ICAR-NDRI, Southern Regional Station, Bengaluru, Karnataka, India.
5. Anoff, M. F., Akshata, S., Shivaswamy, G. P., & Sivaram, M. (2025, January 9–11). Implications of dairy foods consumption on nutritional status in Karnataka [Poster Presentation]. IDA-Southern Dairy Summit 2025, Bengaluru.
6. Banu, K., Gaddi, S. A. M., G., G. B., Naik, L. N., Rao, K. J., Sakthivel, J., Kumar, S. M. H., & Mondal, B. (2025). MILK-O-MAK™: Paper-based device for multi-adulterants detection in milk [Poster presentation]. In Souvenir: National Symposium on "Viksit Bharat: Challenges, Opportunities and Way Forward for the Indian Dairy Sector". Indian Dairy Association (South Zone), Bengaluru, Karnataka, India.
7. Barnwal, P., Devi, I., Deep, A., & Chambyal, T. (2025, February 20–22). Implementation of technologies for smart livestock farming [Poster presentation]. XVII Agricultural Science Congress on "Frontier Sciences and Technologies in Agriculture for Developed India", Govind Ballabh Pant University of Agriculture and Technology, Pantnagar, Uttarakhand, India.
8. Choudhary, S. P., Pushpadass, H. A., Emerald, F. M. E., & Pandiyaraj, K. N. (2025, July 16–18). Vacuum cold plasma treatment of chhana podo for enhanced shelf life [Full-length paper presentation]. Fourth International Conference on "Advances in Plasma Science and Technology", organized by Sri Ramakrishna Mission Vidyalaya College of Arts and Science, Coimbatore, Tamil Nadu, India.
9. Deepshika, Ingole, S. Y., Naik, L., Rao, P. S., Naik, S. K., & Pious, H. (2025). Poster No. NS25-A-105A: A qualitative rapid method to detect presence of milk powder in paneer [Poster presentation]. In Souvenir: National Symposium on "Viksit Bharat: Challenges, Opportunities and Way Forward for the Indian Dairy Sector". Indian Dairy Association (South Zone), Bengaluru, Karnataka, India.
10. Influence of pinni moulding parameters on pinni quality [Poster presentation]. (2025, September 20). 12th National Seminar on Globalization of Indian Dairy Industry, organized by NGA and ICAR-NDRI, Karnal, Haryana, India.
11. Kiran, Raghu H. V., & Vij, S. (2025, September 20–21). Innovations in bioactive colostrum protein and peptide-based formulations: From discovery to application in therapeutics [Poster presentation]. 12th National Seminar on Globalization of Indian Dairy Industry, ICAR-NDRI, Karnal, India.
12. Mondal, S., Vairat, A. D., Menon, R. R., Pushpadass, H. A., & Kataktalware, M. A. (2025). Thermal behaviour, energy potential and proximate characteristics of torrefied cow dung pellets [Presentation]. Jointly organized by ICAR-NDRI, Southern Regional Station, Indian Dairy Association–South Zone, and Alumni Association, ICAR-NDRI SRS, Bengaluru, Karnataka, India.
13. Pasagadi, A., Franklin, M. E. E., Pushpadass, H. A., Pandiyaraj, K. N., & Roopesh, M. S. (2025, February 6–8). Impact of atmospheric cold plasma on the microbiological quality and protein structure of whey. In International Workshop on Cold Plasma Technology and Applications (CPTA-2025), organized by Birla Institute of Technology Mesra, Off-Campus Jaipur, Jaipur, Rajasthan, India.
14. Pasagadi, A., Pushpadass, H. A., Emerald, F. M. E., & Pandiyaraj, K. N. (2025, July 16–18). Cold plasma systems for non-thermal processing of foods [Full-length paper presentation]. Fourth International Conference on "Advances in Plasma Science and Technology", organized by Sri Ramakrishna Mission Vidyalaya College of Arts and Science, Coimbatore, Tamil Nadu, India.
15. Petare, N. R., Kumar, M. C. T., Kumar, S. M. H., Basavaprabhu, H. N., & Rao, P. S. (2026, January 29–30). Sequential application of activated charcoal and selective microbial fermentation for purification of GOS produced from paneer whey [Presentation]. International Conference on "Safe, Standard and Sustainable Food Processing for Healthier Tomorrow", organized by Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu, India.
16. Ravikumar, Shivaswamy, G. P., Sivaram, M., Subash, S., Rashmi, H. M., & Devaraja, H. C. (2025, January 9–11). Consumer awareness and preference for probiotic dairy products in urban Bengaluru [Poster Presentation]. IDA-Southern Dairy Summit 2025, Bengaluru.

17. Ritvik, Mondal, S., & Vairat, A. D. (2025, January 9–11). Production of cattle dung-based composite biomass pellet for utilization of biofuel [Presentation]. Dairy Summit 2025, organized by Indian Dairy Association at NIMHANS, Bengaluru, Karnataka, India.

18. Sharath, S., Naik, L. N., Rao, P. S., Rao, K. J., Magdalene, F., Rashmi, H. M., Devaraja, H. C., & Pious, H. (2025). Poster No. NS25-A-106A: Method for detection of sulphuric acid used as coagulant in synthetic paneer [Poster presentation]. In Souvenir: National Symposium on "Viksit Bharat: Challenges, Opportunities and Way Forward for the Indian Dairy Sector". Indian Dairy Association (South Zone), Bengaluru, Karnataka, India.

19. Shivaswamy, G. P., & Sivaram, M. (2025, January 9–11). Dairy foods consumption expenditure in Southern India: Trends and patterns [Poster Presentation]. IDA-Southern Dairy Summit 2025, Bengaluru.

20. Shivaswamy, G. P., & Sivaram, M. (2025, November 28). Changing scenario of consumption expenditure pattern on dairy foods in Southern India [Poster Presentation]. National Symposium on "Viksit Bharat: Challenges, Opportunities, and Way Forward for the Indian Dairy Sector", Bengaluru.

21. Singh, K., Sharma, M., Rashmi, H. M., & V., V. K. (2025, November 28). Optimization of whey-based medium for the production of Lactiplantibacillus plantarum Lp91 (MTCC 5690) [Poster presentation]. National Symposium on "Viksit Bharat: Challenges, Opportunities and Way Forward for Indian Dairy Sector", ICAR-NDRI, Southern Regional Station, Bengaluru, Karnataka, India.

22. Thakur, N., Wandhare, A., Rizwan, M., & Vij, S. (2025, September 20). Novel fermented cow colostrum whey derived antifungal peptides against Mucorales: In vitro potency, computational characterization and synthetic validation [Poster presentation]. 12th National Seminar on Globalization of Indian Dairy Industry, ICAR-NDRI,Karnal, India.

23. Thakur, N., Wandhare, A., Rizwan, M., & Vij, S. (2025, September 20). Novel fermented cow colostrum whey derived antifungal peptides against Mucorales: In vitro potency, computational characterization and synthetic validation [Poster presentation]. 12th National Seminar on Globalization of Indian Dairy Industry, ICAR-NDRI, Karnal, India.

24. V., M., Chauhan, M., Vedamurthy, G. V., Rashmi, H. M., Manimaran, A., Naik, L., & Jeyakumar. (2025, November 23–24). Enhancing amoxicillin efficacy with N-acetyl cysteine: In vitro modulation and its evaluation in clinical mastitis affected cows. CLIMATECON 2025 International Conference, ICAR-NIANP, Bengaluru, Karnataka, India.

25. Vairat, A. D. (2025, March 1). Transforming agro waste into energy: A sustainable approach for the future [Paper presentation]. 10th Annual Women's Meet – AWM 2025, organized by Venus International Foundation, Chennai, Tamil Nadu, India.

26. Wandhare, A., Thakur, N., & Vij, S. (2025, October 5–7). From bioactive fractions to functional ingredient: A colostrum whey-based strategy for antimicrobial defense and immune enhancement in diarrheal management [Oral presentation]. Xth International Conference in Hybrid Mode on Global Research Initiatives for Sustainable Agriculture and Allied Sciences (GRISAAS-2025), Udaipur.

27. Wandhare, A., Thakur, N., & Vij, S. (2025, September 20–21). Innovations in bioactive colostrum protein and peptide-based formulations: From discovery to application in therapeutics [Poster presentation]. 12th National Seminar on Globalization of Indian Dairy Industry, ICAR-NDRI, Karnal, India.

Dr. M. L. Jat, Secretary DARE & DG,ICAR, New Delhi along with other dignitaries visiting Gene edited Buffalo at NDRI- Livestock Research centre

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TRAINING AND CAPACITY BUILDING

The Human Resource Management (HRM) Unit has been established at NDRI to ensure effective coordination and implementation of training programmes in accordance with the National Training Policy (2012) of the Government of India, which emphasizes competency-based training for all. The training plan of NDRI addresses the gap between existing and required competencies and provides opportunities for employees to enhance and develop their professional skills.

FOREIGN VISITS

Sr. No.	Name and Designation	Title	Duration
1.	**Dr. Dheer Singh** Director, ICAR-NDRI, Karnal	Workshop of InDeVet, the Indo-German Partnership for Veterinary Education and Research at Leipzig University, Germany	April 28-30, 2025
2.	**Dr. Suneel Kumar Onteru** Principal Scientist & Head, Animal Biochemistry Division	Workshop of InDeVet, the Indo-German Partnership for Veterinary Education and Research at Leipzig University, Germany	April 28-30, 2025
3.	**Dr. Sachin Kumar** Senior Scientist, Animal Nutrition Division	Sustainable Family Farming in Livestock to Achieve the SDGs in South Asia-Challenges and Opportunities Kathmandu, Nepal.	August 11-13, 2025,
4.	**Dr. Dheer Singh** Director, ICAR-NDRI, Karnal	To deliver a lecture on "Dairy Production in India" at the Cornell Nutrition Conference, New York, USA	October 21- 23, 2025
5.	**Dr. Goutam Mondal** Principal Scientist, Animal Nutrition Division	Participated in and represented India at the Regional Stakeholder Workshop on the Enhanced Transparency Framework (ETF) organized jointly by ICIMOD and UNFCCC, held at Paro, Bhutan.	December 01-02, 2025
6.	**Dr. Naresh Lalaji Selokar** Senior Scientist, ABT Division	Training under the Lal Bahadur Shastri Outstanding Young Award 2021 Challenge Research Project at the Institute of Farm Animal Genetics, Germany	December 18, 2025 to March 17, 2026

TRAININGS/CONFERENCES

Scientific Staff

The following faculty members of ICAR–NDRI participated in various conferences, seminars, training programmes, and other events across the country.

Sr. No.	Name of Scientist with Designation	Title of Conf./Seminar/Symposium/ etc.	Period and place
1	**Dr. A. Mandal** Principal Scientist	Attended ONLINE Workshop cum training program on "Climate-Smart solutions for heat stress in Poultry and Livestock" at Institute of Veterinary Science and Animal Husbandry, Siksha 'O' Anusandhan, Bhubaneswar, Odisha	January 7-11, 2025

Sr. No.	Name of Scientist with Designation	Title of Conf./Seminar/Symposium/ etc.	Period and place
2	**Dr. Arindam Dhali** Principal Scientist & Head **Dr. S. Jeyakumar** Principal Scientist **Dr. Menon Rekha Ravindra** Principal Scientist **Dr. S. Subash** Senior Scientist **Dr. M.C.A. Devi** Principal Scientist **Dr. Laxmana Naik N.** Senior Scientist **Dr. Satish Kumar M.H.** Senior Scientist **Dr. Priyanka Singh Rao** Scientist **Dr. A. Manimaran** Senior Scientist **Dr. D.N. Das** Principal Scientist **Dr. Vedamurthy G.V.** Senior Scientist **Dr. P. Heartwin Amaladhas** Principal Scientist **Dr. F. Magdaline Eljeeva Emerald** Principal Scientist **Dr. Rashmi** Senior Scientist **Dr. Basavaprabhu** Scienitst **Dr. M. Sivaram** Principal Scientist	"Southern Dairy Summit" at Bengaluru, Karnataka	January 9-11, 2025
3	**Dr. A. K. Samanta** Principal Scientist **Dr. Sachin Kumar** Scientist **Dr. Nitin Tyagi** Principal Scientist **Dr. Gautam Mondal** Principal Scientist **Dr. Chander Datt** Principal Scientist **Dr. A. K. Mishra** Principal Scientist	Participated in World Animal Nutrition Conference (WANACON-2025) at Animal and Fishery Science University, Nagpur	January 20-22, 2025
4	**Dr. Heena Sharma** Senior Scientist	Attended International Conference on "Global Research Initiatives for Agriculture, Science and Technology' at Indira Gandhi Krishi Vishwavidalya, Raipur	January 20-22, 2025
5	**Sh. Biswajit Sen** Scientist	Attended Winter school training on 'Applications of Deep Learning in Agriculture using Python' at ICAR-IASRI, New Delhi	January 21 to February 10, 2025
6	**Dr. A. Mandal** Principal Scientist	Attended National Symposium on Technological Advancement and their application for management of native animal genetic resources and XXII annual convention of SOCDAB at Veterinary college, KVAFSU, Hebbal, Bengaluru.	January 21-22, 2025
7	**Dr. Laxmana Naik N**. Senior Scientist	Participated as Session Co-chairman of theme: Dairy and Bakery Technology: Safety, quality and emerging detection techniques in International Conference on "Recent Advances in Food Science and Technology: A Way Forward" held from 22 to 24 Jan 2025, at Danaveer Sirsangi Shri Lingaraj Desai College of Horticultural Engineering and Food Technology (DSLD, CHEFT), Haveri, Karnataka	January 22-24, 2025
8	**Dr. S. Jeyakumar** Principal Scientist **Dr. F. Magdaline Eljeeva Emerald** Principal Scientist **Dr. P. Heartwin Amaladhass** Principal Scientist **Dr. Vedamurthy G.V.** Senior Scientist	Participated in Workshop on "Nanotechnology: Animal Production and Health" – ICAR NIANP, Bengaluru	January 28, 2025

Sr. No.	Name of Scientist with Designation	Title of Conf./Seminar/Symposium/ etc.	Period and place
9	**Dr. Pradyuman Barnwal** Principal Scientist **Er. Ankit Deep** Scientist	Attended XXIV Annual workshop of AICRP on MAH at MPUAT, Udaipur	January 28-29, 2025
10	**Dr. A. Mandal** Principal Scientist	Attended XIX Annual Review Meeting of Network Project on Animal Genetic Resources at NBAGR, Karnal	January 30-31, 2025
11	**Dr. Khushbu Kumari** Senior Scientist	Participated in 2nd International Faculty Development Program on "Research Excellence and Global Collaboration: Enhancing Faculty Performance" Jointly organized by UAS Raichur and Meadow Agriculture, Raichur, Karnataka.	February 03-09, 2025
12	**Dr. Mukund A Kataktalware** Principal Scientist	Attended MOOC on 'Artificial Intelligence in Agriculture' at ICAR National Academy of Agricultural Research Management, Hyderabad.	February 1-28, 2025
13	**Dr T. V. Raja** Principal Scientist **Dr. M.L. Kamboj** Principal Scientist **Dr. G. R. Gowane** Principal Scientist **Dr. Indu Devi** Scientist	Workshop on "Extension Approaches for Climate Resilient Dairy Farming" at ICAR-NDRI, Karnal.	February 12, 2025
14	**Dr. Writdhama Prasad** Senior Scientist	Delivered a lecture on 'Processing and value addition in Ghee' (online) at NIFTEM, Kundli.	February 13, 2025
15	**Dr. S. K. Onteru** Principal Scientist & Head **Dr. Rubina K. Baithalu** Senior Scientist **Dr. S. Jeyakumar** Principal Scientist	Participated in International Conference on Reproductive Biomedicine: Integrating Basic Biological and Applied Research into Clinical Practice for Human Welfare and 35th Annual Meeting of the Indian Society for the Study of Reproduction and Fertility Conference at RIC (Rajasthan International Centre), Jaipur.	February 14-16, 2025
16	**Dr. Pawan Singh** Principal Scientist & Head **Dr. Pradyuman Barnwal** Principal Scientist **Dr. Rakesh Kumar** Principal Scientist **Dr. Sohan Vir Singh** Principal Scientist **Dr. Richa Singh** Scientist **Dr. Rubina K. Baithalu** Senior Scientist **Dr. Raghu H.V.** Senior Scientist **Dr. Sachin Kumar** Senior Scientist **Dr. Pradip Behare** Senior Scientist **Dr. Ashis K. Samanta** Principal Scientist **Dr. Indu Devi** Scientist **Dr. Gautam Mondal** Principal Scientist **Dr. Heena Sharma** Senior Scientist **Dr. Deep Narayan** Principal Scientist **Dr. Yogesh Khetra** Senior Scientist **Mr. Gaurav Deshwal** Scientist **Dr. Anurag Saxena** Principal Scientist **Dr. Suneel Kumar Onteru** Principal Scientist & Head	Participated in XVII Agricultural Science Congress (ASC) at NAAS, GBPUAT, Pantnagar	February 20-22, 2025

Sr. No.	Name of Scientist with Designation	Title of Conf./Seminar/Symposium/ etc.	Period and place
17	**Dr. Diwas Pradhan** Senior Scientist	Participated in 15th India Probiotic Symposium and presented a research abstract at PGIMER, Chandigarh	February 22-23, 2025
18	**Dr. Bharati Pandey** Scientist	Participated in International Conference and pre conference workshop on Metabolomics and Lipidomics at IIT Bombay	February 25-26, 2025
19	**Dr. Ashok Santra** Principal Scientist	Participated in National conference on 'Precision livestock management technology towards strengthening farming efficiency and animal welfare' at Rajasthan College of Agriculture, Udaipur, Rajasthan	February 26-28, 2025
20	**Dr. Mamta** Senior Scientist **Dr. A. Manimaran** Senior Scientist	Participated in National Brainstorming workshop on "Laboratory Animals and Ethics in Bioscience Research" held at ICAR-NIANP, Bengaluru	February 27, 2025
21	**Dr. Raghu H.V.** Senior Scientist	Participated in National Conference on 'Indian Society for Sheep and Goat Production and Utilization on 'Transforming Small Ruminant Production: Empowering Precision Farming and Genomic Innovations for Enhanced Productivity and Sustainable Development' at ICAR-CIRG, Makhdoom, Farah (Post), Mathura (U.P.).	March 5-7, 2025
22	**Dr. Rajan Sharma** Joint Director (Research) **Dr. Sohan Vir Singh** Principal Scientist **Dr. Pradip Behare** Senior Scientist **Dr. S. Subash** Senior Scientist	Participated in 51st Dairy Industry Conference: 'Indian Dairying - Global Growth; Local Strength" at Samrat Ashoka International Convention Centre, Patna, Bihar	March 6-8, 2025
23	**Dr. Sachin Kumar** Scientist **Dr. M. K. Singh** Senior Scientist **Dr. Sachinandan De** Principal Scientist	Participated in XXII National Academy of Veterinary Sciences (I) Convocation - cum - Scientific Convention on 'Challenges and priorities for optimal production of livestock, poultry, healthcare and nutrition of pets' at Veterinary College, KVAFSU, Hebbal, Bengaluru	March 8-9, 2025
24	**Dr. Sangita Ganguly** Scientist	Participated in Global Conference on Innovations to Impact: Gender Transformative Approach for Sustainable Agri-Food Systems (online) at ICAR-CIWA, Bhubaneswar	March 8-10, 2025
25	**Dr. Narender Raju Panjagari** Senior Scientist	Served as a Course Director, MOOC course on Milk Processing and Value Addition organized in collaboration with ICAR-NAARM, Hyderabad.	March 15 to May 14, 2025
26	**Dr. G.R. Gowane** Principal Scientist **Dr. Rajesh Bajaj** Principal Scientist	Attended the ICAR Annual Conference and IDF/ISO Analytical week 2025, at NDDB, Anand	April 1-4, 2025
27	**Dr. Shaik Abdul Hussain** Senior Scientist	Participated (on-line) in 2nd International Conference on Innovations in Molecular Structure and Instrumental Approaches (ICMSI) organized by School of Science, RK University, Rajkot	April 7-8, 2025
28	**Dr. S. Banik** Principal Scientist & Head	Participated in one-day Workshop on "Career Development in Veterinary and Animal Sciences" at WBUAFS, Kolkata	April 10, 2025
29	**Dr. Kaushik Khamrui** Principal Scientist **Dr. Writdhama Prasad** Senior Scientist	Visited Khatima, Halwani, Lankuan and Almora (Uttarakhand) to understand the current production practices for the traditional milk products at Uttrakhand, Cooperative Dairy Federation Ltd (UCDFL)	April 28 to May 3, 2025
30	**Dr. Sunita Meena** Senior Scientist	Attended Resource person in one-day Webinar on "Health Benefits of Milk" at St. Joseph University, Nagaland	April 30, 2025

Sr. No.	Name of Scientist with Designation	Title of Conf./Seminar/Symposium/ etc.	Period and place
31	**Dr. Chitranayak** Principal Scientist **Dr. Khushbu Kumari** Scientist	Participated in the 14th IDEA Convention and National Seminar and also delivered a talk at Kerala Veterinary and Animal Sciences University (KVASU), Mannuthy, Kerala	May 8-9, 2025
32	**Dr. Yogesh Khetra** Senior Scientist	Attended the project review meeting at Kochi, Kerala.	May 01- 02, 2025
33	**Dr. Sanchita Garai** Senior Scientist **Dr. Sanjit Maiti** Senior Scientist	Participated in the 12th National Seminar on "Futuristic Agriculture: Technology, Sustainability and Beyond", at Umiam, Meghalaya, India	May 22-24, 2025
34	**Dr. D.N. Das** Principal Scientist **Dr. P. Heartwin Amaladhass** Principal Scientist **Dr. S. Jeyakumar** Principal Scientist **Dr. A. Kumaresan** Principal Scientist **Dr. A. Manimaran** Senior Scientist **Dr. S. Subash** Senior Scientist **Dr. Devaraja H.C.** Senior Scientist **Dr. Laxmana Naik N.** Senior Scientist **Dr. Vedamurthy G.V.** Senior Scientist **Dr. Manoj Kumar C.T.** Senior Scientist **Dr. Shivaswamy G.P.** Scientist **Dr. Basavaprabhu H.N.** Scientist **Dr. Siddaramanna** CTO **Dr. Ningaraju K.** ACTO **Mr. Asif Miyan** STO	"Attended Viksit Krishi Sankalp Abhiyan (VKSA)" a Flagship programme of ICAR.	May 29 to June 02, 2025, June 03-07, 2025 and June 08-12, 2025
35	**Dr. A. Kumaresan** Principal Scientist **Dr. Shivaswamy G.P.** Scientist **Dr. P. Heartwin Amaladhass** Principal Scientist **Dr. S. Subash** Senior Scientist	Participated in the National Symposium on "Dairying for Nutrition and Livelihood Security" ICAR NIANP, Bengaluru.	June 06, 2025
36	**Dr. Heena Sharma** Senior Scientist **Dr. Gaurav Kr Deshwal** Scientist	Participated in the Training on 'Milk and Milk Products Processing' organized under ABI, ICAR-NDRI, Karnal	June 09-14, 2025
37	**Dr. S. Banik** Principal Scientist & Head	Participated in the Seminar on "Biofilm Pathogenesis, prevention and control in food safety and diseases" at WBUAFS, Kolkata	June 10, 2025
38	**Dr. Rajani Kumar Paul** Senior Scientist	Participated in the Summer Internship Programme on "Prokaryotic expression and purification of recombinant CRISP1 protein", ICAR-NDRI, Karnal	June 10 to July 10, 2025

Sr. No.	Name of Scientist with Designation	Title of Conf./Seminar/Symposium/ etc.	Period and place
39	**Ms. Priyanka** Scientist	Participated in the training on 'Advancing Women Leaders in Higher Education' under the Nurturing Future Leadership Programme (NFLP), a 5-day residential leadership development programme under the Malaviya Mission Teacher Training Programme (MMTTP).	May 22-24 to June 16-20 to, 2025
40	**Dr. Sadeesh E.M.** Senior Scientist	Participated as Training Coordinator for Student Internship titled "Extraction of Mitochondria and Associated RNA from Buffalo Brain" for Ms. Takshika Sharma, Kurukshetra University, Kurukshetra, held at ICAR–National Dairy Research Institute (NDRI), Karnal, Haryana.	June 16 to July 11, 29 and 31, 2025
41	**Dr. Sadeesh E.M.** Senior Scientist	Delivered an Invited Lecture entitled "Genomic Insights into Milk Linked Mitochondrial Variations Using Whole Mitochondrial Genome Analysis in Indigenous Bovines" at the 13th International Conference-Bioradiance 2025 on the theme "From Molecules to Medicine: Bridging Biochemistry and Therapeutics," organized by Pushpagiri Research Centre in association with Kerala Academy of Sciences at Thiruvalla, Kerala.	June 17–18, 2025
42	**Dr. Shaik Abdul Hussain** Senior Scientist	Served as ABI Training for Dairy Development Officers of Bihar	June 18-19, 2025
43	**Dr. Pawan Singh** Principal Scientist & Head	Delivered lecture on "An overview of Haryana dairy sector challenges and their solutions for a sustainable production" in Sharing Technical Workshop for Agriculture at Haryana (Chandigarh) with World Bank and Department of Agriculture.	June 27, 2025
44	**Dr. Raghu H. V.** Senior Scientist	Participated in the Workshop on "Validation of Rapid Analytical food Testing (RAFT) Kits/ Equipment's/ Methods" organized by FSSAI at New Delhi	July 2-3, 2025
45	**Dr. S. Jeyakumar** Principal Scientist **Dr. Vedamurthy G.V.** Senior Scientist	Participated in the Workshop on "One Water One Soil and One Health" organized jointly by C-DAC Bengaluru and IEEE.	July 4, 2025
46	**Dr. Sumit Arora** Principal Scientist	Delivered an expert lecture on "Hidden Hunger and Fortification Progress" at CSIR-CFTRI, Mysuru	July 4-5, 2025
47	**Dr. P. Barnwal** Principal Scientist & Head	"AI and ML Applications in Agriculture Mechanization Sector" at CIAE, Bhopal	July 7-12, 2025
48	**Dr. A. Manimaran** Senior Scientist	Participated in the One-day workshop on "AMR Stewardship Drive" jointly organized by CII FACE, INFAH and ICAR-NIVEDI at ICAR-NIVEDI, Yelahanka, Bengaluru.	July 11, 2025
49	**Dr. G. R. Gowane** Principal Scientist	Participated in the Workshop on "Breed Development Programme in India" at Indira Gandhi Convention Centre, Gomti Nagar, Lucknow	July 12, 2025
50	**Dr. A. K. Mishra** Principal Scientist	Attended 6th meeting of Animal Husbandry and Equipment Sectional Committee, FAD 32 at BIS-HQ, New Delhi	July 14, 2025
51	**Dr. Bharati Pandey** Scientist	Participated in the Online International Conference on "Biological data analysis and Computation using Mathematical Modelling and Network Science" at JNU, New Delhi.	July 28-30, 2025
52	**Dr. S. Banik** Principal Scientist & Head	Attended meeting on Dairy development policy of Assam at Raj Bhawan, Assam	August 5-6, 2025
53	**Dr. Sumit Arora** Principal Scientist	Participated in the National Stakeholder Consultation on comprehensive analysis of regulatory Framework on Food Labelling, Advertisement and Claims, Vigyan Bhawan, at New Delhi	August 13, 2025
54	**Dr. Magan Singh** Senior Scientist	Participated in the Recent Trends and Development in Agricultural, Biological and Environmental Sciences at Hindustan Academy, Prayagraj, UP	August 13-14, 2025
55	**Dr. S. Banik** Principal Scientist & Head	Attended State Level Workshop on Viksit Krishi Sankalp Abhiyan-2025 (VKSA2025) Rabi Season at ICAR-CIFRI, Barrackpore	August 19, 2025

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56	**Dr. D.N. Das** Principal Scientist **Dr. S. Jeyakumar** Principal Scientist **Dr. S. Subash** Senior Scientist **Dr. Laxmana Naik N.** Senior Scientist **Dr. Satish Kumar, M.H.** Senior scientist **Dr. Priyanka Singh Rao** Scientist **Dr. A. Manimaran** Senior Scientist **Dr. Monika Sharma** Senior Scientist **Dr Vairat Amita Dinkar** (online) Scientist **Dr. Manoj Kumar C.T.** Senior Scientist **Dr. Rashmi H.M.** Senior Scientist **Dr. Basavaprabhu H.N.** Scientist **Dr. Mamta** Senior Scientist **Dr. Vedamurthy G.V.** Senior Scientist **Dr. Mukund A. Kataktalware** Principal Scientist	Participated in the Workshop on "Understanding IP, Its potential and Applications in Animal Science Research" at ICAR-NIANP, Bangalore	August 20, 2025
57	**Dr. Laxmana Naik N.** Senior Scientist	Participated as an invited speaker at "One Day National Workshop on Opportunities and Challenges in Quality Assessment of Dairy Products", at Dairy Science College, Kalaburgi, KVAFSU, Bidar	August 22 , 2025
58	**Dr. Subhasis Mandal** Principal Scientist & Head	Participated in the closing Ceremony of the program "Janjatiya Gaurav Varsh: Nature Festival and Dairy Farming" organized at ICAR–National Dairy Research Institute (NDRI), Karnal, in association with Haryana Police, Government of Haryana and Ministry of Tribal Affairs, Government of India.	August 18-24, 2025
59	**Dr. Vivek Sharma** Principal Scientist	Participated in the Workshop on XMLisation of Standards and OSD organized by the Bureau of Indian Standards (BIS) at NITS, Noida.	August 25, 2025
60	**Dr. Narender Raju Panjagari** Senior Scientist **Dr Ajay Yadav** Scientist	Participated in the Training on 'Milk and Milk Products Processing' organized under ABI, ICAR-NDRI, Karnal	August 25-30, 2025
61	**Dr. Rubina K. Baithalu** Senior Scientist	Attended 14-Days Faculty Development Programme on Generative AI and Advanced Tools for Academic Research Hosted by Scrollwell, ICAR-NDRI, Karnal	September 01 - 14, 2025
62	**Dr. Sumit Arora** Principal Scientist	Delivered expert talk in National Conference on "Food Fortification in overcoming anemia and micronutrient deficiencies", School of health sciences and Technology, UPES, Dehradun, Uttranchal	September 09 -10, 2025
63	**Dr. P.N. Narender** Senior Scientist	Attended the Capacity Building for Internationalization of Higher Education organized by the "Study in India" and British Council at Hotel Crown Plaza, Noida.	September 9-12, 2025
64	**Dr. Subhasis Mandal** Principal Scientist & Head	Participated in the one-day visit programme of Probationers of the 47th Batch of Indian Statistical Service (ISS) organized at ICAR–National Dairy Research Institute (NDRI), Karnal.	September 10, 2025
65	**Dr. S. Banik** Principal Scientist & Head	Participated in the National Workshop on "Animal Nutrition and the AMR Challenge: A One Health Perspective from Feed to Field" at WBUAFS, Kolkata	September 12, 2025
66	**Dr. Pawan Singh** Principal Scientist & Head **Dr. Sohan Vir Singh** Principal Scientist **Dr. M. L. Kamboj** Principal Scientist	Attended 4th Regional ISAE India workshop "Happy Animals, Healthy Yield: Insights on Science on Animal Behavior" at International Convention Centre, Gautam Budh University, Noida (UP)	September 13, 2025
67	**Dr. A.K. Dang** Principal Scientist & Head	Participated in the Workshop on "Science Speak: Communicate Your Research with Impact" at New Delhi.	September 16-17, 2025

Sr. No.	Name of Scientist with Designation	Title of Conf./Seminar/Symposium/ etc.	Period and place
68	**Dr. S. Banik** Principal Scientist & Head	Participated in the General Body meeting of Paschim Banga Go Sampad Bikash Sanstha at Salt Lake, Kolkata	September 19, 2025
69	**Dr. Rajan Sharma** Joint Director (Research) **Dr. Rajesh Bajaj** Principal Scientist **Dr.Vivek Sharma** Principal Scientist **Dr. Kamal Gandhi** Senior Scientist **Dr. Richa Singh** Senior Scientist **Dr. Shilpa Shree B.G.** Senior Scientist **Dr. Shaik Abdul Hussain** Senior Scientist **Dr. Heena Sharma** Senior Scientist **Dr. Gaurav Kr Deshwal** Scientist **Dr. Ajay Yadav** Scientist **Dr. Suman Kapila** Principal Scientist **Dr. Rajeev Kapila** Principal Scientist **Dr. P. Barnwal** Principal Scientist & Head **Dr. Chitranayak** Principal Scientist **Er. Ankit Deep** Scientist **Dr. Khushbu Kumari** Scientist **Dr. Priyanka** Scientist **Pawan Singh** Principal Scientist & Head **A K Misra** Principal Scientist **M L Kamboj** Principal Scientist **Ramesh Chandra** Senior Scientist **Nishant Kumar** Senior Scientist **Rubina Kumari Baithalu** Scientist **Indu Devi** Scientist **Dr. Subhasis Mandal** Principal Scientist & Head **Dr. A.K. Sharma** Joint Director (Academic) **Dr. Udita Chaudhary** Sr. Scientist **Dr. Gunjan Bhandari** Scientist **Dr. Shilpa Vij** Principal Scientist **Dr. Chand Ram** Principal Scientist **Dr. Pradip V Behare** Principal Scientist **Dr. Raghu H V** Senior Scientist **Dr. Diwas Pradhan** Senior Scientist **Dr. Manorama Kumari** Scientist	Participated in the 12th National Seminar on Globalization of Indian Dairy Industry organized by NGAA in collaboration with ICAR- NDRI, Karnal.	September 20, 2025

Sr. No.	Name of Scientist with Designation	Title of Conf./Seminar/Symposium/ etc.	Period and place
70	**Dr. Narender Raju Panjagari** Senior Scientist **Dr. Writdhama Prasad** Senior Scientist **Dr. Kaushik Khamrui** Principal Scientist	Attended the 12th National Seminar on "Globalization of Indian Dairy Industry" organized by the NDRI Graduates Alumni Association and ICAR-NDRI, Karnal.	September 20, 2025
71	**Dr. Sohan Vir Singh** Principal Scientist **Dr. Shaik Abdul Hussain** Senior Scientist **Dr. Rajani Kumar Paul** Senior Scientist **Dr. A. K. Mishra** Principal Scientist	Attended the Conference on "Milk, functional foods and consciousness at Dr. N.N. Dastur Auditorium, ICAR-NDRI, Karnal in collaboration with Bhaktivedanta Institute, Karnal	September 27, 2025
72	**Dr. Sanjeev Kumar** Senior Scientist **Dr. Sunita Meena** Senior Scientist	Participated in the International Conference on Global Research Initiative for Sustainable Agriculture and Allied Sciences at MPUAT, Udaipur.	October 05-07, 2025
73	**Dr. Bharati Pandey** Senior Scientist	Participated in the 3 days workshop on "Bridging AI and Healthcare: A Workshop on Deep Learning for Biomedical Applications" at University of Delhi.	October 07-09, 2025
74	**Dr. S. Banik** Principal Scientist & Head	Participated in the Technology Transfer (ToT) and Product Launch Ceremony and the Technology Transfer Ceremony of C-DAC, Kolkata Ministry of Electronics and Information Technology (MeitY), New Delhi	October 8, 2025
75	**Dr. Arindam Dhali** Principal Scientist & Head SRS NDRI, Bangalore	Participated in the 5th Annual Conference on "Next Generation Physiological Approaches for Climate-Adaptive Livestock Production" at Karnataka.	October 09-10, 2025
76	**Dr. Sadeesh E.M.** Senior Scientist	Participated in the 11th Annual Conference on "Mitochondria in Health, Disease and Ageing" Manipal.	October 09-11, 2025
77	**Dr. Subhasis Mandal** Principal Scientist & Head	Served as Organising Secretary for the Curtain Raiser Event on ESTIC–Emerging Agriculture Technologies (EAT), organized at ICAR–National Dairy Research Institute (NDRI), Karnal in collaboration with ICAR–New Delhi	October 13, 2025
78	**Dr. A. K. Mishra** Principal Scientist	Attended 1st meeting of FAD 32/Working Group 2 'Development of Indian Standards on Travis for Large Animals (Cattle and Equids)' conducted by Bureau of Indian Standards, New Delhi (Online)	October 15, 2025
79	**Dr. Basavaprabhu H.N.** Scientist **Dr. Gautam Mondal** Principal Scientist **Dr. S. Jeyakumar** Principal Scientist **Dr. A. Manimaran** Senior Scientist	Participated in the "Livestock Nutrition and Health Care Translating to Human Health" at Bangalore.	October 16-17, 2025
80	**Dr. A. K. Mishra** Principal Scientist	Participated in the National Agricultural Students' Sammelan organized by the ICAR Education Division and ICAR-IARI at NASC New Delhi	October 27, 2025
81	**Dr. Sanjit Maiti** Senior Scientist	Participated in the ACASA Write-shop on Climate Risks and Adaptation Options, held at Mumbai, Maharashtra, India	October 28-30, 2025
82	**Dr. Manorama Kumari** Scientist **Dr. Saurabh Kadyan** Scientist	Participated in the Four-day training programme on "Laboratory Quality Management System and Internal Audit as per IS/ISO/IEC 17025:2017" at Noida, U.P.	October 28-31 , 2025

Sr. No.	Name of Scientist with Designation	Title of Conf./Seminar/Symposium/ etc.	Period and place
83	**Dr. Diwas Pradhan** Senior Scientist **Dr. Raghu H.V.** Senior Scientist	Participated in the ASM Global Research Symposium on the One Health Approach at Bangaluru, Karnataka.	October 29-31, 2025
84	**Dr. A. Kumaresan** Principal Scientist	Participated in the Conference on "Revisiting reproductive techniques in climate change scenario". KVAFSU, Bengaluru.	October 31, 2025
85	**Dr Ajay Yadav** Scientist **Dr. Yogesh Khetra** Senior Scientist	Participated in the FoSTaC Training Programme on "Advanced Manufacturing- General" at ICAR-NDRI, Karnal	November 03, 2025
86	**Dr. S. Banik** Principal Scientist & Head	Participated in the Conclave on Development of Dairy, Animal Husbandry and Cooperatives in Assam scheduled Organized by Raj Bhavan, Assam at Khanapara, Guwahati	November 3-4, 2025
87	**Dr. Indu Devi** Scientist	Participated in the "Emerging Science Technology and Innovation Conclave-2025" (ESTIC-2025) Bharat Mandapam, New Delhi	November 3-5, 2025
88	**Dr. Ajmar Singh** Principal Scientist	Participated in the Training on "Advanced Econometric Models and Its application to estimate Expenditure Electricity's using Households consumption survey Data" Division of Agriculture Economics ICAR-IARI, New Delhi.	November 04-07, 2025
89	**Dr. Sachinandan De** Principal Scientist	Participated in the Annual Convention of "Indian Society Veterinary Immunology and Biotechnology" and International Conference on "Envisioning Livestock Production and Protection under the One Health Landscape" at IVRI, Mukteshwar	November 06-08, 2025
90	**Dr. P. Barnwal** Principal Scientist & Head **Dr. Chitranayak** Principal Scientist **Sh. Ankit Deep** Scientist	Participated in the 59th Annual Convention on Engineering Innovation for Agriculture 5.0 and Internation Symposium of Mechanotrics and Robotics in Pre and Post Production Agricuture at ICAR-CIAE, Bhopal.	November 10-12, 2025
91	**Dr. Saurabh Kadyan** Scientist	Participated in the 66th Annual Internation Conference and Research Conclave of the Association of Microbiologists of India at Dev Bhoomi University, Dehradun, Uttarakhand.	November 12-15, 2025
92	**Dr. Gopal Gowane** Principal Scientist	Participated in the International Conference XIX Annual Convention of the Indian Society of Animal Genetics and Breeding" at WBUAFS, Kolkata.	November 13-14 , 2025
93	**Dr. Rani Alex** Senior Scientist **Dr. Vikas Vohra** Principal Scientist & Head **Dr. Ashok Santra** Principal Scientist **Dr. Saroj Rai** Senior Scientist **Dr. M Karunakaran** Principal Scientist **Dr. Mohan Mondal** Senior Scientist	Participated in the International Conference "Precision Animal Breeding through Genomics Artificial Intelligence and Machine Learning" at West Bengal University of Animal and Fishery Science, Kolkata.	November 13-14, 2025
94	**Dr. S. Banik** Principal Scientist & Head **Dr. A. Mandal** Principal Scientist & Head	Participated in the XIX Annual Convention of the Indian Society of Animal Genetics and Breeding (ISAGB) and International Conference on "Precision animal breeding through genomics, artificial intelligence and machine learning" Organized by West Bengal University of Animal and Fishery Sciences, Kolkata	November 13-14, 2025

Sr. No.	Name of Scientist with Designation	Title of Conf./Seminar/Symposium/ etc.	Period and place
95	**Dr. Shaik Abdul Hussain** Senior Scientist	Participated (on-line) in the 9th International Conference on "Advances in Agricultural, Biological and Biodiversity Conservation for Sustainable Development (ABCD–2025)" organized by the Department of Studies in Botany, University of Mysore, Karnataka and the ATDS Society, Ghaziabad, Uttar Pradesh at the University of Mysore, Karnataka, India	November 13–15, 2025
96	**Dr. Sachin Kumar** Senior Scientist **Dr. A. K. Mishra** Principal Scientist **Dr. Sohan Vir Singh** Principal Scientist **Dr. Pawan Singh** Principal Scientist & Head **Dr. Nitin Tyagi** Principal Scientist **Dr. Chander Dutt** Principal Scientist **Dr. Goutam Mondal** Principal Scientist	Participated in the 21st Biennial International Conference on "Global Resilience in Animal Nutrition: Innovation for Sustainable Future" held at the College of Veterinary Science and Animal Husbandry, Acharya Narendra Deva University of Agriculture and Technology (ANDUAT), Ayodhya, Uttar Pradesh	November 19-21, 2025
97	**Dr. Sanjit Maiti** Senior Scientist	Participated in the International Conference cum Workshop on Climate Resilient Livestock Production Emerging Concepts and Technology for Sustenance" at ICAR-NIANP, Bengaluru	November 23-24, 2025
98	**Dr. Mamta** Senior Scientist	Participated in the one day national Workshop and Panel Discussion on "Strengthening AMR Surveillance and Research Linkages" held at ICAR-NIVEDI, Bangalore	November 24, 2025
99	**Dr. Sanjeev Kumar** Senior Scientist	Participated in the 6th International Agronomy Congress on "Re-Envisioning Agronomy for Smart Agri-Food System and Environmental Stewardship" at National Agriculture Science Complex, New Delhi	November 24-26 , 2025
100	**Dr. Laxmana Naik N.** Senior Scientist	Participated in the Inter Disciplinary Panel (IDP) meeting by Export Inspection Agency (EIA). EIA, Chennai, S/o. Hyderabad, at M/s. Hatsun Agro Products Ltd, Sangareddy, Telangana.	November 28, 2025
101	**Dr. D. N. Yadav** Scientist **Dr. Heena Sharma** Scientist **Dr. Gaurav Kr Deshwal** Scientist **Dr. Ajay Yadav** Scientist	Participated in the Training on 'Boot Camp on Skill-Up India' on Food Processing for PSSCIVE, Bhopal	November 24-28, 2025
102	**Dr. Shaik Abdul Hussain** Senior Scientist	Participated in the Entrepreneurship Development Training Programme on "Milk and Milk Products Processing", ICAR-NDRI, Karnal	November 24-29, 2025
103	**Dr. Gunjan Bhandari** Scientist **Dr. Udita Chaudhary** Senior Scientist	Participated in the 85th Annual Conference "Assessment of Unrealized Export Potential Regulatory Barriers and Rejection Patterns in Indian Dairy Sector" at Chaudhary Charan Singh Haryana University Hisar.	November 26-28, 2025
104	**Dr A. Manimaran** Senior Scientist	Participated in the 25th Annual Conference of Indian Society of Veterinary Pharmacology and Toxicology and National Symposium on "Emerging Need for Novel Veterinary Drugs to Address Challenges of Livestock Health" at At Shivamogga.	November 26-28, 2025
105	**Dr. Pankaj Kumar Saraswat** Principal Scientist & Head	Participated in the 6th International Agronomy Congress on "Reenvisioning Agronomy for Smart Agri-food Systems and Environmental Stewardship" at At ICAR-Indian Agriculture Research Institute, New Delhi.	November 26, 2025
106	**Dr. Sonu K.S.** Scientist	Participated in the Two days training program on "Measurement of Uncertainty" (NITS), Noida, UP.	November 27-28, 2025

Sr. No.	Name of Scientist with Designation	Title of Conf./Seminar/Symposium/ etc.	Period and place
107	**Dr. Sachinandan De** Principal Scientist **Dr. Rakesh Kumar** Principal Scientist **Dr. Suneel Kumar Onteru** Principal Scientist & Head **Dr. Rajani Kumar Paul** Senior Scientist	Participated in the 9th Annual Convention of (SVBBI) and National Symposium on "Advancing Animal Health and Production through Biochemical and Biotechnological Innovations" at WBUAFS, Kolkata.	November 28-29, 2025
108	**Dr. Rashmi H.M.** Senior Scientist	Participated in the National Symposium on "Viksit Bharat: Challenges Opportunities and Way Forward for Indian Dairy Section at SRS, Bangaluru.	November 28, 2025
109	**Dr. Manorama Kumari** Scientist **Dr. Saurabh Kadyan** Scientist	Participated in the 4-Day Training Programme On Laboratory Quality Management System and Internal Audit at NITS, Noida.	November 28 to 31 2025
110	**Dr. A. Kumaresan** Principal Scientist	Participated in the National Workshop on "Indian Dairy by Masses and Not Mass Production-The Way Forwarded" at Chennai	December 01- 02, 2025
111	**Dr. Subhasis Mandal** Principal Scientist & Head	Participated in the 33rd Annual Conference of Agricultural Economics and Research Association, India at ICAR-NAARM, Hyderabad.	December 01- 03, 2025
112	**Dr. Sachinandan De** Principal Scientist	Participated in the 12th Annual Convention of SVSBT and International Conference on "Bridging Science and Society: Biotechnology for Sustainable One Health" at LRUVAS, Hisar.	December 03-05, 2025
113	**Dr. Bharati Pandey** Scientist	Participated in the Five-day Short-term Course on "Transforming Healthcare and AI Driven Drug Discovery" (Online Mode)	December 05-09, 2025
114	**Dr. Sonu K.S.** Scientist, DC Division	The Winter School on "Application of Foodomics and Advanced Analytical Techniques for ensuring Quality, Safety and Functional Properties of Dairy Foods" at ICAR-NDRI, Karnal.	December 06-26, 2025
115	**Dr. Hardev Ram** Senior Scientist **Dr. Rajesh Kumar Meena** Scientist	Participated in the 33rd National Conference on "Land and Water Management for Ecological Restoration and Agricultural Sustainability" at PAU Ludhiana.	December 08-10, 2025
116	**Dr. Shaik Abdul Hussain** Senior Scientist	Participated in the Training Programme on "Dairy Farming and Milk Processing" under Nand Baba Dugdh Mission of Dairy Development Scheme of UP Government	December 8-13, 2025
117	**Dr. Rajani Kumar Paul** Senior Scientist **Dr. Suneel Kr. Onteru** Principal Scientist & Head	Hands-on training titled "Handling and Care of Laboratory Animals" at ICAR-NDRI, Karnal	December 08-13, 2025
118	**Dr. Gopal R Gowane** Principal Scientist	Deliver a talk in 40th Annual Conference and National Symposium of Indian Poultry Science Association at ICAR-DPR, Hyderabad.	December 09-11, 2025
119	**Dr. Naresh Lalaji Selokar** Senior Scientist **Dr. Manoj Kumar Singh** Senior Scientist **Dr. Nishant Kumar** Senior Scientist **Dr. Vedamurthy, G.V.** Senior Scientist **Dr. Rubina Kumari Baithalu** Senior Scientist **Dr. A. Kumaresan** Principal Scientist	Participated in the International Conference on "Animal Reproduction in a Changing World: Addressing Challenges and Embracing Opportunities" at Rajiv Gandhi Institute of Veterinary Education and Research, Puducherry.	December 10-12, 2025

Sr. No.	Name of Scientist with Designation	Title of Conf./Seminar/Symposium/ etc.	Period and place
120	**Dr. Shilpa Shree B.G.** Senior Scientist	Participated in the International Conference on "Women 5.0: Power Progress and Possibilities" at University of Hyderabad	December 11-12, 2025
121	**Dr. Rajan Sharma** Joint Director (Research)	Delivered a talk during 4th National Dairy Summit at New Delhi	December 12, 2025
122	**Dr. Rubina Kumari Baithalu** Senior Scientist	Attended online training on POSH ACT, 2013: Sexual Harassment of Women at Workplace (Prevention, prohibition and redressal)	December 12, 2025
123	**Dr. Pawan Singh** Principal Scientist & Head **Dr. Naresh Lalaji Selokar** Senior Scientist **Dr. Vikas Vohra** Principal Scientist & Head **Dr. Sohan Vir Singh** Principal Scientist **Dr. Indu Devi** Scientist **Dr. Rubina Kumari Baithalu** Senior Scientist	Participated in the National Conference on "Buffalo Production and Health in a Changing Climate: Innovations for a Resilient Future" at ICAR-IVRI, Bareilly, Izatnagar.	December 15-16, 2025
124	**Dr. Laxmana Naik N.** Senior Scientist	Participated in the Gunavatta Yatra-Awareness Program on NABL Accreditation at ICAR-NIVEDI, in collaboration with the National Accreditation Board for Testing and Calibration Laboratories (NABL), Quality Council of India (QCI),	December, 16, 2025
125	**Dr. P. Heartwin Amaladhas** Principal Scientist	Participated in the 31st Indian Convention of Food Scientists and Technologists-2025 on the Focal theme "Innovation in Nutrition, Dietetics, Upcycling and Local Foods on Gastronomic Engineering" at NIFTEM, Thanjvaur.	December 18-20, 2025
126	**Dr. Nitin Tyagi** Principal Scientist	Participated in the Technical Workshop on "Buffalo Milk Productivity Optimization" at New Delhi	December 19, 2025
127	**Dr. Pawan Singh** Principal Scientist & Head	Attended online fund utilization review meeting with DADH official on status of strengthening of semen stations under RGM.	December 19, 2025
128	**Dr. Jai Kumar Kaushik** Principal Scientist & Head **Dr. Diwas Pradhan** Senior Scientist **Dr. Pradip Vishnu Behare** Senior Scientist **Dr. Narender Raju Panjagari** Senior Scientist **Dr. Raghu H.V.** Senior Scientist **Dr. Yogesh Khetra** Senior Scientist **Dr. Kaushik Khamrui** Principal Scientist **Dr. Rashmi H.M.** Senior Scientist **Dr. Saroj Rai** Senior Scientist	Participated in the International Conference on "Fermented Foods, Health and Social Well-being" at West Bengal University of Animal and Fishery Sciences, Kolkata.	December 19-22, 2025

Sr. No.	Name of Scientist with Designation	Title of Conf./Seminar/Symposium/ etc.	Period and place
129	**Dr. Santanu Banik** Principal Scientist & Head, ERS Kalyani **Dr. Arindam Dhali** Principal Scientist & Head, SRS Bangalore **Dr. Nishant Kumar** Senior Scientist	Received Fellow Award during 23rd Convocation of National Academy of Veterinary Sciences (India) cum National Scientific convention on "Strategic Framework for Transformation of India's Livestock, Poultry and Meat Sector for Viksit Bharat@2047" at Bihar Animal Sciences University, Patna	December 22-23, 2025
130	**Dr. A. K. Mishra** Principal Scientist	Participated in the National Farmer's Day at KVK, NDRI Karnal	December 23, 25

Techhnical Staff

The following faculty members of ICAR-NDRI various conferences/seminars/Training and other events across the country.

S.No	Employee name and designation	Purpose	Duration
1	**Dr. Uttam Kumar**, CTO	CAFT Training Programme on "Applying Genomic Models In prediction of Breeding Value Using BLUPF90 Software" at ICAR-NDRI, Karnal	January 10 to 30, 2025
2	**Dr. Rahul Kumar Meena**, STA	Genome Editing Technology on Farm Animals at ICAR-NDRI, Karnal	February 08 to 17, 2025
3	**Sh. Jitender Kumar Dabas**, CTO	14th IDEA convention & National Seminar on Engineering Challenges & Strategies for Sustainable Growth in Dairy and Food Processing at VKIDFT, KVASU, Mannuthy, Kerala.	May 08 to 09, 2025
4	**Mr. Braj Kishor**, CTO	Attended the 12th National Seminar on "Globalization of Indian Dairy Industry" organized by the NDRI Graduates Alumni Association and ICAR-NDRI, Karnal.	September 20, 2025
5	**Sh. Ashwani Kumar**, ACTO	Training Programme on Management of Salt-Affected Areas through SLM Practices at ICAR-CSSRI, Karnal	December 08 to 12, 2025
6	**Dr. Sonia**, STO	Application of Foodomics and Advanced Analytical Techniques for Ensuring Quality, Safety and Functional Properties of Dairy Foods" at ICAR-National Dairy Research Institute, Karnal	December 06 to 26, 2025
7	**Dr. Ravi Kumar**, STO	Online MOOC on Natural Farming- Principles and Practices MANAGE, Hyderabad	September 17 to December 31, 2025

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MAJOR EVENTS

Sr.No.	Title of Event	Date
1	National training programme on *Applying Genomic Models in Prediction of Breeding Value using BLUPF90 software* under CFAT for Advanced Training in Animal Genetics and Breeding	January 10 - 30, 2025
2	Training cum workshop on *Enhancement of Competency and Work Efficiency in Organization*	January 20 - 22, 2025
3	Winter School on *Milk Derived High Value Bioactive Compounds: Agro-Industrial Prospects, Challenges and Way Forward 2025* at SRS, ICAR-NDRI, Bengaluru	January 31 to February 20, 2025
4	ICAR-North Zone Sports Tournament	February 2 - 5, 2025
5	*Laying of the foundation stone for training hall* at KVK NDRI, Karnal by Dr Himanshu Pathak Secretary, DARE and Director General of ICAR	February 9, 2025
6	Winter School on *Advances in Socio-Climatological Dimensions of Climate Resilient Agriculture*	February 6 - 26, 2025.
7	Winter School on *Doubling Income of Dairy Farmers by Reproductive Management of Dairy Cows and Buffaloes*	February 6 - 26, 2025
8	Awareness program on *Natural Farming - Turmeric Cultivation*	February 11, 2025
9	National Dairy Mela and Agri Expo	February 27 to March 1, 2025
10	Training programme on *Scientific Dairy Farming*	March 4 - 6, 2025
11	Rajbhasha workshop on *Mandatory activities for the implementation of the Official Language (Hindi) in Central Government offices (Region 'C')*	March 5, 2025
12	*International Women's Day celebrated*	March 8, 2025
13	National training programme on *Genome Editing Technology: Basics and Applications*	March 17 - 21, 2025
14	*Dairy Entrepreneurship and Skill Development Centre* inaugurated at ICAR- NDRI, SRS, Bengaluru	April 11, 2025
15	A training programme on *Scientific Animal Husbandry*	May 19 - 23, 2025
16	Training on *Kid Nursery and Scientific Goat Farming Practices*	May 26 to 30, 2025
17	Viksit Krishi Sankalp Abhiyan	May 29 to June 12, 2025
18	*World Milk Day* celebrated	June 1, 2025
19	*International Bicycle Day* celebrated	June 3, 2025
20	National training programme on *Hands-on CRISPR Tools in Bovines*	June 6 to 26, 2025
21	Training programme on *Artificial Insemination and Veterinary First Aid*	June 17 - 18, 2025
22	*ICAR-NDRI Foundation Day* Celebrated	July 1, 2025
23	*Fish Farmer's day* celebrated	July 10, 2025
24	Training programme on *Preparation of Ice cream and frozen desserts*	July 7 to 11, 2025
25	*World Breastfeeding Week* organised	August 7, 2025
26	*Tiranga Yatra* organised	August 13, 2025
27	Janjatiye Gaurav Varsh and Prakriti Mahotsav and Dairy Farming	August 18 - 24, 2025
28	Scientific animal husbandry training on *Lakhimi cattle*	September 15 - 21, 2025
29	National Seminar on *Globalization of Indian Dairy Industry*	September 20, 2025
30	Conference on *Milk Functional Foods & Consciousness*	September 27, 2025
31	Rajbhasha workshop on *Contribution to and Implementation of the Official Language in uniting the nation*	September 30, 2025
32	Launch of PM Dhan-Dhanya Krishi Yojana and the Pulse Self-Reliance Mission	October 11, 2025

Sr.No.	Title of Event	Date
33	Inauguration of the *Curtain-Raiser Programme of Emerging Agriculture Technologies (EAT) for ESTIC-2025* by Dr. M. L. Jat, Secretary, DARE and Director General of ICAR	October 13, 2025
34	Janjatiya Gaurav Varsh Pakhwada	November 8, 2025
35	Hands on Training Programme on *Analysis of Ghee as per FSSAI Parameters*	November 10–14, 2025
36	Deeksharambh: Induction-cum-Foundation Course	November 12–18, 2025
37	*National Milk Day* Celebrated	November 26, 2025
38	National training programme on *Next-Gen Animal Breeding Hands-on Approach to Genomics, Selection Strategies, and Artificial Intelligence in Dairy Animals*	November 19 to December 9, 2025
39	Winter school on *Application of Foodomics and Advanced Analytical Techniques for Ensuring Quality, Safety and Functional Properties of Dairy Foods*	December 6 – 26, 2025
40	Certificate course on Hands-on Training on *Handling and Care of Laboratory Animals*	December 8-13, 2025
41	*Freshers' Day* celebrated	December 11, 2025
42	*National Farmers' Day* celebrated	December 23, 2025

Visit of QRT at ERS campus

QRT members being apprised of the new initiatives at ERS

Foundation Day Celebration

Organisation of 'National Milk Day'

Inauguration of goat housing shed at tribal villages by Director ICAR-NDRI on the occasion of 'Janajatiya Gaurav Varsh Pakhwada'

Address by Director, ICAR-NDRI on the occasion of 'Janajatiya Gaurav Varsh Pakhwada'

A winter school on "Application of Foodomics and Advanced Analytical Techniques for Ensuring Quality, Safety and Functional Properties of Dairy Foods"

World Antimicrobial Resistance Awareness Week (WAAW) 2025 at Dairy Microbiology Division organised from November 18–24, 2025

Participants from Garden City University (PG students in Microbiology) attending the training programme on "Physico-Chemical, Technological and Microbiological Aspects of Milk and Milk Products"

Participants of the training programme on "Preparation of Ice Cream and frozen desserts" conducted by Dairy Processing Section, SRS-ICAR-NDRI, Bengaluru during July 7–11, 2025

Participation of faculty members of SRS, ICAR–NDRI, in the Hindi Workshop

Dr. Dheer Singh, Director, NDRI, addressing scientific community during 12th National Seminar on Globalization of Indian Dairy Industry held on September 20, 2025

Release of Souvenir by the dignitaries on the occasion of National Symposium titled "Viksit Bharat: Challenges, Opportunities and Way Forward for the Indian Dairy Sector" on November 28, 2025

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DISTINGUISHED VISITORS

Date	Name and Designation of the Visitor
January 14–18, 2025	QRT Team of the Institute led by Dr. S.L. Goswami, Former Vice Chancellor, Banda University of Agriculture and Technology, Banda (Uttar Pradesh) & Former Director, NAARM, Hyderabad (Chairman) along with other members: Dr. Umesh Rai, Vice-Chancellor, University of Jammu, Dr. R.K. Sethi, Former Director, CIRB, Hisar, Dr. H.N. Mishra, Emeritus Professor, Department of Agricultural and Food Engineering, IIT Kharagpur, Mr. Ajay Kumar Khosla, Former Executive Director, Mother Dairy & NDDB Dairy Services and Dr. Ravinder Malhotra, Former Principal Scientist, Dairy Economics, Statistics and Management, Karnal
February 2, 2025	Dr. Raghavendra Bhatta, Deputy Director General (Animal Science), ICAR, New Delhi
February 9, 2025	Dr. Himanshu Pathak, Secretary, DARE & Director General, ICAR Dr. M. S. Chauhan, Vice-Chancellor, GBPUAT, Pantnagar Dr. C. Srinivas Rao, Director, ICAR-IARI, New Delhi
February 16, 2025	Sh. Shankar Bhai Choudhary, Speaker, Vidhansabha, Gujarat
February 27, 2025	Dr. Rajbir Singh, Deputy Director General (Agricultural Extension), ICAR, New Delhi
March 10, 2025	Dr. Ch. Srinivasan Rao, Vice-Chancellor and Director, ICAR-IARI
March 11, 2025	Dr. Sanjay Kumar, Chairman, ASRB
March 14, 2025	Dr. Raghavendra Bhatta, Deputy Director General (Animal Science), ICAR, New Delhi
April 21, 2025	Hon'ble Shri Shivraj Singh Chauhan, Union Minister of Agriculture and Farmers Welfare & Rural Development, Government of India Shri Sukhbir Singh Mann, Distinguished Alumnus, ICAR-NDRI, Karnal
May 14, 2025	Ms. Alka Upadhyaya, IAS, Secretary, Department of Animal Husbandry & Dairying, Govt. of India Dr. Abijit Mitra, Animal Husbandry Commissioner, Department of Animal Husbandry and Dairying, Govt. of India
June 1, 2025	Dr. J. P. Mishra, Director, ICAR- ATARI, Jodhpur
July I, 2025	Dr. Sudhir Gupta, illustrious alumnus of ICAR-NDRI
July I4, 2025	Dr. Rajiv Siwach, Chief General Manager, NABARD
July 18, 2025	Prof. Bechan Lal, OSD to the Governor of Assam
July 27, 2025	Dr Pramod Kumar Singh, Chief Executive Officer, Livestock Development Board, Lucknow, Dr. Vijay Kumar Pandey, Deputy Director, Animal Husbandry, U.P. Dr. Gourav Singh, Veterinary Officer, Livestock Development Board, Lucknow
July 27, 2025	Dr. Joseph W. McFadden, Associate Professor from Cornell University, USA
August 2, 2025	Sh. Shyam Singh Rana Ji, Hon'ble State Agriculture Minister of Haryana Government
August 13, 2025	Prof. Shantanu Bhattacharya, Director, CSIR-Central Scientific Instruments Organisation, Chandigarh
August 18, 2025	Sh. Shatrujit Kapoor, Director General of Police, Haryana
September 9, 2025	A delegation of 30 senior civil servants from the Republic of Madagascar visited ICAR–NDRI, Karnal, on September 9, 2025 to strengthen bilateral cooperation in agriculture and livestock development. The delegation, representing agriculture and allied sectors, was led by Ramarosandratana Guy, Governor of Alaotra Mangoro Region; Ralaiarimalala Sylvain Rodolphe, Mayor of Moramange; and Rakotoarivony Riana, Head of the National School of Administration of Madagascar
September 26, 2025	Sh. Mukesh Kumar Meshram, Principal Secretary, AHD & Fisheries, UP
September 27, 2025	Dr. T. D. Singh, Founder Director, Bhaktivedanta Institute
October 11, 2025	Dr. Suresh Kumar Malhotra, Vice-Chancellor, Maharana Pratap Horticultural University, Karnal

October 13, 2025	Dr. M. L. Jat, Secretary, DARE & Director General, ICAR Dr. Raghavendra Bhatta, Deputy Director General (Animal Science) ICAR, New Delhi Dr. S.N. Jha, Deputy Director General (Engineering) ICAR, New Delhi
November 19, 2025	Shri. Jagmohan Anand, MLA, Karnal
December 9, 2025	Dr. Praveen Malik, CEO, Agrinnovate India Ltd
December 10, 2025	Dr. Kavya Dashora, Associate Professor, IIT Delhi

Dr. Himanshu Pathak, Secretary, DARE & DG, ICAR, New Delhi laying Foundation stone for Training-cum-Seminar Hall at KVK on February 09, 2025

Dr. M. L. Jat, Secretary, DARE & DG, ICAR, New Delhi inaugurating Curtain Raiser Programme-Emerging Agriculture Technologies-2025 on October 13, 2025

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MAIN CAMPUS, ICAR-NDRI, KARNAL

RESEARCH DIVISIONS

ANIMAL GENETICS AND BREEDING

The Animal Genetics Division is a premier centre of excellence dedicated to genetic improvement, conservation, and sustainable utilization of dairy animal genetic resources. It plays a critical role in developing scientific strategies to enhance productivity, adaptability, and resilience of dairy animals across diverse agro-climatic conditions in India. The Division has strong expertise in quantitative genetics, genomic selection, molecular breeding, and genetic diversity analysis. Its research focuses on estimation of genetic parameters, prediction of breeding values, development of advanced statistical and genomic models, and identification of genes and genomic regions associated with production, reproduction, health, and adaptation traits. The Division actively contributes to national breeding programmes by providing technical inputs, capacity building, and policy advisory support. It also serves as a major hub for postgraduate education, offering training to M.V.Sc. and Ph.D. students, along with specialized training programmes for scientists and field professionals through the Centre for Advanced Faculty Training. With interdisciplinary research, modern infrastructure, and strong national and international collaborations, the Animal Genetics Division continues to play a significant role in strengthening India's dairy sector and ensuring long-term genetic sustainability.

LIVESTOCK PRODUCTION & MANAGEMENT

The Livestock Production & Management (LPM) section came into existence in June 2009 after being carved out of the Dairy Cattle Breeding Division of the Institute. A separate faculty of LPM along with a Board of Studies has been in existence since 1976, and postgraduate and doctoral degree programmes in LPM have been continuing since then. The faculty of LPM is engaged in conducting research in frontline areas of all applied aspects of dairy animal production and has been successful in evolving many transferable technologies and developing packages of practices for the routine care and management of dairy animals. The faculty of LPM is engaged in teaching at both UG and PG levels. The LPM faculty is also shouldering the responsibility of the routine management of the Livestock Research Centre and breeding bulls maintained at the Artificial Breeding Research Centre of the Institute, besides supporting the training and extension activities of the Institute.

The mandate of the division includes: (i) to maintain an elite germplasm repository of dairy animals of the identified breeds, (ii) development of state-of-the-art dairy animal management facilities and infrastructure for high-yielding dairy animals, (iii) to carry out research, in collaboration with different divisions, in the upstream areas of dairy animal production, (iv) to standardize the package of management practices and to demonstrate state-of-the-art dairy animal production systems to clients, and (v) to provide consultancy to farmers and entrepreneurs for the establishment of commercial dairy farms.

The organizational structure for research consists of the Sensor and Animal Behaviour Lab, Molecular Reproduction Lab, ABRC, Andrology and Semen Preservation Lab, Milk Analysis Lab, ARGO Lab in LRC, and the Livestock Research Centre.

ANIMAL BIOTECHNOLOGY

The research in the area of Animal Biotechnology was started in 1988 with the establishment of the National Research Centre - Animal Biotechnology, and the first academic program (M.Sc in Animal Biotechnology) was launched in 1989. Under a UNDP "Centre of Excellence on Biotechnology" programme was established. The urgent need for the application of recent biotechnological advances in reproduction and the production of superior females of dairy breeds of ruminants, for improving animal productivity in the country, formed the basis for establishing a state-of-the-art Embryo Biotechnology Centre (EBC) with financial support from the Department of Biotechnology. Biotechnology activities were further strengthened with the establishment of the Livestock Genome Lab and the Molecular Biology Unit. The research activities in animal biotechnology were consolidated by bringing all the scientists working in are area of biotechnology from various disciplines under the umbrella of Animal Biotechnology Centre

in 1999 with the construction of new building. Later on, the centre was upgraded to the level of division (Animal Biotechnology) in 2022. The objectives of the division are: (1) to undertake biotechnology-oriented basic and applied research programmes for improving animal productivity and for developing innovative dairy processes to produce superior quality, safe, and wholesome dairy products; (2) to train manpower in the application of biotechnology in dairy production and dairy processing; and (3) to organize B.Tech., Master's, and Ph.D. programmes in biotechnology to serve the emerging biotechnology sector in animal sciences. A state-of-the-art biotechnology research facility has a working space of more than 20,000 sq. ft. and houses specialized laboratories on Embryo Biotechnology, Regenerative Biotechnology, Animal Genomics, and Proteomics Research.

ANIMAL PHYSIOLOGY

Animal Physiology functioned as a section of the erstwhile Dairy Husbandry Division and subsequently as part of the Dairy Cattle Nutrition and Physiology Division until the end of the 6th Five Year Plan. The discipline of Animal Physiology attained the status of an independent division in 1984. The scientists of the division contributed to the development of infrastructural facilities for initiating research in the area of the Embryo Biotechnology Centre, which has now been established as the Animal Biotechnology Centre. The division is committed to conducting research, teaching, and extension activities in Environmental and Stress Physiology, Lactation and Immunophysiology, Growth and Reproductive Physiology, and Endocrinology. The division has developed several useful technologies, such as induction of lactation, use of rBST to augment milk production, milk SCC as an indicator of udder health and clean milk production, and the application of mist and fan systems to alleviate summer stress, which have been adopted by progressive farmers. A large animal treadmill was indigenously developed for evaluating draft performance and work–rest cycles in working bullocks. Somatic Cell Count has been a major focus as an index of clean milk production and udder health in milch animals. A modern, custom-designed shelter with automatic control systems has been installed at the Livestock Research Centre to mitigate heat stress. Water-saving and purification demonstration units have also been installed at the animal farm for use by dairy farmers. Modern, state-of-the-art facilities are available at the National Innovations on Climate Resilient Agriculture (NICRA) Centre.

ANIMAL NUTRITION

The Dairy Cattle Nutrition Division was established in 1972 as the Dairy Cattle Nutrition and Physiology Division. It was bifurcated into two independent divisions Dairy Cattle Nutrition and Dairy Cattle Physiology in 1978. The Dairy Cattle Nutrition Division was subsequently renamed as the Animal Nutrition Division in 2016. The division undertakes basic and applied research, conducts postgraduate education programmes, and participates in extension education through various training programmes and field-level technology development and refinement in the disciplines of animal nutrition and forage production. Milk replacer and calf starter based on locally available resources were developed along with their feeding schedules. Significant work has also been carried out on the nutrient requirements of cattle, buffalo, and goats, including studies on the utilization of zinc, vitamin A, and iodine. A "Degcure" mixture was developed as a remedy for degnala disease. Sulphur requirements in combination with non-protein nitrogen (NPN) compounds were also standardized. Various mineral sources were evaluated for their bioavailability, and chelated minerals were developed and assessed. Surveys have been conducted to determine the prevalence of pesticide residues, toxic metals, and essential trace minerals. With the emergence of the One Health concept, greater emphasis has been placed on value addition of milk and meat products, application of probiotics and prebiotics in animal nutrition, mineral nutrition, and strategies for methane emission mitigation. The division offers Ph.D. and Master's programmes in the discipline of Animal Nutrition.

The research laboratories are equipped with modern analytical instruments for chemical and physical analysis. The division has established excellent laboratory facilities that serve as central resources for research and education, not only for the institute but also for various sister organizations. These facilities include a central instrumentation laboratory, an anaerobic rumen microbiology laboratory, laboratories for environmental studies including methanogenesis, a quality control laboratory, a feed processing unit, and a nutritional biotechnology laboratory. Sophisticated instruments available include an atomic absorption spectrophotometer, gas–liquid chromatograph, HPLC system, ^{15}N-Analyzer, methane analysis equipment using the SF_6 technique, spectrophotometer, and PCR machine. Research on precision nutrition has also been undertaken in recent years.

AGRONOMY

The Agronomy Section (Forage Research and Management Centre) was established in 2013 as a sister section of the Forage Production Section to strengthen research, teaching, and extension activities related to year-round forage production and quality improvement through agronomic interventions. The mandate of the section includes generating human resources in Forage Agronomy, developing agro-techniques for enhancing fodder productivity and quality through efficient resource management, and disseminating knowledge on improved forage crop production and management practices to dairy farmers and extension functionaries. The section offers

Master's and doctoral programmes in Agronomy. The section is equipped with facilities for forage quality analysis and has approximately 10 acres of land for conducting research experiments involving five scientists and trials of 19 students.

ANIMAL BIOCHEMISTRY

The Division of Animal Biochemistry was established in September 1984 through the merger of the Animal Biochemistry discipline of the Dairy Chemistry Division and the Division of Human Nutrition and Dietetics. The division's research endeavours are currently focused on the development of probiotic foods, dairy nutraceuticals and their mechanisms of action, validation of health benefit claims of Indian dairy products, characterization of genes related to fertility in buffalo, signal transduction mechanisms in sperm function, identification of fertility markers, and bioinformatics research. The division offers Master's and Doctoral degree programmes in Animal Biochemistry. It houses a Central Instruments Room equipped with advanced and expensive instruments, which are accessible to all users. The Small Animal House is a central facility managed by the Animal Biochemistry Division.

The contributions of the division have been widely recognized through prestigious awards, including three Rafi Ahmed Kidwai Memorial Awards, the Dr. P. G. Nair Award, two Jawaharlal Nehru Awards, Young Scientist Awards, the IUIS/FIMSA Travel Bursary Award, Best Publication Awards, and several paper presentation awards.

DAIRY CHEMISTRY

The Dairy Chemistry Division is one of the oldest divisions of ICAR–NDRI, established in 1941. Since its inception, the division has been actively engaged in fundamental and applied research, human resource development for academia and industry, and providing R&D support to the dairy industry and standard-setting bodies (FSSAI/BIS/AGMARK). The mandate of the division includes conducting fundamental and applied research to understand the chemistry of milk and milk products, imparting undergraduate and postgraduate education, and providing R&D support to address chemical quality control issues in the dairy industry. The division has made significant contributions to knowledge on the chemistry of milk and milk products. The division's work on the development and commercialization of strip-based rapid test methods for detecting adulteration in milk and milk products, technology for low-lactose milk powder, nano-encapsulation of curcumin, and low-cholesterol ghee has earned national and international recognition. The Dairy Chemistry Division has generated a substantial amount of intellectual property (more than 17 in the last five years), in addition to producing high-quality research publications with significant impact. The academic programmes offered by the division, leading to Master of Science/Technology and Doctor of Philosophy degrees, provide a strong foundation in the chemistry of milk constituents, milk products, food chemistry, and analytical chemistry.

DAIRY TECHNOLOGY

The Dairy Technology Division is one of the oldest divisions of the Institute and contributes significantly to its teaching, research, training, and consultancy activities. The educational programmes offered by the division include the flagship B.Tech. (Dairy Technology), B.Tech. (Food Technology), Master's and Ph.D. (Dairy Technology), and Master's (Food Technology). The research efforts of the faculty are realized through sponsored as well as in-house projects, including postgraduate dissertations. Basic and applied studies aimed at refining processing and packaging technologies for traditional, composite, Western, and dried dairy products constitute the major focus of research activities.

The division has developed strong expertise in membrane processing, biotechnological applications, fermented dairy products, composite dairy and food products, and their packaging. It has successfully organized 40 national training programmes under the ICAR-sponsored Centre for Advanced Faculty Training in Dairy Processing (formerly the Centre for Advanced Studies in Dairy Technology) since 1994, catering to teaching faculty from State Agricultural Universities and other institutions.

The Dairy Technology Division has received numerous awards in recognition of the outstanding scientific contributions made by its scientists, students, and staff. These include Fellowships of the National Academy of Agricultural Sciences (NAAS) and the Indian Dairy Association (IDA), ICAR Best Employee Awards, Best Teacher Awards, Rafi Ahmed Kidwai Awards, Jawaharlal Nehru Awards, DAAD Fellowships, Humboldt Fellowships, and several Best Research Paper awards.

DAIRY MICROBIOLOGY

Dairy Microbiology Division is engaged in research, teaching, consultancy, training and technology transfer in specialized field of Dairy Microbiology. Broadly, the research work of the division covers the areas related to starter cultures and fermented milk products; direct vat starters (DVS); indigenous probiotics, their functional efficacy and gut microbiota, prebiotics and synbiotics; bioactive peptides, microbial metabolites and bio-preservatives; biosensors, quality assurance and food safety; rumen micro-organisms etc. The division has played a leading role in establishing National Collection of Dairy Cultures' (NCDC) with current repository of more than 800 cultures and national referral centre for milk quality and safety. The division has recently transferred technologies on two indigenous strains of probiotics, *Misti Dahi*, rapids kits for antibiotic residues, *Listeria monocytogenes* and *Enterococci* to potential stake holders in our country for

their industrial application. Few more such products like carbonated *lassi*, vitamin B_{12} rich propioni-yoghurt, blueberry fortified probiotic dahi, real time test for detection of *E. coli* and antibiotic residues in milk have been developed and are under process of validation for their commercialization. The Division offers M. Tech and Ph. D programmes in Dairy Microbiology. The division offers contractual and consultancy / training services such as supply of starter cultures, freeze-drying of cultures, microbiological analysis and setting standards for regulatory compliance of dairy products in the country.

DAIRY ENGINEERING

Dairy Engineering Division was established as one of the major research divisions from the inception of the Institute. It was engaged in the maintenance and operation of tractors & agricultural implements for agricultural operation & road transport duties in year 1960-61. The division also looked after the equipment in the dairy supervised and kept in proper working order the electrical and mechanical apparatus in research divisions. Diploma Course in Dairy Engineering was started for the first time in November, 1962 by Government of India in collaboration with the UNICEF/FAO. The enrolment for this course was continued up to session 1984-85. In year 1972, Dairy Engineering was one of the disciplines, which were identified for post-graduate research and training/ post-graduate courses/M.Sc. (Dairying). In year 1977-78, Dairy Engineering was one of the disciplines for which students were distributed for PhD degree programmes. The division has research laboratory facilities to cater to the needs of specific areas and programmes such as Process Engineering, Process Equipment Design and Instrumentation, Research & Development Workshop, Equipment testing hall, CAD Lab to support both research and teaching activities. The division has achieved breakthrough in developing a number of process equipment for manufacturing indigenous milk products.

DAIRY ECONOMICS, STATISTICS & MANAGEMENT

The Dairy Economics, Statistics & Management (DES&M) Division has a strong historical foundation in advancing research, education, and industry-driven initiatives in dairy economics and management. With a focus on trade, marketing, natural resource management, and policy analysis, the division aims to enhance economic efficiency and sustainability in the dairy sector. The division offers academic programmes including B.Tech. (Dairy Technology), M.Sc. (Agricultural Economics), and Ph.D. (Agricultural Economics), supported by dedicated faculty. Its research has made significant contributions to areas such as dairy export competitiveness, demand for

functional dairy foods, water productivity in dairy farming, profitability of integrated farming systems, and price policy dynamics. The division's achievements include externally funded research projects, high-impact publications, and recognition of faculty and students at national and international levels.

DAIRY EXTENSION

The Dairy Extension Division was established at NDRI, Karnal in May 1961 to undertake extension activities, along with teaching and research in Extension Education. The research endeavours of the division focus on areas such as Information and Communication Technologies (ICTs), organizational behaviour, information management, participatory technology development, and impact assessment of dairy innovations. The faculty is actively engaged in human resource development through postgraduate and doctoral programmes of NDRI. The division organizes major extension programmes of the institute, including Dairy Mela, demonstrations, field days, and related activities. It also conducts Research–Extension–Industry–Farmer Interface programmes to facilitate convergence among stakeholders involved in dairy development. These interfaces help address current challenges faced by the dairy sector and contribute to long-term strategic planning. The division regularly organizes technology transfer campaigns, infertility and veterinary aid camps, Kisan Sangoshthi, and field workshops in adopted villages. These initiatives strengthen linkages with end users, help in understanding farmers' problems, and ensure effective dissemination of technologies along with timely feedback from the field.

A new extension education initiative, "Dairy Education at Farmers' Door," was launched on February 9, 2009, to enhance the dissemination of dairy production and processing technologies among the farming community. The division has also introduced innovative extension approaches such as "Climate Resilient Dairy Farm School" and "NDRI Climate Services" at the village level to update farmers' knowledge on climate-resilient dairy farming and agriculture.

SUPPORT SECTIONS

National Referral Centre for Milk Quality and Safety

The National Referral Centre for Milk Quality and Safety (NRCMQS) located at ICAR-NDRI is a NABL accredited and also serve as a National Referral Lab (FSSAI). The laboratory has been upgraded to NABL-FSSAI integrated accreditation under ISO/IEC 17025:2017 on various quality aspects of milk and milk products as per the requirements of the FSSR, 2011. NRCMQS is well equipped with basic infrastructure facility for chemical and microbiological analysis of milk and milk products and supports the dairy industry for compliance with regulatory standards. Further NRCMQS conducts specialized training programs for various stakeholders in milk quality and safety assessment.

A view of students working at National Referral Centre for Milk Quality and Safety

AGRICULTURAL TECHNOLOGY INFORMATION (ATIC)

Agricultural Technology Information Centre at NDRI Karnal became operational in November 2004. This centre is engaged in disseminating information on dairying and allied agricultural fields. Besides NDRI, relevant information available from other research stations of ICAR and state institutions located at Karnal are utilized by this centre for the farmers and other stakeholder visiting this centre. A large number of entrepreneurs, practicing farmers, extension workers and students are availing the facilities of ATIC together latest information related to dairying and allied fields.

At present, ATIC provides a single-window delivery system for agricultural and dairy farming information, products, and technologies developed by the institute, ensuring quality services to stakeholders. It also strengthens advisory services through a multidisciplinary approach for effective problem-solving and decision-making by dairy farmers. Besides this, the centre functions as a repository of agricultural and dairy information related to farming practices, inputs, and education. The centre is also engaged in offering consultancy services to various stakeholders and also generated financial resources for the institute through sales and services. A dedicated helpline (+91-184-2259219) provides real-time advisory services to farmers on dairy and agricultural issues. Information on seed availability and farm management is also provided. Efforts are underway to convert it into a toll-free service for better accessibility.

Services rendered in agricultural technology and technology products January to December, 2025

S. No.	Detail of services	No. of Services	No. of Persons
1.	Dairy/ Agriculture related information through Video show and Lecture	72	3652
2.	Personal Discussion with Subject-Matter-Specialist on Dairy Farming	64	2820
3.	Information through Dairy/Agriculture Literature	88	120
4.	Information on Agriculture (Seed/ Fertilizer/ Compost etc.)	1240	1628
5.	Information through telephone (Toll-free) on Agriculture & Dairying etc.	308	308
6.	Information through e-mail on Agriculture & Dairying etc.	29	66
7.	Information through whatApp group on Agriculture & Dairying etc.	48	82
	Total	1849	8676

Seed sale from January to December, 2025

S. No.	Detail of services	Quantity (Qntl)	Amount (₹)
1.	Wheat seed (DBW-327, DBW-371, DBW-372)	421	1894500.00
2.	Paddy seed (PB-1509, PB-1692, PB-1885, PR-114, PR-126)	133.50	1013400.00
3.	Paddy Grain (PB-1847, PB-1692, Tarori Basmati, Arize Gold)	20.67	65425.00
4.	Berseem Seed (BL-44)	4.9	171500.00
5.	Oats Seed (OL-10)	4.6	27600.00
6.	Mustard Seed (Chinese Cabbage)	0.65	7150.00
	Total	585.32	31,79,575.00

Total publication sale January to December, 2025:

Item	Numbers/Quantity	Amount (₹)
Books (NDRI Publications)	661	51208.00

FODDER PRODUCTION SECTION

The Forage Production Section is primarily responsible for ensuring a consistent supply of high-quality green fodder to meet the nutritional requirements of the Institute's herd. This responsibility becomes especially critical during lean periods such as May–June and November–December, when the availability of green fodder is minimal. To address this challenge, the section emphasizes the cultivation of perennial grasses and high-value dual-purpose crops that ensure a year-round supply of fodder. These approaches help in maintaining continuity in fodder availability while reducing maintenance costs and supporting a sustainable production system. In addition to meeting the herd's daily fodder requirements, designated areas are utilized for the production of seeds of fodder and grain crops.

Various farm activities and crops at ICAR-NDRI farm

This dual-purpose approach supports the Institute's technology transfer programmes by providing essential inputs while also contributing to the overall feed supply. These activities further generate revenue, thereby enhancing the financial sustainability of the Institute. Through efficient forage resource management, the section successfully addresses both short-term and long-term objectives by balancing immediate fodder needs with sustainability and economic viability.

FODDER/SEED PRODUCTION AT FORAGE PRODUCTION SECTION

During 2025, the Forage Production Section successfully fulfilled the fodder demand of the Livestock Research Centre (LRC) and produced 160,210 q of high-quality green fodder (Table 1) along with 3,577.55 q of straw. These achievements were realized through the cultivation of high-yielding fodder crops such as maize, sorghum, Napier grass, makchari, cowpea, and bajra during the Kharif season, and berseem, oats, mustard, and Chinese cabbage during the Rabi season. Throughout the year, a total of 160,210 q of fodder and 3,577.55 q of straw were distributed to the cattle yard, ABRC, and other sections, ensuring that the nutritional requirements of the Institute's livestock were consistently met. The section also emphasized seed production of oats, wheat, mustard, and berseem, resulting in a total production of 7,006.29 q of seeds/grain.

Table 1. Monthly Fodder Supply to LRC/ ABRC

Month	Green Fodder (qt.)
January	10728.00
February	14246.00
March	17378.00
April	12686.00
May	10259.00
June	11816.00
July	15992.00
August	15821.00
September	16033.00
October	13678.00
November	9957.00
December	11616.00
Total	**160210.00**

Table 2. Production and Productivity of Fodder Crops

S. No.	Crop	Area (ha)	Production (q.)	Average Yield (q/ha)
Rabi* Season *(2024-25)				
1.	Berseem	68.17	41453.00	608.08
2.	Berseem+Mustard	68.17	14443.00	212.81
3.	Oats Green	48.67	12637.00	259.64
4.	Mustard C. cabbage	7.72	1052.00	136.26
5.	Napier mixture	14.47	2544.00	175.81
6.	Napier grass	4.47	1339.00	299.55
	Total	**211.67**	**73468.00**	**347.08**
***Kharif* Season**				
1.	Maize	146.19	30882.00	211.23
2.	Sorghum	121.90	319253.00	261.37
3.	Bajra	10.97	3453.00	314.60
4.	Napier Grass	23.61	12256.00	519.10
5.	Makchari	12.47	3926.00	314.59
6.	Cowpea	2.11	340.00	160.84
	Total	**317.25**	**370110.00**	**1166.62**
	Grand Total	**528.92**	**443578.00**	**838.65**

Table 3. Calculated cost of fodder supplied to LRC/ABRC

S .No.	Crop Name	Quantity (q)	Rate (₹/q)	Amount (₹)
1.	Green fodder (Cereal)	105348.00	300/-	31604400.00
2.	Green fodder (Legume)	54862.00	400/-	21944800.00
3.	Straw	3577.55	1000/-	3577550.00
	Total	**163787.55**	**---**	**57126750.00**

The primary challenge in increasing fodder crop productivity is the lack of high-quality seeds of improved varieties. To address this, NDRI, Karnal, launched a Revolving Fund Scheme on Seed Production, covering 202.49 hectares (Table 5). The scheme aims to produce and supply improved fodder and grain crop seeds from the Institute's farm to farmers and other agencies. During the reporting period, the scheme successfully produced **6385.10 quintals of wheat seed, 54.0 quintals of mustard and Chinese cabbage seed, and 505.19 quintals of oat seed**. The total value of the straw was **₹35,77,550.00** (Table 6 and 7). Notably, the sale of seeds and other farm outputs under the scheme generated **₹2,07,50,284.60** in revenue (Table 8). Beyond improving seed availability, this initiative enhances financial sustainability, reinforcing the positive impact of the Revolving Fund in supporting agricultural activities at NDRI, Karnal.

Table 4. Revenue Generation during 2025

S. No.	Kind	Sold (qt.)	Rate per qt.	Amount (₹)	Remarks
1.	Oats seed	0.70	5000/-	3500.00	Sold to Farmer/other agency
2.	Oats seed	410.77	6000/-	2464620.00	
3.	Mustard (C. Cabbage)	3238.16 kg	11000/-	356197.60	
5.	Napier Root	4050	3/- Root	12150.00	
6.	Wheat seed	6385.10	3150.50	17853817.00	DWR
7.	Others (FYM, Fuel wood and Oats)				
a.	Oats	10.00	6000/-	60000.00	Supplied to Lalukheri
	Total	**----**	**----**	**2,07,50,284.60**	

The total calculated cost of fodder/straw supplied to LRC is ₹5,71,26,750.00 and the total revenue generation by sale/supply of seed and other items under RFS is ₹2,07,50,284.60.

LIVESTOCK RESEARCH CENTRE

The Livestock Research Centre was established in 1955 with objective of simultaneous breed improvement and breed conservation. The total milk production of the herd during the reporting year was **799,130.9 kg**. The average production performance of the two crossbred strains developed at NDRI, viz. Karan Swiss and Karan Fries, was **8.9 kg** and **11.4 kg per head per day**, respectively. The average daily milk yield of Sahiwal, Gir, and Tharparkar cows was **6.6 kg, 3.9 kg, and 5.0 kg**, respectively, while the milking average of Murrah buffaloes was **7.1 kg**. The highest milk production recorded for Karan Fries and Karan Swiss was **30.0 kg (KF-8112)** and **20.0 kg (KS-4477)**, respectively. Among indigenous breeds, the best yields recorded were **19.0 kg (Sahiwal), 18.0 kg (Gir), and 14.0 kg (Tharparkar)**. The previous best yield record of **16.5 kg** was surpassed during the reporting period. The best daily yield in Murrah buffalo (**MU-7025**) was **23.0 kg** during the reporting year. For goats, the best yields recorded were **4.3 kg in Alpine × Beetal (AB)** and **4.1 kg in Sirohi/Beetal (SB)**.

Herd Strength of Cattle and Buffaloes as on 31-12-2025

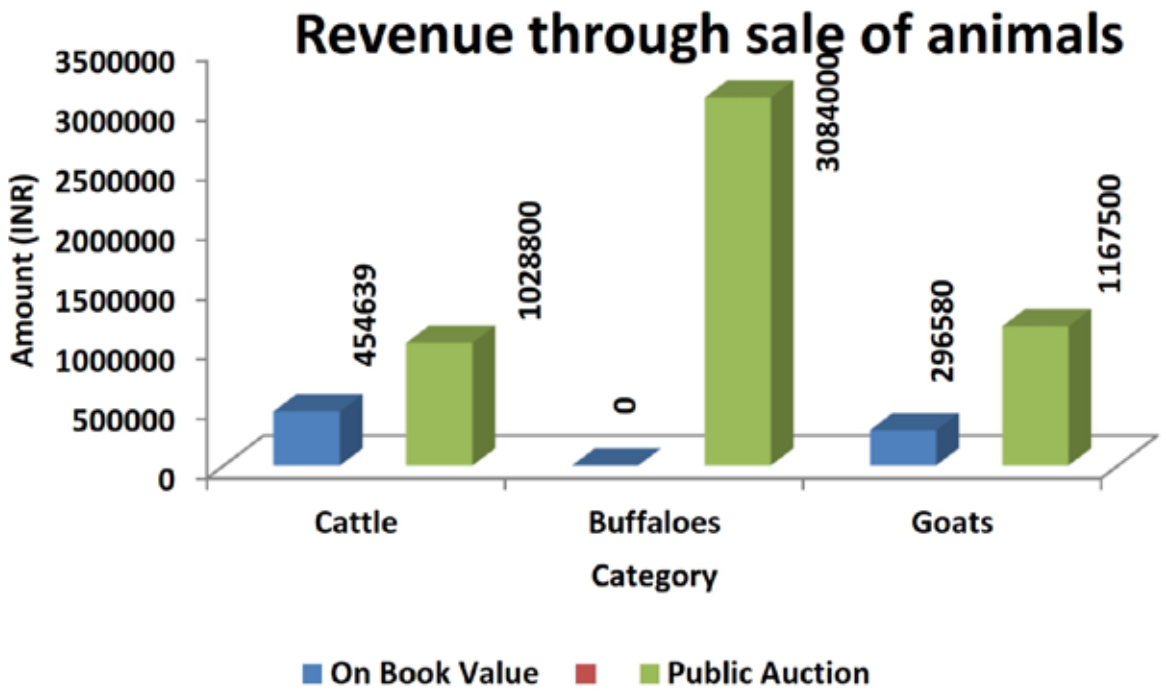
Age group	Cattle						Buffaloes	Experiment	Total Bovines
	Sahiwal	Tharparkar	Gir	Karan Swiss	Karan Fries	Total	Murrah	Murrah	
Male up to 06 months	21	06	07	-	16	50	38	-	88
Female up to 06 months	26	08	10	01	19	64	39	-	103
Heifers	153	53	55	03	53	317	111	77	505
Cows/ Buff	187	52	67	08	109	423	146	10	579
Young Male Stock	03	02	04	02	15	26	15	03	44
Bulls	05	03	03	-	19	30	01	02	33
Teaser Bull	-	-	-	-	-	-	02	-	02
Total	**395**	**124**	**146**	**14**	**231**	**910**	**352**	**92**	**1354**

Herd Strength of Goats as on 31-12-2025

Age Group	Alpine x Beetal	Saanen × Beetal	Total	Barbari	Total
Female					
Kids upto 12 months	51	22	73	03	76
Yearling	32	07	39	-	39
Goats	61	25	86	-	86
Male					
Kids upto 12 months	36	15	51	02	53
Bucks	28	12	40	-	40
Total	208	81	289	05	294

Sale of Livestock During the year 2025 (01-01-2025 to 31-12-2025)

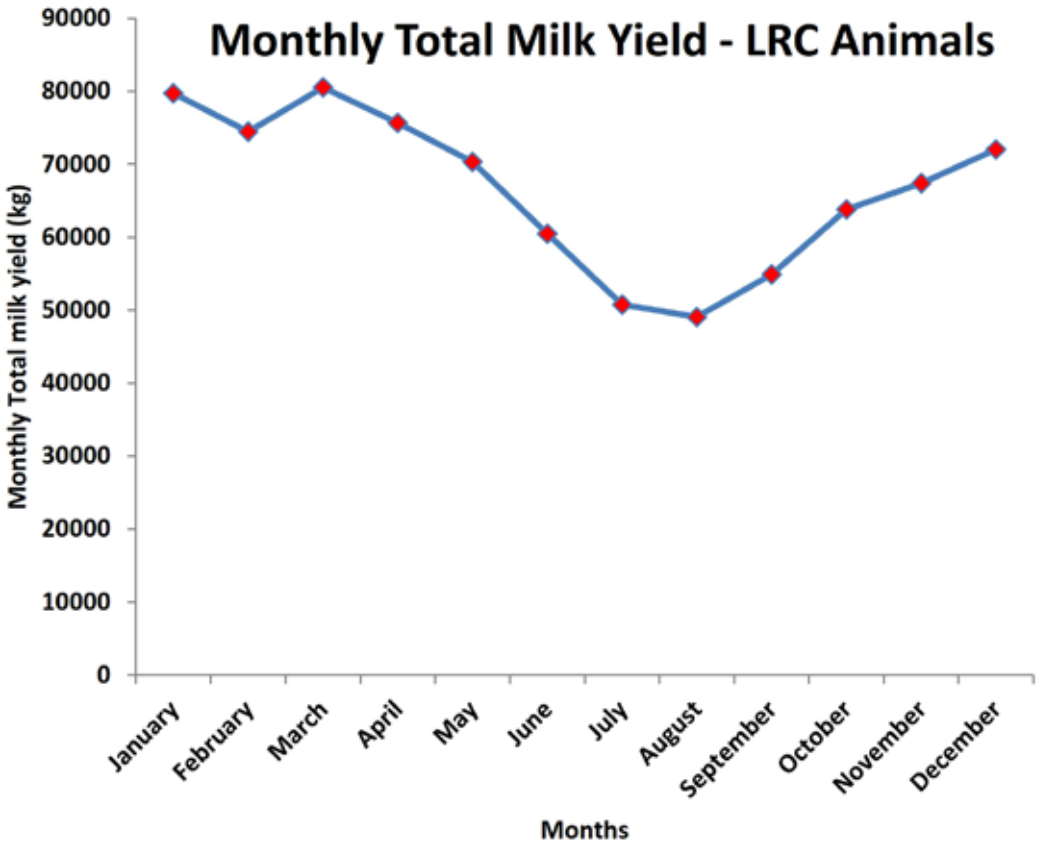
Auction of animals was conducted on 24.03.2025 to 26.03.2025 and 13.10.2025 to 15.10.2025. Total revenue from sale of livestock was ₹60,31,519.00 .



Revenue through sale of animals at LRC during the year 2025

Total milk production and milk supplied to Experimental Dairy during the year 2025

MONTH	TOTAL MILK PRODUCTION (kg)	TO CALVES/KIDS (kg)	TO OTHER DIVISION (kg)	TOTAL DISPOSAL MILK (kg)	TOTAL MILK SEND TO EXPT. DAIRY (kg)	TOTAL MILK RECD. BY EXPT. DAIRY (kg)
January-2025	79722.9	12831.3	359.5	13190.8	66331.0	66333.0
February	74463.8	11527.6	261.5	11789.1	62277.0	62279.0
March	80519.6	12558.9	198.5	12757.4	67714.5	67772.0
April	75685.3	12502.2	389.5	12891.7	62760.5	62760.0
May	70302.7	12432.2	366.5	12798.7	57311.4	57261.0
June	60471.9	9404.0	319.9	9723.9	50866.1	50808.0
July	50743.6	8602.4	322.0	8924.4	41765.5	41773.0
August	49074.0	8590.5	129.6	8720.1	40113.7	40119.0
September	54905.1	10521.5	202.0	10723.5	43704.4	43706.0
October	63792.5	13237.8	205.0	13442.8	50164.7	50164.0
November	67405.9	14142.3	265.3	14407.6	52807.3	52810.0
Dec.-2025	72043.6	13883.8	168.0	14051.8	57679.3	57681.0
Total	799130.9	140234.5	3187.3	143421.8	653495.4	653466.0



Month-wise total milk yield at Livestock Research Centre during the year 2025

Month-wise and breed wise Milking Average (kg.) of Cows, Buffaloes and Goats Maintained at NDRI, Karnal 2025 (01.01.2025 to 31.12.2025)

Months	Cows								Buffaloes				Goats			
	Sahiwal		Tharparkar		Gir		Karan Swiss		Karan Fries		Murrah		Alpine x Beetal		Sannen x Beetal	
	Av. No of animals in milk per day	Milk Yield Av. (kg) per Animal per day	Av. No of animals in milk per day	Milk Yield Av.(kg) per animal per day	Av. No of animals in milk per day	Milk Yield Av (kg) per animal per day	Av. No of animals in milk per day	Milk Yield Av. (kg) per animal per day	Av. No of animals in milk per day	Milk Yield Av. (kg) per animal per day	Av. No of animals in milk per day	Milk Yield Av. (kg) per animal per day	Av. No of animals in milk per day	Milk Yield Av. (kg) per Animal per day	Av. No of animals in milk per day	Milk Yield Av. (kg) per Animal per day
Jan. 25	80	6.3	18	5.4	21	5.7	04	9.5	60	13.1	99	8.7	58	1.5	20	1.6
Feb.	82	7.0	17	6.1	26	6.0	06	8.6	62	12.9	103	7.9	57	1.6	21	1.7
Mar.	87	6.7	19	4.8	31	4.9	06	9.9	61	12.8	97	7.8	58	1.6	21	1.9
Apr.	92	6.8	23	4.3	30	4.7	07	8.7	62	12.0	95	7.2	48	1.8	21	1.9
May	94	6.1	21	4.6	32	4.3	06	8.6	63	10.9	91	6.4	47	1.5	21	1.7
June	85	6.7	20	4.5	29	4.2	05	6.7	59	9.6	84	5.7	52	1.3	22	1.5
July	78	6.2	19	4.6	25	3.1	04	6.3	58	8.5	74	5.1	42	1.1	19	1.3
Aug.	82	5.9	20	3.7	26	2.5	03	6.5	61	8.9	71	4.6	24	1.2	14	1.3
Sept.	79	7.0	20	4.3	26	2.5	02	11.7	58	10.6	67	6.2	28	1.4	15	1.3
Oct.	81	7.1	17	6.3	21	2.8	02	11.8	60	9.6	68	7.7	33	1.7	18	1.4
Nov.	76	7.4	16	6.9	18	2.9	02	10.7	64	12.3	76	8.4	27	1.8	16	1.4
Dec. 25	75	7.0	14	7.1	17	2.7	02	10.5	62	13.6	79	8.9	33	1.7	13	1.3
Avg.	**83**	**6.6**	**19**	**5.0**	**25**	**3.9**	**04**	**8.9**	**61**	**11.4**	**84**	**7.1**	**42**	**1.5**	**19**	**1.5**

Performance of Dairy Animals During the year 2025 (01-01-2025 to 31.12.2025)

Particulars	Livestock Groups									
	Sahiwal	Tharparkar	Gir	Karan Swiss	Karan Fries	Total cattle	Murrah	AXB Goats	SXB Goats	Total Goats
Average number of animals in milk per day	83	19	25	04	61	192	84	42	19	61
Average number of dry animals per day	102	38	40	04	45	229	60	16	05	21
Milking average (kg) per day	6.6	5.0	3.9	8.9	11.4	7.7	7.1	1.5	1.5	1.5
Overall average (kg) per day	3.0	1.7	1.5	4.5	6.5	3.5	4.1	1.1	1.2	1.1
Best yield (kg) in a day	19.0	14.0	18.0	20.0	30.0		23.0	4.3	4.1	
Animal Number	**2730**	**1536**	**135**	**4477**	**8112**		**7025**	**620**	**308**	

ARTIFICIAL BREEDING RESEARCH CENTRE (ABRC):

The Artificial Breeding Research Centre (ABRC) maintains **115 breeding bulls** (Sahiwal–30, Tharparkar–8, Karan Fries–19, Murrah–55, and Gir–3) and is actively engaged in progeny testing programmes for Sahiwal, Karan Fries, and Murrah bulls. The centre undertakes advanced research on bull management, breeding soundness evaluation standards for indigenous bulls, semen cryobiology, sperm sexing, amelioration of vaccination stress in bulls, and early fertility assessment. It also focuses on the dissemination of quality germplasm to farmers and developmental agencies. The Artificial Insemination Laboratory under ABRC is involved in developing strategies for fertility improvement in dairy cows and buffaloes through effective reproductive management.

Murrah Buffalo Bull

Sahiwal Bull

Tharparkar Bull

Karan Fries Bull

Elite bulls of various breed at Artificial Breeding Research Centre

Production of Superior Germplasm

The centre is involved in the production and conservation of superior male germplasm of cattle and buffaloes. During the year 2025, a total of **168,387 (One lakh sixty-eight thousand three hundred eighty-seven)** doses of frozen semen were produced.

Month-wise production of frozen semen doses in year 2025 from various bulls of various breeds

Month	MU	SW	TP	Gir	KF	TOTAL
January	2080	680	780	-	800	4340
Febuary	2620	740	140	-	2280	5780
March	324	-	960	-	1348	2632
April	6980	7780	3970	-	7470	26200
May	4935	6545	2100	900	1970	16450
June	7917	4940	1440	1200	4080	19577
July	6030	5580	770	98	4440	16918
August	1230	2790	730	-	2510	7260
September	9310	2510	1120	-	1050	13990
October	9720	2350	380	-	1580	14030
November	14070	1820	3630	-	2200	21720
December	10390	4080	2640	-	2380	19490
Total	**75606**	**39815**	**18660**	**2198**	**32108**	**168387**

Mu: Murrah; SW: Sahiwal; TP: Tharparkar; KF: Karan Fries

Dissemination of Superior Germplasm

The centre disseminates superior male germplasm for genetic improvement programmes of cattle and buffaloes. During the year 2025, ABRC disseminated **146,440 ml doses of liquid semen** of Sahiwal, Karan Fries, and Murrah bulls to local farmers. It also supplied **137,734 doses of frozen semen** of Sahiwal, Tharparkar, Karan Fries, and Murrah bulls to farmers, research scholars, and various institutes (Table 2).

Month-wise dissemination of semen doses in year 2025 from Artificial Breeding Research Centre

Month	Liquid semen doses (ml) to Farmers	Frozen semen doses to Farmers / Institutes / Dairy Development Agencies/ Project students Research
JAN.	12200	11893
FEB.	10440	6880
MAR.	11510	2620
APR.	10410	10761
MAY.	12150	5813
JUN.	9575	12172
JUL.	11230	12744
AUG.	13225	18287
SEP.	14310	9341
OCT.	13500	16274
NOV.	13845	12658
DEC.	14045	18291
TOTAL	**146440**	**137734**

Revenue generation

ABRC generated **₹41,14,026 (Rupees forty-one lakh fourteen thousand twenty-six)** as revenue for the institute through the sale of liquid semen, frozen semen, and liquid nitrogen during the year 2025. In addition, **₹16,61,225 (Rupees sixteen lakh sixty-one thousand two hundred twenty-five)** was generated through the auction of bulls. The total revenue generated by ABRC during the year 2025 was **₹57,75,251 (Rupees fifty-seven lakh seventy-five thousand two hundred fifty-one)**. The month-wise revenue generation is presented in Table.

Revenue Generation from Artificial Breeding Research Centre in year 2025

Revenue generated through the sale of semen (₹)				
Month	Frozen semen (₹)	Liquid semen (₹)	Liquid nitrogen (LN2)	Total (₹)
JAN.	191920	146400	1008	339328
FEB.	131580	125280	624	257484
MAR.	53040	138120	648	191808
APR.	234940	124920	696	360556
MAY.	92020	145800	888	238708
JUN.	229740	114900	1152	345792
JUL.	279840	134760	888	415488
AUG.	226580	158700	1200	386480
SEP.	113200	171720	768	285688
OCT.	282400	162000	1056	445456
NOV.	265440	166140	1344	432924
DEC.	244670	168540	1104	414314
TOTAL	**2345370**	**1757280**	**11376**	**4114026**
Auction of Bulls				**1661225**
Total Revenue generation				**5775251**

Reproductive status of NDRI Herd for the Year - 2025

Particulars	Breed					
	Sahiwal	Tharparkar	Karan Swiss	Gir	Karan Fries	Murrah
COW/BUFFALO						
Nos. of Observation	98	32	7	50	49	62
Service Period (days)	128.14	104.96	16071	140.62	146.85	121.58
Nos. of Service/Conception	1.54	1.28	1.14	1.54	1.42	1.40
HEIFER						
Nos. of Observation	56	18	-	17	22	52
Av. Age at Maturity (Month)	29.14	32.11	-	30.00	22.72	29.71
Av. Age at Conception (Month)	29.66	32.61	-	32.82	30.04	30.61
Nos. of Service/Conception	1.57	1.33	-	1.64	1.68	1.30
CONCEPTION RATE (%)						
Conception Rate 1st Service	50.74	64.51	75.00	45.23	44.72	60.26
Conception Rate 3rd Service	83.58	80.64	75.00	76.19	85.71	86.75
Overall Conception Rate	46.11	47.00	66.66	43.12	44.72	53.35

SMALL ANIMAL HOUSE

The Small Animal House Facility houses approximately **1000 mice** (Swiss albino and C57BL/6 black), **500 rats** (Wistar albino), and **25 New Zealand White rabbits**. All animals are maintained under strict hygiene and animal ethics guidelines, with provision of a balanced diet and a comfortable microenvironment. Planned breeding programmes are carried out to meet the experimental requirements of research scholars and faculty of the institute. The facility is equipped with centralized air conditioning, autoclave, incinerator, euthanasia chamber, dissection room, and fumigation facility.

EXPERIMENTAL DAIRY

The Experimental Dairy was established at the Institute in 1961 with the objective of providing necessary infrastructure facilities to scientists for scaling up new products and processes developed in laboratories to pilot scale, as well as to provide training facilities to students in the operation of dairy plants. The per day milk handling capacity of the Experimental Dairy is **10,000 litres**. After meeting the requirements of research and teaching, the plant is utilized for converting surplus milk into a variety of dairy products. This self-sustaining Experimental Dairy has been operating under a Revolving Fund Scheme since **1989–90**. During the year 2025, a new product, **"Masala Chhach"**, was launched for effective utilization of whey. An online payment system through UPI at the milk parlour was also initiated for customer convenience.

The Experimental Dairy processes milk received from the NDRI Cattle Yard. During the year 2025, **1.89 lakh kg of buffalo milk** and **6.22 lakh kg of cow milk** were received and processed. Prior to processing, routine platform and quality tests are conducted daily. Milk is processed in different sections, including the Market Milk Section, Powder Section, and Paneer and Cheese Section, for product preparation. During 2025, various milk products such as flavoured dairy drinks, ice cream, kalakand, lassi, paneer, cheese slices, roller-dried skimmed milk powder, and Masala Chhach were prepared and sold at the NDRI Milk Parlour. The total revenue generated from the sale of milk products during the year 2025 was **₹7.05 crore**.

COMPUTER CENTRE

The Computer Centre was established in 1982 with the aim of providing scientific data processing facilities to scientists and research scholars of the Institute. Over the years, the Centre has expanded its activities in line with rapid advancements in the ICT field to meet emerging challenges. The Centre has successfully inculcated a computer culture in the Institute by organizing training programmes and workshops. The activities of the Computer Centre are carried out through three units, namely the Data Processing Unit, Teaching & Training Unit, and Computer Maintenance Unit, in addition to the AKMU Cell and BTIS Sub-Centre. The Centre also includes an ASRB Lab and a PC Lab, where more than 130 systems are currently operational, equipped with i3/i5 processors, heavy-duty line matrix printers, and software such as MATLAB and SYSTAT.

NKN connectivity with a 1 Gbps link (providing speeds of more than 300 Mbps) is available at NDRI offices and the library, and is utilized for various official purposes. In addition, the library provides internet and email services to students, faculty members, and other staff. For this purpose, 40 workstations are available in the library, enabling students to access current information in their areas of interest and communicate with researchers efficiently. The Kaveri, Alaknanda, and Narmada hostels are fully Wi-Fi enabled, allowing students to carry out research-related work from their hostels. This facility has significantly enhanced the academic environment

by providing seamless internet access for studies, research, and other educational activities.

A dedicated mail server with the domain **ndri.res.in** has been created for students. This server is maintained by the Computer Centre, ensuring reliable and secure email communication for academic and administrative purposes. Server maintenance includes regular updates, security checks, and technical support to ensure uninterrupted service. The server room, web server, and mail server for smooth internet functioning at NDRI are also maintained by the Computer Centre.

NATIONAL LIBRARY IN DAIRYING

The Institute Library has an impressive collection of literature on dairy science and related subjects. At present, **15 print journals (6 Indian and 9 foreign)** are subscribed to, ensuring access to current scientific and technical developments. In addition, the Institute has online access to **over 13,000 journals across 27+ subject categories** through the One Nation One Subscription (ONOS) scheme of the Government of India.

The library holds **100,006 volumes**, including books, bound journals, theses, standards, and annual reports. A total of **2,339 e-books** from various Indian and international publishers are available for perpetual access on the NDRI campus. In addition to these, **1,174 e-books and 17 serial publications** are accessible through CeRA for institute users.

The online library catalogue is available at **library.ndri.res.in** using the Koha-LMS platform, and **53,444 catalogue records** are also accessible through AgriCat/WorldCat. At present, **7,345 digitized records**, including valuable institutional publications, M.Sc. and Ph.D. dissertations, reports, conference proceedings, and reprints, are available in the KrishiKosh Repository of the Indian National Agricultural Research System.

The library also manages anti-plagiarism services using the DrillBit software through the Shodh Shuddhi portal of the INFLIBNET Centre, UGC, for plagiarism detection in Ph.D. theses. Additionally, the same platform is subscribed to and managed for plagiarism detection in master's theses and other institutional documents.

COMMUNICATION CENTRE

The Communication Centre provides comprehensive photography, videography, and audio-visual support for various events and academic activities. The Photo Lab handled photography for 350 events, including seminars, workshops, VIP visits, and extension programs. It also managed photo printing, cataloguing, scanning, and consultancy services. The Video Lab covered 44 events, supporting research and documentation through audio-video editing, dubbing, and mixing. A notable achievement includes the re-editing of the NDRI song, showcased to national and international visitors. Facilities like Dr. D. Sundresan Auditorium (900 seats), Dr. N. N. Dastur Auditorium (149 seats), and Pinaki Hall support major institute functions and meetings. The Exhibition Unit hosted 14,580 visitors across 243 groups, organizing nine exhibitions across India. Additionally, the unit organized **9 exhibitions** across India during this period. A Virtual Classroom supports online education with smart panels. Audio-visual services also extend to various auditoriums, halls, and outdoor venues, including student and institute events, ensuring seamless execution of programs across platforms.

MAINTENANCE ENGINEERING SECTION

In 1979, the Institute assumed responsibility for the maintenance of essential infrastructure services from the Central Public Works Department (CPWD) and Uttar Haryana Bijli Vitran Nigam Limited (UHBVNL), and established the Maintenance Engineering (M.E.) Section as a centralized in-house facility. The Section is responsible for the operation, maintenance, and management of the Institute's utility and infrastructure services, including water supply, sewage disposal, Effluent Treatment Plant (ETP) operations, and electrical systems to ensure uninterrupted services across academic, residential, and research facilities. It undertakes civil, electrical, mechanical, and HVAC maintenance, renovation and repair works, preparation of estimates for construction and maintenance projects, and maintenance of infrastructure records. The M.E. Section also coordinates with regulatory and government agencies such as Central Public Works Department (CPWD), Central Pollution Control Board (CPCB), Haryana State Pollution Control Board (HSPCB), Uttar Haryana Bijli Vitran Nigam (UHBVN), and the Central Electricity Authority (CEA), to ensure statutory compliance and smooth execution of projects. In addition, it manages residential quarters, solar power systems, civil and electrical stores, and infrastructure upgradation, including laboratory modifications. Regular inspection and monitoring of buildings and utility services are carried out to ensure efficient, safe, and sustainable infrastructure management across the Institute.

Infrastructure developed

During the year, infrastructure work of **₹ 2195.06 lakhs** has been initiated to make the institute future ready. Some of the important infrastructure which have been developed/ongoing at the institute are as follows:

- **Hostels:** Construction of boys' hostel and girl's hostel with 120 bedded each is ongoing. Expansion of two existing wings along with dining hall of Kaveri Hostel is ongoing.
- **New laboratories:** Construction of Center of Excellence with OPV-IVF Lab is ongoing.
- **Repair & Maintenance:** Repair and renovation of flooring of KVK and electric wiring of Kisan Hostel.

- **Parking:** Construction of parking lots at various places in the institute
- **Renovation:** Repair & Renovation of Feed Quality Control Lab, Calf Shed of LRC, administrative building, processing department buildings, library building, Satluj Hostel building, Central Store Building etc. Up-gradation and Modernization of Various Laboratories including Civil & Electrical work and Modular Lab Furniture etc. is ongoing. Furniture/ Fixtures of Hostels, Labs, Conference Rooms, Lecture Halls etc. is ongoing.
- **Livestock Research Centre Renovation:** Re-carpeting of Inner Circle Road of LRC is ongoing. Construction of Modern sheds of approximate area 1600 sqm and Repair of Drainage system of LRC and Milking Byres including electrical work at LRC is ongoing. Repair and Renovation of Goat section and toilet blocks of LRC is ongoing.
- **Animal Breeding Research Centre (ABRC):** Construction of New Semen Processing Laboratory including allied facilities at ABRC is ongoing. Construction of a new bull shed and quarantine shed at ABRC are in progress.
- **Farm Section:** Construction of covered storage shed of unprocessed seeds and grain straw in Farm Section.
- **Paver Block Work:** Providing and fixing of CC interlocking paver blocks around the ABC/DC Division building is in progress.
- **Sports Facilities:** Repair and renovation of the badminton hall are ongoing.
- **Water Infrastructure:** Repair/replacement of approximately 150 overhead water storage tanks along with supporting beams and columns across residential quarters is underway.
- **Pathways:** Providing and fixing of a chequered tile path between the Educational Museum and Exhibition Unit is in progress.
- **Repair of Buildings & Hostels:** Repair and repainting of the corridor and exterior of the 24-room block of Kalki Guest House, along with repair and painting of Alaknanda Hostel and the Indoor Sports Complex, are in progress.
- **Training Hostel:** Construction of a Training Hostel under the DAHD Project is ongoing.
- **Street Lighting:** Repair and renovation of street lights at LRC premises, including strengthening of power cables of the old TBI Small Animal House and Animal Health Complex, are ongoing. Replacement of streetlight poles from the Auditorium & Sports Ground Road to the Animal Nutrition Division building via the Generator House and Administrative Block is also in progress.
- Construction of Training Hostel under DAHD Project is ongoing.

HUMAN HEALTH COMPLEX

The Human Health Complex of ICAR- NDRI became functional on September 23 1991, with a 20-bed capacity to cater to the healthcare needs of students, staff, retired personnel, and their families. Additionally, it provides medical treatment facilities to sister institute located in Karnal.

During the year 2025 Approx 10943 patients, we have given Allopathic, Ayurvedic and Homeopathic treatment to the employees and students of NDRI with satisfactorily. These facilities were also extended to other sister Institutes located at Karnal with consultancy only. Furthermore, HHC has empaneled 9 hospitals – Amritdhara, Cygnus, Park, Virk, Arpana, Sarswati Nethralaya, NP Rawal, Global Cadle, Shri Hari, Samparan Health Care, hospital Karnal. for cashless treatment, along with 13 hospitals for OPD treatment of staff, their dependents, and retired employees.

In the human health complex, a Diagnostic Clinical Laboratory is well equipped with fully automated Hematology Analyzer. A well-qualified Nursing staff, LAB Technicians and Pharmacist assist the doctors in providing the desired medical facilities. Additionally regularly organizes various health awareness programmes on diseases such as malaria, and polio in collaboration with District Hospital, Karnal. It also conducted Three medical health camps.

1. Dental health camp on April 15, 2025
2. Blood donation camp on September 26, 2025
3. Gynecology, Pediatrics & Dietitian health Camp on November 17, 2025

It also conducted medical health camps in partnership with Amritdhara, Park, Cygnus, Virk, hospitals during the ICAR Sports Meet held from February 2 to 5, 2025.

MODEL DAIRY PLANT

The Model Dairy Plant (MDP) at ICAR-NDRI, Karnal, was established in 1996 with financial assistance from the National Dairy Development Board (NDDB) and commissioned on a turnkey basis. Designed initially for a capacity of 60,000 litres of milk per day, the plant currently handles 2.0–2.1 lakh litres daily. The facility is certified under ISO 22000:2018 Food Safety Management System standards and serves as a unique platform for commercial dairy operations, student training, and scale-up of research technologies. The Model Dairy Plant functions as an autonomous unit of ICAR-NDRI and is administered by a committee chaired by the Director, ICAR-NDRI.

Milk Processing and Product Manufacturing

MDP receives milk on behalf of Mother Dairy Fruit & Vegetable Pvt. Ltd. from Milk Producer Companies across the country. Average milk procurement is about 1.4 lakh litres per day, supporting the processing and packaging of approximately 1.7 lakh litres of liquid milk daily. Milk is processed in three

shifts and marketed in various categories, including Full Cream (Premium), Full Cream, Toned, Double Toned, Super T, and Cow Milk for distribution in Delhi and nearby markets.

The plant also manufactures cow ghee using butter procured from various State Federations. Average ghee production and sales are 50–55 metric tonnes per month, with the entire quantity marketed through the MDP sales counter.

In addition, MDP produces value-added products such as pinni, multi-grain pinni, besan pinni, besan burfi, besan laddoo, kulfi, and softy. During January–December 2025, total sales of pinni, burfi, and laddoo reached 120.26 metric tonnes, while kulfi and softy sales stood at 3.23 lakh and 71,061 units, respectively. The plant also supports student training and pilot-scale production of paneer, cottage cheese, and processed cheese.

Training and Academic Support

The Model Dairy Plant plays a vital role in experiential learning by providing six months of in-plant training to B.Tech. (Dairy Technology) students of NDRI Deemed University. Students receive hands-on exposure to modern dairy plant operations, production management, quality assurance, and industrial practices through structured training modules and supervised shift operations.

Since its inception, the plant has trained 29 batches comprising 728 students. From 2026 onwards, trainees are provided a stipend of ₹7,500 per month. The training programme is further enriched through participation in KAIZEN and Small Group Activities, fostering practical problem-solving and managerial skills.

Research and Technology Support

MDP serves as an important interface between research and industry by providing facilities for scaling up laboratory-developed technologies under commercial production conditions. The plant enables NDRI scientists to validate process innovations and assess their industrial feasibility before technology transfer.

Highlights of 2025

- Procured three high-speed milk packaging machines (12,000 pouches/hour capacity) to enhance operational efficiency.
- Launched besan laddoo and softy as new value-added products.
- Initiated packing of cow ghee in 5-litre and 15-litre containers.
- Constructed a new 50' × 70' storage shed for packaging materials through in-house efforts.
- Enhanced low-temperature ghee storage capacity by refurbishing the cooling system.
- Fabricated and installed stainless steel material-handling racks in the main store.
- Replaced conventional lighting with energy-efficient LED systems in processing, packaging, laboratory, and cold storage areas, resulting in daily energy savings of approximately ₹1,500–2,000.
- Repaired and renovated underground water storage tanks (5 lakh litres each).
- Modernized the pinni manufacturing section.
- Completed epoxy flooring in butter cold stores and the main laboratory.

Dr. Dheer Singh, Director, ICAR-NDRI releasing Pinni manufactures using automatic pinni making machine during IRC meeting

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REGIONAL STATIONS

SOUTHERN REGIONAL STATION, BENGALURU

The National Dairy Research Institute (NDRI) was originally established in Bengaluru (formerly Bangalore) and has since evolved into the Southern Regional Station (SRS) of NDRI. As one of India's pioneering institutions in dairy science, it has played a vital role in the development of the dairy sector for over a century. The Institute's first formal training programme, a two-year course leading to the Indian Dairy Diploma (IDD), was introduced in 1923. A notable milestone in its history was the visit of Mahatma Gandhi in 1927, who gained first-hand exposure to scientific dairy farming practices.

Following India's independence, the Institute expanded its activities through the establishment of key facilities such as the Central Artificial Insemination Centre, Key Village Scheme Centre, and Southern Regional Animal Nutritional Research Centre at Bengaluru. After the reorganization of the Institute in 1955, NDRI headquarters was shifted to Karnal, while the Bengaluru campus continued as the Southern Regional Station, focusing on research, education, training, and extension. With a scientific workforce of about 25 faculty members, the Station undertakes teaching, research, and extension programmes in dairy production, dairy engineering, dairy processing and technology, dairy extension, economics, and statistics.

The campus possesses approximately 21 hectares of farmland, a dairy herd of about 300 animals comprising Deoni, Malnad Gidda, and HF crossbred cattle, along with laboratories, an experimental dairy plant, library, staff dispensary, student hostels, and guest house facilities. The station focuses on region-specific research, technology development, dissemination, and advanced human resource development to cater to the needs of southern states. Its core objectives include genetic improvement of indigenous breeds, process upgradation for region-specific dairy products, quality assurance systems, economic analysis, development of model villages, technology transfer, and capacity building of farmers and entrepreneurs.

To commemorate National Milk Day, a National Symposium on "Viksit Bharat: Challenges, Opportunities and Way Forward for the Indian Dairy Sector" was organized on November 28, 2025 at ICAR–NDRI SRS, Bengaluru

Livestock Research Centre

The Livestock Research Centre at SRS of NDRI maintained a diverse herd comprising HF crossbred, Deoni, and Malnad Gidda cattle. During the year 2025, the total milk production recorded was 156,061.5 kg, with HF crossbreds contributing the major share (123,883.0 kg), followed by Deoni (29,891.6 kg) and Malnad Gidda cattle (2,286.9 kg). On average, the milking herd included 36 HF crossbred cows, 18 Deoni cows, and 3 Malnad Gidda cows.

Production performance of Cattle at SRS- NDRI Herd during 2025

Particulars	Cattle Breed wise		
	Deoni	Malnad Gidda	HF crossbred
Herd Strength as on 31-12-2025	137	26	124
Total milk production (kg)	29891.6	2286.9	123883.0
Av. no. of cow's in milk/day	18	3	36
Av. no. of cow's in dry/day	13	1	5
Wet Average (kg)/day	4.49	2.73	9.40
Herd Average (kg)/day	2.59	1.80	8.17

Milk production performance at SRS-NDRI, Bengaluru herd (Jan-Dec' 25)

Months	Milk Production (Kg.)	Wet Average (Kg.)	Herd Average (Kg.)	Average FAT %		Average SNF %	
				HF	Deoni	HF	Deoni
January	10481	6.39	4.61	3.91	4.35	8.58	8.86
February	9599	6.62	4.59	3.80	4.36	8.55	8.76
March	12039.5	7.20	5.09	3.43	3.90	8.42	8.68
April	11690	6.91	5.17	3.72	4.26	8.48	8.83
May	13757	7.51	5.94	3.74	4.23	8.69	8.96
June	13390	7.53	5.95	3.68	4.39	8.65	8.90
July	13013.5	7.45	5.62	3.62	4.54	8.60	8.85
August	14142	8.43	5.97	3.84	4.19	8.82	9.04
September	13210.5	7.77	5.65	3.35	4.21	8.56	9.11
October	14735	8.21	6.08	3.54	4.20	8.48	8.97
November	14518.5	7.92	6.08	3.69	4.27	8.71	9.06
December	15485.5	8.16	6.19	3.84	4.34	8.94	9.15
Total Milk	156061.5						
Overall Average	13005.13	7.51	5.58	3.68	4.27	8.62	8.93

Livestock Research Centre of ICAR-NDRI SRS, Bengaluru

Forage Section

To support feeding requirements, a total of 1,801.80 tonnes of green fodder was produced, including Hybrid Napier (778.40 tonnes), Paragrass (509.00 tonnes), and Guinea Grass (393.90 tonnes), along with Fodder Maize, CoFS, and other minor fodder crops, ensuring nutritional sustainability and fodder diversity.

Fodder production and supply to the Institute Farm, ICAR-NDRI-SRS, Bengaluru, during 2025

S.No.	Particulars of fodders	Quantity (Qtl.)
1	Hybrid Napier	**7784.00**
2	Para Grass	**5090.00**
3	Guinea Grass	**3939.00**
4	Maize	**645.00**
5	CoFS (Fodder sorghum)	**435.00**
6	Misc. **(Hedge Lucerne /Rhodes/ Sudan)**	**125.00**
Total		**18018.00**

Experimental plant

The experimental dairy plant has the facility to process the milk to pasteurized milk and packaging in LDPE pouches. The capacity of the plant is 500 LPH. In addition, it has also the facility to manufacture products like ice cream, cheeses, processed cheese, cheese spread, paneer, butter, ghee, flavoured milk, yoghurt, dahi, traditional Indian sweets like kunda, milk sweet, chhana podo. Dry powder products like cheese puri mix and gulabjamun mix are also being manufactured in this facility. This facility has been used by most of the research students of post-graduation and doctoral degree to complete their research work. This facility is also made available to external user on chargeable basis as and when request received, especially equipment like homogenizer and ice cream freezer.

Milk parlour

Milk parlor is situated at the entrance of SRS, ICAR-NDRI Campus and many customers visit and purchase milk and milk products. It operates from morning 6:30 AM to evening 6:30 PM. Raw fresh milk is also offered for sale to customers through this parlor. Value added products like ice creams, Cheddar cheese, processed cheese, cheese spread, paneer, butter, flavoured milk, Greek yoghurt, curd, kunda, milk sweet, chhana podo, cheese puri mix, gulab jamun mix, whey-fruit beverages, mozzarella cheese are being sold through this parlor. As a new initiative, the students of dairy processing and technology were engaged in the milk parlor operation to understand and get hands-on experience on marketing, accounts and customer handling.

Academic cell

Academic cell of SRS NDRI looks after Educational and other Academic activities of SRS. During the period of report, the following courses viz. B.Tech (Dairy Technology), M.Tech (Dairy Technology) and M.Tech (Dairy Engineering) courses were offered at this station. In 2025, 21 B.Tech (DT), 6 M.Tech (DT) and 4 M.Tech (DE) students were admitted. The faculty of SRS also guided the dissertation work of PG and PhD students in the disciplines of Dairy Technology, Dairy Chemistry, Dairy Engineering, Animal Genetics & Breeding, Animal Nutrition, Veterinary Gynaecology and Obstetrics, Livestock Production Management, Animal Biochemistry, Agricultural Economics and Agricultural Extension Education. During the year, 29 PG and 6 PhD students submitted their final theses for the award of the degree. PG students from other universities were also mentored to carry out their internship training at this station. Further, the station serves as a Study Centre of the Indira Gandhi National Open University (IGNOU). During the year, a total of 88 students registered for various IGNOU courses at this station: Post Graduate Diploma in Food Safety and Quality Management (PGDFSQM) - 18; M.Sc. Food Safety and Quality Management (MSCFSQM) - 60 and B.Sc. Food Safety and Quality Management (BSCFSQM) - 10.

Library

The library of this station is stocked with 13420 books, 10946 bound journals, 4382 Thesis and 1295 reprints. Few journals are received on *gratis* basis from different Institutions / Organizations of the Country. The library has LIBSOFT Library automation software through which in house operation and functions are carried out. 10654 bibliographical details about the books have been updated into the software. Library is equipped with computer system to meet the student's requirements with Wi-Fi connectivity, photocopying facility, newspaper clipping services, reference services and inter library loan facilities to readers. Library is functional from 9.00 a.m. to 05.30 p.m. on all working days. The Library serves as a referral Centre for students and dairy industry professionals of the region.

Computer Section

The Computer Centre at SRS of ICAR-NDRI, Bengaluru was established in 1990 with an aim to provide Scientific data processing facilities to Scientists and Research scholars of the Institute. Over the years, the Centre has expanded its activities in keeping with rapid advancements in the Information and Communication Technology field to meet new challenges. The Computer centre at this campus is also responsible for Institute's information security using a centralized, network-based security system, which includes a Sophos firewall and antivirus software. The institute's internet facility is provided by the National Knowledge Network (NKN), a Govt. of India initiative, which connects the institute as an NKN hub via a 100 Mbps link. The network is used for

various official & research purposes. Furthermore, the computer cell and library at this station provide Internet and email services to students, faculty, and staff. Our campus and hostel are now fully Wi-Fi enabled, allowing researchers and students to conduct research-related work from the hostel premises. This upgrade has significantly enhanced the academic environment by providing seamless internet access for study, research and other educational activities. The network is maintained by the Computer Centre, ensuring that all students, researchers and staff have reliable and secure email communication for research, academic, and administrative purposes. New computers and peripherals are added annually to support students and researchers with the latest technology for their academic and research activities. The campus computer centre supports online meetings, conferences, and student synopsis across the Conference Hall, Seminar Hall and the newly developed RKVY Farmers Training Cell.

Additionally, the Computer Centre outsources the maintenance of computers and their peripherals—including hardware and software—to an external agency. This ensures uninterrupted service and smooth internet functioning through regular updates, security checks, and technical support. The Computer Centre also installs and maintains CCTV surveillance systems and EPABX (intercom and direct PRI telephone lines) at the campus.

Atal Incubation Centre

Atal Incubation Centre at SRS is called AIC-SRS-ICAR-NDRI Foundation, Bengaluru. The Atal Incubation Centre was established at SRS, Bengaluru as a SPV i.e. Section – 8 company (registered as AIC- SRS-ICAR-NDRI Foundation Bengaluru) in the year 2018 with the financial support of Atal Innovation Mission (AIM), NITI Aayog, New Delhi. The AIC is functional and operated by the Board of Directors and External Members with the assistance of CEO, Incubation Manager and Office Assistant. A total of three incubates viz. M/S. Amizzo Foods (Kulfi& Ice Cream), M/S. S.R. Establishments (Paneer) and M/S. 2S Dairy Deli Products (OPC) Pvt. Ltd (Cheeses Spreads and Dips) completed their incubation. Currently, on-board incubates are M/S. Pollsem Agronomic Pvt Ltd. (Developing extender for easy storage of semen), M/S. BioSouk Life Science (kit for milk & meat freshness detection), M/S. Qshiravbrih Foods Pvt Ltd. (supply of raw milk, processed milk and value added dairy products), ALT Basket PVT Ltd. (plant based Oat milk), M/S. Bfills Edibles Pvt Ltd. (Honey with Dairy Products) and M/S. Ankuraam Foods (preparation of Paneer). The Board of Directors attended the review meeting of AIC on October 29–31, 2025 at NITI Ayog, New Delhi.

Dairy Entrepreneurship and Skill Development Centre, ICAR-NDRI SRS

A state-of-the-art facility, the Dairy Entrepreneurship and Skill Development Centre, has been established under the National Agriculture Development Programme (Rashtriya Krishi Vikas Yojana) externally funded project at ICAR-NDRI SRS, Bengaluru. The Centre is intended to facilitate training programmes and skill development initiatives for farmers, entrepreneurs, and field-level extension personnel engaged in the dairy sector. Occupying an area of 136 square meters, the facility is equipped with modern infrastructure, including a video conferencing system, seating capacity for 50 persons, and a VIP office room. The total project outlay amounted to ₹103 lakh, and the facility was constructed by CPWD. The Centre was formally inaugurated on 11 April 2025 by Ms. Alka Nangia Arora, Additional Secretary (DARE) & Financial Advisor (ICAR), New Delhi, in the presence of Dr. Dheer Singh, Director & Vice Chancellor, ICAR-NDRI.

The "Dairy Entrepreneurship and Skill Development Centre" building constructed under RKVY project was inaugurated on April 11, 2025 at ICAR-NDRI SRS, Bengaluru

Revenue Generation

Sl No.	Particulars	Amount (in Lakh)
A) Institute Revenue		
i)	Milk from LRC	45.39
ii)	Other farm produces	4.47
iii)	Guesthouse	6.06
iv)	Students' fees	16.37
v)	Analytical charges	2.97
vi)	Training fees	9.22
vii)	Others	5.84
Total-A		90.32
B) Revenue from Revolving Fund		
i)	Sale of Milk	47.08
ii)	Sale of Milk Products	16.58
Total-B		63.66
Grand total (A+B)		**153.98**

Participants of the ICAR Sponsored Winter School on "Milk Derived High Value Bioactive Compounds: Agro Industrial Prospects, Challenges and Way Forward" conducted at ICAR-NDRI SRS, Bengaluru during the period of January 31 to February 20, 2025

Visit of Quinquennial Review Team (QRT) to ICAR-NDRI SRS, Bengaluru

EASTERN REGIONAL STATION, KALYANI

Eastern Regional Station of National Dairy Research Institute (NDRI) is located at Kalyani, Nadia District, West Bengal. The Eastern Regional Station was established at the Central Dairy in Calcutta in 1964 and was shifted during 1966 to Kalyani, Nadia district; about 50 km north of Calcutta and was located in the Administrative Building of Kalyani University. The Regional Animal Nutrition Research Centre of the ICAR till then located at Haringhata, West Bengal, was merged with the Eastern Regional Station of NDRI with effect from June 1, 1968. In 1978 the Government of West Bengal granted 100 acres of land at Kalyani where cattle sheds, forage unit, staff quarters etc. were gradually built up. The Station built its own laboratory building and the entire station started functioning within the same campus from May, 1987. The main objective of establishing the Eastern Regional Station is to identify the major constraints of dairy production in eastern and north eastern India and to offer solutions through research and extension activities to these problems. It serves as a vital link between the NDRI, Karnal and the far-flung areas of the eastern and north eastern regions of the country for transfer of technology developed at the institute and provides appropriate feedback after trial for perfection. The research work undertaken at this station is mainly strategic and applied in nature and the thrust of research is to improve the socio-economic condition of dairy farmers of this region.

Over the years, research activities expanded from animal nutrition to multiple disciplines including dairy chemistry, bacteriology, animal breeding, livestock production and management, forage production, dairy economics, and extension. Further strengthening came with the establishment of animal biotechnology activities in 2005, animal physiology and reproduction laboratories during 2013–14, and a goat farm in 2014–15, along with the establishment of Krishi Vigyan Kendra-II in 2016–17. The centre is now equipped with comprehensive infrastructure including laboratories, cattle yard, Black Bengal goat farm, library, computer facilities, academic units, hostels, guest house, and extension systems, supporting integrated research, education, and outreach in the region.

A view of the main building of Eastern Regional Station, Kalyani

A view of the fodder field of Eastern Regional Station, Kalyani

Forage Farm of ERS-NDRI, Kalyani

The forage farm functions as an independent operational and training unit, spread over 18–20 hectares, and is responsible for the cultivation, harvesting, and supply of quality fodder to the institute's livestock units. In addition to fodder production, it includes a mini workshop for maintenance of agricultural machinery such as tractors and chaff cutters, and a vermicomposting unit used for training and demonstration purposes. The unit also supports agroforestry development, with plantations of species such as teak, sheesham, mango, and coconut, contributing to sustainability and resource diversification. It serves both as a production unit and a practical training facility, covering theoretical and hands-on aspects of fodder crop production and management.

Annual Performance Of ERS, ICAR-NDRI, Kalyani Herd (Jan-Dec'25)

Production & Reproductive Performance of Cattle at ERS- NDRI Herd during 2025

Particulars	Jersey Cross (2025)
Herd Strength as on 31-12-2025	219
Total milk production (kg)	13262.50
Av. no. of cow's in milk/day	77
Av. no. of cow's in dry/day	30
Wet Average (kg)/day	5.78
Herd Average (kg)/day	4.15
Age at First Calving (month)	35.2
No. of Inseminated	174
No. of Pregnant	66
Conception Rate (%)	37.9
Service period (days)	126
Inter calving period (days)	450
Mortality (%)	12.8

Milk Production Performance at ERS-NDRI, Kalyani Herd (Jan-Dec'25)

Months	Milk Production (kg)	Wet Average (kg)	Herd Average (kg)	Average FAT %	Average SNF %
January	14218.0	6.00	4.50	5.14	8.90
February	13930.5	6.13	5.00	4.97	8.88
March	15453.0	6.16	4.53	4.77	8.88
April	13783.0	6.00	4.10	5.02	8.77
May	14433.0	6.22	4.02	4.91	8.74
June	13755.5	6.34	4.00	4.57	8.77
July	12710.5	6.00	3.46	4.62	8.68
August	13045.5	6.00	4.12	4.70	8.68
September	12935.5	6.00	4.40	4.64	8.61
October	13183.0	5.23	4.34	4.92	8.63
November	11287.0	5.00	4.00	4.86	8.70
December	10415.5	4.22	3.36	5.25	8.86
Total Milk	**159150.0**				
Overall Average	**13262.500**	**5.78**	**4.15**	**4.86**	**8.76**

Fodder production and supply to the Institute Farm, ICAR-NDRI-ERS, Kalyani, during 2025 (Jan-Dec.)

S. No.	Particulars of fodders	Quantity (Qtl.)
1.	Oats / Oats+Mustard	2108.05
2.	Berseem / Berseem+Mustard	1850.00
3.	Bajra / Bajra+Cowpea	1472.70
4.	SSG / SSG+ Cowpea	7121.65
5.	Maize	783.10
6.	Cowpea	123.80
7.	Guinea/Paddy green/ Napier	3820.20
	Total	**17279.50**

Library

The library serves as a key knowledge resource centre with a collection of 1818 books and 4078 bound volumes of journals and other periodicals related to dairy science. In addition, annual reports of various institutes, conference proceedings, and other technical publications are available for reference, supporting academic and research activities.

Computer Cell

The computer cell facilitates database management and research data analysis and provides high-speed internet connectivity through the National Knowledge Network (NKN). This facility is widely used by postgraduate students and research scholars for academic and research purposes, as well as by staff for administrative work. Internet connectivity has been extended to hostels, guest house, and various operational units including the cattle yard, forage section, and estate section.

Academic Cell

The academic cell manages postgraduate teaching and research programmes across disciplines such as Animal Nutrition, Livestock Production and Management, Animal Physiology, Animal Reproduction, Animal Biotechnology, Animal Genetics and Breeding, and Dairy Extension. During 2025, 09 Master's students and 03 Ph.D. scholars completed their degrees, while eleven Master's and seventeen Ph.D. students are currently pursuing their research. In addition to academic work, students actively participate in sports and literary activities for overall development.

Resource Generation (Jan-Dec'25)

S.No	Heads	Amount (₹)
1	Sale of milk	69,97,857.00
2	Guest house rent	27,250.00
3	Sale of goats	68,395.00
4	Sale of cows	4,01,000.00
5	Sale of semen straw	540.00
6	Training	87,100.00
7	Miscellaneous	1,41,205.00
8	KVK-II(Add.) Farm produce	46,462.00
9	KVK-II(Add.) Training	1,38,768.00
10	KVK-II(Add.) Hostel rent	200.00
	TOTAL	**79,08,777.00**

Establishing goat housing at Tribal Village

Interaction programme at tribal villages

Dr. Dheer Singh, Director, ICAR-NDRI addressing to tribal

A view of the Quinquennial Review Team (QRT) visiting the field

Glimpse of activities indicating involvement of Director, ICAR-NDRI in implementation of various activities at ERS of ICAR-NDRI , Kalyani

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BUDGET AND EXPENDITURE

The financial outlay in terms of actual expenditure for grants for the year 2025–26 was ₹ **29164.16** lakhs and the sanctioned budget for Grants in 2025-26 was ₹ **29164.16** lakhs. These figures include the financial outlays for regional stations also.

Financial Outlays & Expenditure during 2025-26 (₹ in lakhs)

Particulars	RE/ Budget (2025-26)	Expenditure (2025-26)
National Dairy Research Institute, Karnal, including ERS, Kalyani and SRS, Bengaluru		
Grant-in-Aid Capital	202.43	202.30
Grant-in-Aid General	4744.48	4744.40
Non Scheme:- GIA-General	0.00	0.00
Total (Capital + General)	4946.91	4946.70
Grant-in-Aid Salary	9552.46	9552.46
Grant-in-Aid Pension	14665.00	14665.00
Total (Salary + Pension)	**24217.46**	**24217.46**
Grand Total	**29164.37**	**29164.16**

Resource Generation

Sl. No.	Head of Account	Amount in lakhs
1.	Sale of farm produce	445.96
2.	Sale of livestock	106.96
3.	License Fee	60.24
4.	Interest earned on loans and advances	7.54
5.	Leave salary and pension contribution	71.99
6.	Analytical and Testing Fee	10.43
7.	Application fee from candidates	350.13
8.	Interest earned on short term deposits	96.74
9.	Income generated through internal resource generation	44.13
10.	Recoveries of loans and advances	24.54
11.	Miscellaneous Receipts	135.79
12.	Training	37.55
	Grand Total	**1392.00**

Position of Manpower at NDRI, Karnal and its Regional Stations with KVKs as on December 31, 2025

Type of Posts	Sanctioned/ Approved Posts	In-Position Posts	Vacant Posts
Director	1	1	0
Joint Director	2	2	0
Scientific	192	134	58
Technical	204	143	61
Administrative (Group A & B)	48	37	11
Administrative (Group B, Non-Gazetted & Group C)	95	62	33
Multi-Tasking Staff	374	179	195
Total	**916**	**558**	**358**

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राजभाषा गतिविधियां-2025

भारत सरकार की राजभाषा नीति के अनुपालन में राजभाषा हिंदी के प्रचार, प्रसार एवं कार्यान्वयन हेतु संस्थान में वर्ष 1979 में राजभाषा एकक की स्थापना की गई। राजभाषा एकक द्वारा संस्थान के अधिकारियों, वैज्ञानिकों, मंत्रालयिक स्टाफ, तकनीकी स्टाफ आदि को राजभाषा हिंदी में कार्य करने के लिए प्रोत्साहित करते हुए हर संभव प्रयास/सहयोग प्रदान किया जा रहा है। संस्थान के द्वारा वर्ष 2025 में निम्नलिखित गतिविधियों का आयोजन किया गया।

संस्थान राजभाषा कार्यान्वयन समिति की बैठकें

1. डा. धीर सिंह, निदेशक, भाकृअनुप-राष्ट्रीय डेरी अनुसंधान संस्थान, करनाल की अध्यक्षता में संस्थान राजभाषा कार्यान्वयन समिति की 01 जनवरी से 31 मार्च, 2025 तक 106वीं तिमाही समीक्षा बैठक दिनांक 28.03.2025 को आयोजित की गई। बैठक में संस्थान के 23 पदाधिकारी शामिल हुए और उन्होंने उन सभी बिन्दुओं पर चर्चा की जहां हिन्दी के कार्य में गति लाने की आवश्यकता थी।
2. संस्थान राजभाषा कार्यान्वयन समिति की 01 अप्रैल से 30 जून, 2025 तक 107वीं तिमाही समीक्षा बैठक डा. धीर सिंह, निदेशक, भाकृअनुप-राष्ट्रीय डेरी अनुसंधान संस्थान, करनाल की अध्यक्षता में दिनांक 30.06.2025 को आयोजित की गयी। बैठक में संस्थान के 15 प्रभागों एवं अनुभागों के अध्यक्ष शामिल हुए। बैठक में राजभाषा हिन्दी के कार्य में गति लाने वाली अनेक बिंदुओं पर चर्चा की गई।
3. डा. धीर सिंह, निदेशक, भाकृअनुप-राष्ट्रीय डेरी अनुसंधान संस्थान, करनाल की अध्यक्षता में संस्थान राजभाषा कार्यान्वयन समिति की 01 जुलाई से 30 सितंबर, 2025 तक की 108वीं तिमाही समीक्षा बैठक दिनांक 05.08.2025 को आयोजित की गयी। बैठक में संस्थान के अनेक प्रभागों एवं अनुभागों से 36 पदाधिकारी शामिल हुए एवं उन्होंने बैठक में राजभाषा हिन्दी से संबंधित सभी महत्वपूर्ण बिंदुओं पर चर्चा की जिससे हिन्दी का कार्य आगे बढ़ सके।
4. डा. धीर सिंह, निदेशक, भाकृअनुप-राष्ट्रीय डेरी अनुसंधान संस्थान, करनाल की अध्यक्षता में संस्थान राजभाषा कार्यान्वयन समिति की 01 अक्तूबर से 31 दिसंबर, 2025 तक की 109वीं तिमाही समीक्षा बैठक दिनांक 19.12.2025 को आयोजित की गयी। बैठक में संस्थान के 31 पदाधिकारी शामिल हुए। बैठक के दौरान समिति ने उन सभी बिन्दुओं पर चर्चा की जहां हिन्दी के कार्य में गति लाने की आवश्यकता थी।

हिन्दी कार्यशालाएं, संगोष्ठियां एवं प्रशिक्षण

1. भाकृअनुप-केन्द्रीय आलू अनुसंधान संस्थान, शिमला द्वारा दिनांक 11.03.2025 को झूम मीटिंग द्वारा (''राजभाषा कार्यान्वयन एवं संसदीय राजभाषा प्रश्नावली'') विषय पर कार्यशाला का आयोजन संस्थान के श्री धीरज शर्मा, संयुक्त निदेशक(राजभाषा) द्वारा व्याख्यान दिया गया जिसमें राष्ट्रीय डेरी अनुसंधान संस्थान, करनाल एवं केन्द्रीय आलू अनुसंधान संस्थान, शिमला के अधिकारी शामिल हुए।
2. संस्थान में दो दिवसीय कार्यशाला दिनांक 26.06.2025 एवं 27.06.2025 का (कंप्यूटर हिन्दी डेस्क प्रशिक्षण व्यावहारिक) को आयोजन किया गया। जिसमें संस्थान के 18 अधिकारी एवं 22 कर्मचारी शामिल हुए।
3. दिनांक 22.07.2025 को (हिन्दी कार्यान्वयन, छमाही रिपोर्ट एवं तिमाही रिपोर्ट कैसे भरें" कार्यशाला) हिन्दी कार्यशाला का आयोजन किया गया जिसमें संस्थान के 41 वैज्ञानिक, अधिकारी एवं कर्मचारी एवं नराकास करनाल के सदस्य कार्यालयों से 47 अधिकारी एवं कर्मचारी शामिल हुए।
4. हरियाणा पुलिस एवं एनडीआरआई, करनाल के संयुक्त तत्वावधान में जनजातीय गौरव वर्ष, प्रकृति महोत्सव एवं डेरी फार्मिंग 2025 का आयोजन 18-24 अगस्त, 2025 को किया गया। इस अवसर पर नराकास, करनाल के द्वारा नगर के सदस्य कार्यालयों के अधिकारियों एवं कर्मचारियों

हेतु नगर स्तरीय हिन्दी कविता-पाठ/गीत-गायन/कवि सम्मेलन का आयोजन दिनांक 22.08.2025 को किया गया।

5. संस्थान के पिनाकी हॉल में दिनांक 19.11.2025 को "राजभाषा हिंदी एवं उसका कार्यान्वयन, शब्द रचना एवं शब्दावली" विषय पर तिमाही हिन्दी कार्यशाला का आयोजन किया गया जिसमें संस्थान के 90 वैज्ञानिक, अधिकारी एवं कर्मचारी सम्मिलित हुए।

कार्यशाला की झलक दिनांक 22.07.2025

हिंदी दिवस समारोह एवं हिंदी पखवाड़ा-2025 एवं वार्षिक पुरस्कार वितरण समारोह

भाकृअनुप-राष्ट्रीय डेरी अनुसंधान संस्थान, करनाल ने दिनांक 22.09.2025 से 18.11.2025 तक की अवधि में हिंदी पखवाड़ा-2025 का आयोजन किया गया। इस महोत्सव के दौरान वैज्ञानिकों, कर्मचारियों तथा विद्यार्थियों के लिए हिंदी शोध पत्र/पोस्टर प्रदर्शन प्रतियोगिता (23.09.2025), हिंदी टंकण प्रतियोगिता (25.09.2025), हिंदी निबंध प्रतियोगिता (26.09.2025), राजभाषा हिंदी ज्ञान प्रतियोगिता (29.09.2025), का आयोजन किया गया।

हिंदी शोध पत्र/पोस्टर प्रदर्शन प्रतियोगिता की झलक दिनांक 23.09.2025

नराकास गतिविधियों की जानकारी

नगर राजभाषा कार्यान्वयन समिति, करनाल के तत्वावधान में नगर स्तरीय प्रतियोगिताओं का आयोजन किया गया। इसके अन्तर्गत दिनांक 04.09.2025 को हिन्दी श्रुतलेख प्रतियोगिता, दिनांक 08.09.2025 को हिन्दी शब्दार्थ प्रतियोगिता, दिनांक 10.09.2025 को कहानी लेखन प्रतियोगिता एवं दिनांक 12.09.2025 को राजभाषा हिन्दी ज्ञान प्रतियोगिताओं में नराकास, करनाल के सदस्य कार्यालयों के अधिकारियों/कर्मचारियों ने बढ़-चढ़कर हिस्सा लिया।

हिंदी शब्दार्थ प्रतियोगिता के दौरान प्रतिभागियों की झलक दिनांक 08.09.2025

राजभाषा हिंदी ज्ञान प्रतियोगिता के दौरान प्रतिभागियों की झलक दिनांक 12.09.2025

वर्ष 2025 के दौरान संस्थान की राजभाषा संबंधी प्रमुख गतिविधियां

- संस्थान की हिन्दी की चारों तिमाही बैठकें प्रत्येक तिमाही में एक-एक कर आयोजित की गयीं।
- नगर राजभाषा कार्यान्वयन समिति की 30 जून, 2025 बैठक में नराकास, करनाल के सभी सदस्यों कार्यालयों द्वारा राजभाषा कार्यान्वयन के क्षेत्र में वर्ष 2024-25 में सराहनीय कार्य हेतु प्रदत्त, पत्रिका प्रकाशन हेतु शोध संस्थान श्रेणी, बैंक श्रेणी, केन्द्रीय कार्यालय श्रेणी, निगम श्रेणी को प्रथम, द्वितीय एवं तृतीय पुरस्कार से सम्मनित किया गया।
- नराकास, करनाल का सचिवालय होने के कारण नगर राजभाषा कार्यान्वयन समिति की 30 जून, 2025 तथा 28 नवंबर, 2025 में छमाही समीक्षा बैठक आयोजित की गयी।
- संस्थान में वर्ष के दौरान चार हिन्दी कार्यशालाओं का आयोजन किया गया।
- वर्ष 2024-25 के दौरान "सरकारी कामकाज में मूल हिन्दी टिप्पण/आलेखन योजना" के अन्तर्गत संस्थान के 09 विजेताओं को नकद पुरस्कार व प्रमाणपत्रों से सम्मानित किया गया।
- संस्थान की "वैज्ञानिक तथा तकनीकी लेखन प्रोत्साहन योजना" का नियमित रूप से प्रत्येक वर्ष आयोजन कर विजेताओं को नकद पुरस्कार एवं प्रमाण पत्रों से सम्मानित किया जाता है।
- संस्थान में वैज्ञानिकों व विद्यार्थियों के द्वारा हिन्दी में शोधपत्र व पोस्टर बनाने के लिए उन्हें प्रोत्साहित करने के लिए प्रत्येक वर्ष हिन्दी पखवाड़ा/माह के दौरान "हिन्दी शोधपत्र व पोस्टर प्रदर्शन "प्रतियोगिता का आयोजन कर सभी प्रतिभागियों को प्रतिभागिता प्रमाणपत्र व विजेताओं को नकद पुरस्कार एवं प्रशस्ति प्रमाणपत्र से सम्मानित किया जाता है।
- संस्थान के डेरी कैलेण्डर को विगत वर्षों की भाँति कृषकों व पशुपालकों के हित को ध्यान में रखकर उनसे संबंधित उपयोगी जानकारी को संक्षिप्त रूप में केवल हिन्दी में तैयार कर प्रकाशित किया जा रहा है।
- निदेशक महोदय के हस्ताक्षर से संस्थान के सभी प्रभागों एवं अनुभागों में जांच बिन्दु बनाए गए।
- संस्थान के सभी वैज्ञानिकों, अधिकारियों एवं कर्मचारियों के नाम से निदेशक के हस्ताक्षर उपरांत व्यक्तिशः आदेश जारी किए गए।
- संस्थान के 100 से अधिक शोधकर्ता विद्यार्थियों के थीसिस एब्सट्रेक्ट का हिन्दी में अनुवाद किया गया।
- संस्थान के लगभग 60 विद्यार्थियों को सप्ताह में तीन दिन हिन्दी की कक्षा के माध्यम से हिन्दी संबंधी बुनियादी जानकारी प्रदान की गयी।
- राजभाषा अधिनियम 1963 की धारा 3(3) के अंतर्गत आने वाले 400 से अधिक दस्तावेजों को राजभाषा एकक द्वारा द्विभाषी किया गया।
- हिन्दी में प्राप्त सभी पत्रों के उत्तर हिन्दी में दिए गए।
- एनडीआरआई नराकास, करनाल का सचिवालय होने के कारण करनाल शहर के भारत सरकार के 47 कार्यालयों को समय-समय पर सुझाव दिए गए। जब कभी भी भारत सरकार के कार्यालयों में कार्यशाला या प्रशिक्षण कार्यक्रम आयोजित किए गए। उन्हें अवसरों पर व्याख्यान एवं मार्गदर्शन के माध्यम से प्रेरित किया।

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SWACHH BHARAT ABHIYAN: CLEAN & GREEN NDRI

Celebration of Swachhata Pakhwada

Under the Swachh Bharat Mission, "Swachhta Pakhwada-2025" (Cleanliness Fortnight) programme was organized at ICAR-NDRI, Karnal from December 16 to 31, 2025. The campaign was inaugurated on December 16, 2025, by Dr. Dheer Singh, Director, ICAR–NDRI, who administered the cleanliness pledge to all employees. The objective of the cleanliness campaign is to increase awareness about cleanliness in society and promote it at the local level through public participation. Continuing this effort, extensive cleaning was carried out daily in the institute's office premises during the Swachhta Pakhwada. Dr. Dheer Singh, along with all employees and students of the Institute, participated in the cleaning drive. He said that cleanliness is a good habit, and everyone should cultivate this habit for a clean environment and an ideal lifestyle. He added that "a healthy mind develops in a healthy body," and keeping this in mind, our Prime Minister launched the cleanliness campaign, recognizing the great need for cleanliness in the country. We should all participate wholeheartedly in this campaign for our healthy lives. Everyone should contribute towards maintaining cleanliness in homes, workplaces, public spaces and the environment. society, community, city, parks, and the environment clean every day. He urged everyone to actively participate in this cleanliness campaign and increase awareness about cleanliness in society. The nodal officer of the cleanliness campaign, Dr. B.S. Meena, said that the objective of this campaign is not limited to just cleaning, but it also paves the way for a healthy and developed society. Therefore, we all need to keep our nature, thoughts, and values pure so that our society and country can be clean, prosperous, and well-developed.

Celebration of Swachhata Pakhwada at ICAR-NDRI, Karnal

Celebration of *Swachhotsav* at ICAR–NDRI, Karnal (September 17–October 02, 2025)

Dr. B.S. Meena, the nodal officer of the cleanliness campaign, presented a brief report on the programs conducted at NDRI under the Swachhta Hi Seva (Cleanliness is Service) fortnight and stated that such programs will continue in the future. He emphasized that along with cleaning the office, we must also keep our personal nature, thoughts, and values pure so that we can realize Mahatma Gandhi's dream of a clean and ideal society.

Farmers' Training Programme on promotion of Swachh Bharat Abhiyan

Organized a three-day farmer training programme on Entrepreneurship in Vermicomposting: Transforming Waste to Wealth Under Swachhta Action Plan from February 17–19, 2025 at KVK, NDRI, Karnal.

Organized three days farmer training on Vermicomposting for Soil Health and Profitable Agriculture Under Swachhta Action Plan from September 24-26, 2025 at KVK, NDRI, Karnal

Celebration of Swachhotsav at Southern Regional Station, Bengaluru

The Swachh Bharat Abhiyan – Swachhotsav 2025 with a theme "Celebrating a Clean- Green-Healthy Future for All," was initiated on 17th September at SRS-NDRI, with online pledge-taking administered by Hon'ble Director General, ICAR. The focus Programme of Swachhata Pledge Taking was organised as per the directives of Headquarters, at Southern Regional Station of ICAR-NDRI, Bengaluru, in the august presence of Honourable Director & Vice-Chancellor, ICAR-NDRI, Dr. Dheer Singh and Dr. Arindam Dhali, Head, SRS-NDRI. The online Swachhata Pledge Taking Programme organised at Council level on 17th Sep. 2025 at 1.30 pm, was well-attended by all the staff members that included, Scientists, Technical, Multi-Tasking and contractual Staff Members. "Swachhata Prathigya - Cleanliness Pledge" which indicated the responsibilities and commitment of every citizen of India for their dedicated contribution and continuous efforts for the Cleanliness Drive and Development of their Homes, workplaces, Villages, Cities and the Nation.

- As per the date-wise schedule, the plan of activity of Transformation of Cleanliness Target Units (CTUs), was organised at the Livestock Research Centre of SRS-NDRI.
- Cleanliness drive activity was initiated at the rear portion of the hostel premises that covered, clearance of weeds, removal of dried & dead / fallen tree branches, stones and plastic wastes. The cleanliness drive had active participation of students and hostel staff for a clean-green hostel premises.
- On 22nd September 2025, a Human Chain was organised in front of the Institute, with active participation of scientific, technical, administrative and multi-tasking staff and UG & PG students. The event focused on sensitisation of the theme of Swachhotsav among the general public, with display of informative posters on importance of cleanliness at home, workplace, public utility places.
- As part of the Swachhta Hi Seva Campaign 2025, the "Ek Din – Ek Ghanta – Ek Saath" Nationwide Shramdan Cleanliness Drive was successfully organized at the Livestock Research Centre (LRC) during September 2025. Key activities undertaken included collection and proper disposal of scattered debris, dried leaves, and non-biodegradable waste, clearing of overgrown weeds and unwanted vegetation to improve sanitation and visibility.
- As part of the Swachhotsav programme, the best of all in the competitions conducted during the SHS schedule of activities, the participant winners were awarded prizes for the best posters on sensitisation of Swachh Bharat Abhiyan, best cleanliness and beautification work for the staff and students. As the focus agenda of the concluding session, recognition of Safai Mitras for their contributions to sanitation and hygiene, all the housekeeping staff were appreciated with gratitude, for their sincere and dedicated maintenance work throughout the year, for a clean - green campus and work place.
- Organized Kisan Diwas and On-Campus Sensitization Programme on Scientific Dairying and Swachhata Initiatives for the benefit of dairy farmers at SRS-NDRI on 23rd December 2025, as per the action plan programme, well-attended by 25 farmers and farm women from Bengaluru Rural District.

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PERSONNEL

INSTITUTE STAFF

As on December 31, 2025

Director's Office	
Dheer Singh, PhD	Director
Santra Devi, BA	Principal Private Secretary
Joint Director (Academics) Office	
A K Singh, PhD	Joint Director (Academic)
Seema Rani, BA, BEd	Private Secretary
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B D Phansal, MA	Joint Director (Admn) & Senior Registrar
Anjali Aggarwal, PhD	Principal Scientist & Academic Coordinator
Bhagwan Dass, BA	Assistant Administrative Officer
Joint Director (Research) Office	
Rajan Sharma, PhD	Joint Director (Research)
Ranjana, BA	Private Secretary
Research Prioritization, Monitoring and Evaluation Unit	
Rajan Sharma, PhD	Principal Scientist & Chairman
Braj Kishor, MA, BLib Sc	Chief Technical Officer
Veenu, BSc, MCA	Technical Officer
Consultancy Processing Cell	
Rajan Sharma, PhD	Principal Scientist & Chairman
P.N. Raju, PhD	Scientist & Officer-in-Charge
Information Technology Management Unit	
Pradip V Behare, PhD	Senior Scientist & Officer-in-Charge
National Referral Lab	
Rajan Sharma, PhD	Principal Scientist &CEO
Rajesh Kumar, PhD	Principal Scientist & Nodal Officer
Richa Singh, PhD	Senior Scientist & Deputy Quality Manager
Sonu KS, PhD	Scientist & Technical Manager
Saurabh Kadyan, PhD	Scientist & Technical Manager
Rakesh Kumar, PhD	Assistant Chief Technical Officer
Ishu Dhiman	Senior Technical Assistant
National Collection of Dairy Cultures	
Pradip V Behare, PhD	Senior Scientist & Officer-in-Charge
Yogita Sharma, MSc	Technical Officer

Administrative Wing	
B D Phansal, MA	Joint Director (Admn) & Senior Registrar
Dinesh Nagpal, AMIE (Civil Engineering)	Chief Administrative Officer
Gajanand Yadav, MSc	Senior Administrative Officer
Ravinder Hooda, BE (Mechanical)	Senior Administrative Officer
Karambir Malik, MA	Principal Private Secretary
Sukhdev Singh, BA	Administrative Officer
Bhagwan Das, BA	Assistant Administrative Officer
Ajit Singh, BA	Assistant Administrative Officer
Gurjeet Singh, B Pharma	Assistant Administrative Officer
Ram Dhari Singh, MA	Assistant Administrative Officer
Chiranjee Lal, MLib Sc	Assistant Administrative Officer
B L Meena, Senior Secondary	Assistant Administrative Officer
Subhash Kumar, BA	Assistant Administrative Officer
Santosh Kumari, BA	Assistant Administrative Officer
Sonika Yadav, MTech	Assistant Administrative Officer
Dharmendra Singh, BSc	Assistant Administrative Officer
Meera Rani, Senior Secondary	Assistant Administrative Officer
Prabhjit Singh, Pre-University	Assistant Administrative Officer
Pradeep Malik, BA	Assistant Administrative Officer
Finance Wing	
Jagdish Chander, Higher Secondary	Senior Finance & Account Officer
Deepak, BTech	Finance & Accounts Officer
Vishal Acharya, MA	Assistant Finance & Accounts Officer
Sunil, MBA	Assistant Finance & Accounts Officer
Avnish Kumar, B Com	Private Secretary
Animal Genetics & Breeding Division	
Vikas Vohra, PhD	Principal Scientist & Head
Sabyasachi Mukherjee, PhD	Principal Scientist
Anupama Mukherjee, PhD	Principal Scientist
T V Raja, PhD	Principal Scientist
Gopal Ramdas Gowane, PhD	Senior Scientist
Rani Alex, PhD	Senior Scientist
Satish Kumar Rathee, PhD	Scientist
Ravi Kant Saini, PhD	Chief Technical Officer
Sanjiv Kumar, MA Economics	Chief Technical Officer
Lakshman, B. Com	Technical Officer
Livestock Production & Management Division	
Pawan Singh, PhD	Principal Scientist & Head
A K Misra, PhD	Principal Scientist
M L Kamboj, PhD	Principal Scientist
Ramesh Chandra, PhD	Senior Scientist
Nishant Kumar, PhD	Senior Scientist
Rubina Kumari Baithalu, PhD	Scientist
Indu Devi, PhD	Scientist
Shiv Kumar, MSc	Chief Technical Officer
Ms. Santosh, BA & Stenography	Private Secretary

Animal Nutrition Division	
Raman Malik, PhD	Principal Scientist & Head
Ram Singh, PhD	Principal Scientist
Chander Datt, PhD	Principal Scientist
Nitin Tyagi, PhD	Principal Scientist
Goutam Mondal, PhD	Principal Scientist
Sachin Kumar, PhD	Scientist (SS)
Gyan Singh, MSc	Assistant Chief Technical Officer
Sumit Narayan, MSc	Assistant Chief Technical Officer
Anita Behl, BA	Private Secretary
Animal Physiology Division	
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Sohanvir Singh, PhD	Principal Scientist
Anjali Aggarwal, PhD	Principal Scientist
Karuna Bambode	Scientist
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Narender Kumar, BA	Technical Officer
Dheeraj Kumar, MSc	Technical Officer
Anita Behl, BA	Private Secretary
Animal Biotechnology	
S De, PhD	Principal Scientist & National Professor
J K Kaushik, PhD	Principal Scientist & Head
Anuradha Bhardwaj, PhD	Principal Scientist
Satish Kumar, PhD	Principal Scientist
Rakesh Kumar, PhD	Principal Scientist
M K Singh, PhD	Principal Scientist
D. Malakar, PhD	Principal Scientist
Sudarshan Kumar, PhD	Senior Scientist
Naresh Selokar, PhD	Senior Scientist
Bharati Pandey, PhD	Scientist
Animal Biochemistry	
Suneel Kumar Onteru, PhD	Principal Scientist & Head
Gautam Kaul, PhD	Principal Scientist
Dheer Singh, PhD	Principal Scientist
Rajeev Kapila, PhD	Principal Scientist
Suman Kapila, PhD	Principal Scientist
Varij Nayan, PhD	Principal Scientist
Rajani Kumar Paul, PhD	Senior Scientist
Sunita Meena, PhD	Senior Scientist
Sadeesh EM, PhD	Senior Scientist
Meenu Rani, MA, PGDCA	Private Secretary
Dairy Technology Division	
Deep Narayan Yadav, Ph.D	Principal Scientist & Head
Ashish Kumar Singh, Ph.D	Principal Scientist & JD (Acad.)
Kaushik Khamuri, Ph.D	Principal Scientist
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Yogesh Khetra, Ph.D	Senior Scientist
Shaik Abdul Hussain, Ph.D	Senior Scientist
Writdhama G. Prasad, Ph.D	Senior Scientist
Ajay Yadav, Ph.D	Scientist (Sr. Scale)
Sangita Ganguly, Ph.D	Scientist (Sr. Scale)
Heena Sharma, Ph.D	Scientist (Sr. Scale)
Gaurav Kr. Deshwal, Ph.D	Scientist
Elizabeth Thomas, Ph.D	Scientist
Harshita Sonarthi, Ph.D	Scientist
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Sumit Arora, PhD	Principal Scientist
Vivek Sharma, PhD	Principal Scientist
Rajan Sharma, PhD	Principal Scientist and JD(R)
Richa Singh, PhD	Senior Scientist
Shilpa Shree B.G., PhD	Senior Scientist
Kamal Gandhi, PhD	Scientist (SS)
Sonu KS, PhD	Scientist
Priyae Brath Gautam, PhD	Scientist
Lehri Singh, MSc	Chief Technical Officer
Balwant Singh, Matric	Senior Technician
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Pradip V Behare, PhD	Senior Scientist
Raghu HV, PhD	Senior Scientist
Diwas Pradhan, PhD	Senior Scientist
Saurabh Kadyan, PhD	Scientist
Manorama Kumari, PhD	Scientist
Soniya Ranveer, PhD	Senior Technical Officer
Yogita Sharma, MSc	Technical Officer
Meenu Rani, MA, PGDCA	Private Secretary
Dairy Engineering Division	
P Barnwal, PhD	Principal Scientist & Head
Chitranayak, PhD	Principal Scientist
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Khushbu Kumari, PhD	Scientist (Senior Scale)
Priyanka, PhD	Scientist
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Ravi Kumar, PhD	Senior Technical Officer
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Ajmer Singh, PhD	Principal Scientist
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Gunjan Bhandari, PhD	Scientist
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B S Meena, PhD	Principal Scientist
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Sanchita Garai, PhD	Senior Scientist
Raj Kumar, PhD	Senior Scientist
Maina Kumari, PhD	Scientist
Printing Press	
Sanjit Maiti, PhD	Senior Scientist & Printing Press In-charge
Sammi Kumar, Matriculation	Technician (T-1)
Forage Research and Management Centre	
Anurag Saxena, PhD	Principal Scientist
Magan Singh, PhD	Senior Scientist
Hardev Ram, PhD	Senior Scientist
Sanjeev Kumar, PhD	Senior Scientist
Rajesh Kumar Meena, PhD	Senior Scientist
Anil Kumar Dagar, MSc	Chief Technical Officer
Jitendra Rana, MSc	Chief Technical Officer
Kamal Garg, PhD	Senior Technical Officer
Muneesh Leharwan, MSc	Senior Technical Assistant
Agricultural Technology Information Centre	
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Krishi Vigyan Kendra/ TTC	
Pankaj Kumar Saraswat, PhD	Principal Scientist and Head
Kulvir Singh, MSc	Chief Technical Officer
Uttam Kumar, MSc	Chief Technical Officer
Ashwani Kumar, MSc	Assistant Chief Technical Officer
Deepa Kumari, MA	Assistant Chief Technical Officer
Pradeep A, Mfsc	Senior Technical Officer
Sonia, PhD	Senior Technical Officer
Chinamyee Sahu	Senior Technical Officer
Veena Sethi, BA	Assistant Administrative Officer
Livestock Research Centre	
Nitin Tyagi, PhD	Principal Scientist & Officer-in-Charge LRC
T.V.Raja, PhD	Principal Scientist &Co-incharge LRC
Rubina Kumari Baithalu, PhD	Senior Scientist
S Raju, MVSc	Chief Technical Officer
Praveen Kumar, MVSc	Chief Technical Officer

Vijendra Kumar Meena, PhD	Chief Technical Officer
Pramod Kumar, MSc	Chief Technical Officer
Amar Pal Singh, PhD	Assistant Chief Technical Officer
Hari Kishan Meena, Senior Secondary	Technical Officer
Sandeep Khokhar, MSc	Technical Officer
Puneet Pal Singh, MVSc	Technical Officer
Artificial Breeding Research Centre	
Nishant Kumar, PhD	Senior Scientist & Officer-in-Charge
Subhash Chand, BVSc & AH	Chief Technical Officer
Kaushal Kumar, BVSc & AH	Technical Officer
Ghan Shyam Meena, BSc (Ag)	Technical Officer
Vikas, PhD	Technical Officer
National Library in Dairying	
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B P Singh, MA, MLib, ISc, PGDCA	Chief Technical Officer
Narendra Singh, MSc	Senior Technical Officer
Computer Centre	
Udita Chaudhary, PhD	Senior Scientist & Officer-in-Charge
Vivek Kumar, MSc	Senior Technical Officer
Des Raj, Senior Secondary	Technical Officer
Atul Gupta, MTech	Technical Officer
Communication Centre	
B S Meena, PhD	Principal Scientist & Communication In-charge
Atul Gupta, MTech	Senior Technical Officer
Paramjeet, Diploma (Elect & Telecom)	Senior Technical Officer
Official Language Unit	
Dhiraj Sharma, MA (English), PGJMC	Joint Director (OL)
Agri-Business Incubator	
S A Hussain, PhD	Scientist (SS) & Officer-in-Charge
SINED- Technology Business Incubator	
Kaushik Khamrui, PhD	Principal Scientist & Officer-in-Charge
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Estate Section	
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Human Health Complex	
Arun Kumar Misra, PhD	Principal Scientist & Officer-in-Charge
Dr. Suneel Kumar Onteru, PhD	Incharge (H.H.C)
Richa Walia, Nurses Course	Senior Technical Officer
Saroj Kathuria, Sr Sec & Nurses Course	Senior Technical Officer
Saroj Bala, BA, Pharmacy Diploma	Technical Officer
Anuradha, General Nursing Diploma	Technical Officer
Deepak, Matriculation	Technical Officer
Hospitality Cell	
Navdeep Singh, M Tech	Technical Officer & Officer-in-Charge
Sudesh Kumar, Matric	Technical Officer

Pawan Kumar, ITI	Technical Officer
Umed Singh	Technical Officer
Atam Parkash	Technical Officer
Mohan Lal, Dip. Mechanical Eng.	Technical Officer
Parveen Kumar, Sr. Secondary	Technical Officer
Vehicle Maintenance Section	
Sanjeev Kumar, MSc	Assistant Chief Technical Officer
Sports Cell	
Pradip Vishnu Behre, PhD	Senior Scientist & Officer-in-Charge
Sandeep Deswal, MPhil	Chief Technical Officer
Maintenance Engineer	
J K Dabas, PhD	Chief Technical Officer & Officer-in-Charge
Sanjeev Kumar, MTech (CS)	Assistant Chief Technical Officer
Mohan Lal Sharma, MTech (Electrical)	Senior Technical Officer
Balbir Singh, ITI Diploma (Electrical)	Technical Officer
Gurpartap Singh, MTech	Assistant Chief Technical Officer
Ravinder Singh, BTech, Diploma (Civil)	Technical Officer
Pradeep Malik, BA	Assistant Administration Officer
Hostel Office	
Nitin Tyagi, PhD	Principal Scientist & Chief Hostel Warden
Hardev Ram, PhD	Senior Scientist & Warden, Sutlej Hostel
Sanchita Garai, PhD	Senior Scientist & Warden, Kaveri Hostel
Bharati Pandey, PhD	Scientist & Warden, Kaveri Hostel
M K Singh, PhD	Senior Scientist & Warden, Krishna Hostel
Yogesh Khetra, PhD	Senior Scientist & Warden, Brahmaputra Hostel
Sachin Kumar, PhD	Senior Scientist & Warden, Brahmaputra Hostel
Rani Alex, PhD	Senior Scientist & Warden, Alaknanda Hostel
Indu Devi, PhD	Senior Scientist & Warden, Brahmaputra Hostel
Sanjit Maiti, PhD	Senior Scientist & Warden, Married Hostel
Sanjeev Kumar, PhD	ACTO & Assistant Hostel Warden
Ravi Rawat, MSc	ACTO & Assistant Hostel Warden
Deepa Kumari, MA	ACTO & Assistant Hostel Warden
Hardev Singh, BSc	Technical Officer
Experimental Dairy	
Deep Narryan Yadav, PhD	Principal Scientist & Officer-in-Charge
Ajeet Rundla, MTech	Senior Technical Officer
Diksha Bhardwaj, MTech	Senior Technical Officer
Himanshu Nitant, BTech (Mechanical)	Senior Technical Assistant
Manoj Kumar, Diploma (Electrical)	Senior Technical Assistant
Vijay Kumar, BE (Mechanical)	Senior Technical Assistant
SRS, Bengaluru	
Arindam Dhali, PhD	Principal Scientist & Head
B Srinivas, PhD	Principal Scientist
M C Arunmozhi Devi, PhD	Principal Scientist
D N Das, PhD	Principal Scientist

P Heartwin Amaladhas, PhD	Principal Scientist
S Jeyakumar, PhD	Principal Scientist
M A Kataktalware, PhD	Principal Scientist
Menon Rekha Ravindra, PhD	Principal Scientist
M Sivaram, PhD	Principal Scientist
A Kumaresan, PhD	Principal Scientist
FME Emerald, PhD	Principal Scientist
Thirumala Rao Talluri, PhD	Principal Scientist
Mamta Chauhan, PhD	Senior Scientist
S Subash, PhD	Senior Scientist
A Manimaran, PhD	Senior Scientist
Devaraja, HC, PhD	Senior Scientist
Sathish Kumar, MH,PhD	Senior Scientist
Rashmi H M, PhD	Senior Scientist
Monika Sharma, PhD	Senior Scientist
Laxmana Naik N, PhD	Senior Scientist
Priyanka Singh Rao, PhD	Senior Scientist
Vedamurthy, GV, PhD	Senior Scientist
Manoj Kumar CT, PhD	Scientist
Shivaswamy GP, PhD	Scientist
Amita Dinakar Vairat, PhD	Scientist
Basavaprabhu, HN, PhD	Scientist
Sadvatha, R.H, PhD	Scientist
P Muruganantham, BSc, MLib	Chief Technical Officer
Siddaramanna, PhD	Chief Technical Officer
Janakshi, MSc, MCA	Assistant Chief Technical Officer
R Muthuraju, MCA	Assistant Chief Technical Officer
K Rama Krishna Prasad, MSc	Senior Technical Officer
Ahmed Hussain, PhD	Senior Technical Officer
Leena Mishra, PhD	Senior Technical Assistant
Khurshid Ahmed Jangubai,BE	Senior Technical Assistant
Asif Miyan, MSc	Senior Technical Assistant
Jayalingamma	Senior Technician
ERS, Kalyani	
Santanu Banik, Ph.D	Principal Scientist (AGB) & Head
Annu Mann	AAO
T. K. Dutta	Principal Scientist
S. K. Das	Principal Scientist
A. Santra, Ph.D.	Principal Scientist
C. Bhakat, Ph.D.	Principal Scientist (LPM)
A. Mandal, Ph.D.	Principal Scientist (AGB)
D. K. Mandal, Ph.D.	Principal Scientist (LPM)
A. Chatterjee, Ph.D.	Principal Scientist (AN)
M. Karunakaran, Ph.D.	Principal Scientist (ARGO)
M. Mondal, Ph.D.	Senior Scientist (AP)
A. Mohammad, Ph.D.	Senior Scientist (Ag. Extn.)

Sanjay Kumar Ray, Ph.D	Senior Scientist (Soil Sci. & Ag. Chem.) & KVK
Saroj Rai, Ph.D.	Senior Scientist (LPM)
Somenath Dutta	Chief Technical Officer
P.P. Chaudhury, M.Sc.(Zoology)	Astt.Chief Technical Officer
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Chinmoyeev Sahu, Ph. D (LPM)	SMS in KVK (Additional)
GuthaVenkata Ramesh, Ph.D.(P.Pat)	SMS in KVK (Additional)
Veesam Hari Priya, M.Sc (Ag.Ext.)	SMS in KVK (Additional)

Joining/ Appointment

- Dr. Ashish Kumar Samanta, Head, Animal Nutrition Division, ICAR-NDRI, Karnal selected to the post of ADG (Animal Nutrition & Physiology), ICAR, HQs, New Delhi vide Council's OM dated 04.04.2025 and relieved from ICAR-NDRI, Karnal w.e.f. 08.04.2025.
- Dr. Anil Kumar Puniya, Principal Scientist, Dairy Microbiology Division, ICAR-NDRI, Karnal appointed to the post of Director, ICAR-NRC on Camel, Bikaner vide Council's OM dated 04.04.2025 and relieved from ICAR-NDRI, Karnal w.e.f. 05.04.2025.
- Dr. Anil Kumar Dixit, Principal Scientist, Dairy Economics Statistics & Management Division, ICAR-NDRI, Karnal appointed to the post of ADG (Prog. Implementation and Monitoring), ICAR, HQs, New Delhi vide Council's OM dated 04.04.2025 and relieved from ICAR-NDRI, Karnal w.e.f. 05.04.2025.
- Dr. Richa Singh, Scientist appointed to the post of Sr. Scientist and joined her duties at ICAR-NDRI, Karnal w.e.f. 21.04.2025
- Dr. Shilpa Shree B.G., appointed to the post of Sr. Scientist and joined her duties at ICAR-NDRI, Karnal w.e.f. 07.05.2025.
- Dr. Rajesh Kumar, Principal Scientist appointed to the post of Head, Dairy Chemistry Division and joined his duties at ICAR-NDRI, Karnal w.e.f. 03.06.2025(AN).
- Mrs. Jyoti Priya, appointed to the post of Technician (L/T) at SRS , NDRI Bangalore w.e.f. 05.06.2025.
- Dr. Anuradha Bhardwaj, Principal Scientist joined at ICAR-NDRI, Karnal after relieving NRC-Equines, Hisar w.e.f. 13.06.2025.
- Mr. Tarsem Singh, appointed to the post of Technician (L/T) at ICAR-NDRI, Karnal w.e.f. 19.06.2025.
- Dr. (Mrs.) Ankita (Animal Nutrition) joined to the post of Scientist at ICAR-NDRI, Karnal as w.e.f. 07.07.2025 (FN).
- Dr. Elizabeth Thomas appointed as Scientist w.e.f. 07.07.2025 in the discipline of Dairy Technology vide Council's OM dated 19.05.2025 and joined her duties at ICAR-NDRI, Karnal w.e.f. 21.10.2025.
- Dr. Harshita Sonarthi appointed as Scientist w.e.f. 07.07.2025 in the discipline of Dairy Technology vide Council's OM dated 19.05.2025 and joined her duties at ICAR-NDRI, Karnal w.e.f. 27.10.2025.
- Dr. Karuna Prakash Bambode appointed as Scientist w.e.f. 07.07.2025 in the discipline of Animal Physiology vide Council's OM dated 19.05.2025 and joined her duties at ICAR-NDRI, Karnal w.e.f. 27.10.2025.
- Dr. Priyae Brath Gautam appointed as Scientist w.e.f. 07.07.2025 in the discipline of Agricultural Extension vide Council's OM dated 19.05.2025 and joined her duties at ICAR-NDRI, Karnal w.e.f. 27.10.2025.
- Dr. Maina Kumari appointed as Scientist w.e.f. 07.07.2025 in the discipline of Agricultural Extension vide Council's OM dated 19.05.2025 and joined her duties at ICAR-NDRI, Karnal w.e.f. 27.10.2025.
- Dr. Catherine Skyongzin Paul appointed as Scientist w.e.f. 07.07.2025 in the discipline of Dairy Microbiology vide Council's OM dated 19.05.2025 and joined her duties at ICAR-NDRI, Karnal w.e.f. 27.10.2025.
- Sh. Ram Avtar, CF&AO joined at ICAR-NDRI, Karnal w.e.f. 17.07.2025 after relieving ICAR-CPCRI, Kasargod, Kerala.
- Dr. Sadvatha M.H. Scientist has joined his duty in the forenoon of dated 13.08.2025 at ICAR-NDRI-SRS, Bangalore vide Council's F. No. 7-92/10/e-93299/Vol. 2-557 dated 28.08.2025.
- Dr. Thirumala Rao Talluri, Principal Scientist joined at ICAR-NDRI-SRS, Bangalore this station w.e.f. 05.01.2026
- Sri. Vinod Kumar,UDC joined as Assistant, w.e.f. 31.12.2025 at ICAR-NDRI-SRS, Bangalore.

Promotion

- Mr. Asif Miyan, Technical Assistant promoted to next higher grade of Senior Technical Assistant w.e.f. 04.02.2025.
- Mrs. Deepa Kumari, Senior Technical Officer promoted to next higher grade of Assistant Chief Technical Officer (FFT) w.e.f. 25.02.2025.
- Dr. Writdhama G. Prasad, Scientist promoted to the post of Sr. Scientist w.e.f. 01.01.2024.
- Dr. Sachin Kumar, Scientist promoted to the post of Sr. Scientist w.e.f. 01.01.2024.

- Dr. Monika Sharma, Sr. Scientist promoted to the next higher level 13-A w.e.f. 18.09.2023.
- Sh. Bhagwan Dass, Assistant Administrative Officer promoted to the post of Administrative Officer w.e.f. 28.04.2025.
- Smt. Veena Kumari, Smt. Meena Kumari and Smt. Simranjeet Kaur Lal, Assistants, NDRI, Karnal promoted to the post of Assistant Administrative Officer w.e.f. 23.05.2025 and joined her duties as Assistant Administrative Officer on 29.05.2025(FN).
- Mr. Baldev Singh, Skilled Supporting Staff, ICAR-NDRI Karnal promoted as Technician (FFT) w.e.f. 17.07.2025.
- Dr. Nishant Singh, Sr. Scientist promoted to the post of Principal Scientist w.e.f. 20.07.2023
- Dr. M.K. Singh, Sr. Scientist has promoted to the post of Principal Scientist w.e.f. 10.02.2024
- Sh. Ram Kumar, Multi asking Staff, NDRI, Karnal promoted to the post of Lower Divisional Clerk w.e.f. 25.11.2025
- Mr. Parveen Kumar, Sr. Technical Assistant promoted to next higher grade of Technical Officer w.e.f. 19.12.2025.
- Sh. Vinod Kumar, UDC, NDRI, Karnal promoted to the post of Assistant w.e.f. 31.12.2025 at SRS of NDRI, Bengaluru.

Transfer

- Dr. Hima John Scientist, transferred from ICAR-NDRI Karnal to join at ICAR-CPCRI, Kasaragod and relieved on 10.1.2025.
- Sh. Biswajit Sen, Scientist, Dairy Economics Statistics & Management Division, ICAR-NDRI, Karnal transferred from ICAR-NDRI, Karnal in the afternoon of 26.09.2025 to enable him to join his duty at new place of posting at ICAR-NDRI, Karnal vide Council's OO dated 16.09.2025.
- Dr. Chinmayee Sahu, SMS(T-6), transferred from KVK, ERS Kalyani w.e.f. 14.11.2025 and joined KVK, ICAR-NDRI, Karnal on 17.11.2025.

Superannuation

- Sh. Subhash Chander, Assistant Administrative Officer superannuated from Council's Service w.e.f. 28.02.2025.
- Dr. S.S. Lathwal, Principal Scientist, ICAR-NDRI, Karnal superannuated from Council's service w.e.f. 30.04.2025
- Mr. Dharam Pal, Technical Officer superannuated from service w.e.f. 30.04.2025
- Sh. Ramesh Kumar, Assistant, NDRI, Karnal superannuated from Council's Service w.e.f. 30.04.2025.
- Sh. Jagdish Chander, CF&AO, ICAR-NDRI, Karnal superannuated from Council's Service w.e.f. 31.05.2025.
- Dr. K. Jayaraja Rao, Principal Scientist, ICAR-NDRI-SRS, Bangalore superannuated from Council's service w.e.f. 30.06.2025.
- Mr. Bali Ram, Sr. Technician superannuated from Council's service w.e.f. 30.06.2025
- Mr. K. Ningaraju, Assistant Chief Technical Officer superannuated from Council's service w.e.f. 31.07.2025
- Dr. V.R.V Surendranath Naik, Chief Technical Officer superannuated from Council's service w.e.f. 31.07.2025
- Mr. Raj Pal, Sr. Technician superannuated from Council's service w.e.f. 31.07.2025
- Dr. T.K. Mohanty, Principal Scientist superannuated from Council's Service w.e.f. 31.07.2025.
- Dr. Ningaraju, Assistant Chief Technical Officer superannuated from Council's Service i.e. 31.07.2025.
- Dr. Somenath Dutta, Chief Technical Officer, ICAR-NDRI-ERS, Kalyani, superannuated from Council's service w.e.f. 31.08.2025.
- Mr. Ramesh Kumar, Technical Officer superannuated from service w.e.f. 31.08.2025
- Dr. Dhruba Malakar, Principal Scientist superannuated from Council's Service w.e.f. 30.09.2025.
- Mr. Yogender Pratap Singh, Sr. Technical Officer superannuated from Council's service w.e.f. 31.10.2025
- Dr. Subrata Kumar Das and Dr. Tapas Kumar Dutta, Principal Scientists at ICAR-NDRI-ERS, Kalyani superannuated from Council's Service i.e. 31.12.2025.
- Dr. Pawan Singh, Head, ICAR-NDRI, Karnal superannuated from Council's Service i.e. 31.12.2025.
- Dr. Arun Kumar Misra, Principal Scientist, ICAR-NDRI, Karnal superannuated from Council's Service i.e. 31.12.2025.
- Dr. Sachinandan De, Principal Scientist, ICAR-NDRI, Karnal superannuated from Council's Service i.e. 31.12.2025.


भाकृअनुप-राष्ट्रीय डेरी अनुसंधान संस्थान, करनाल
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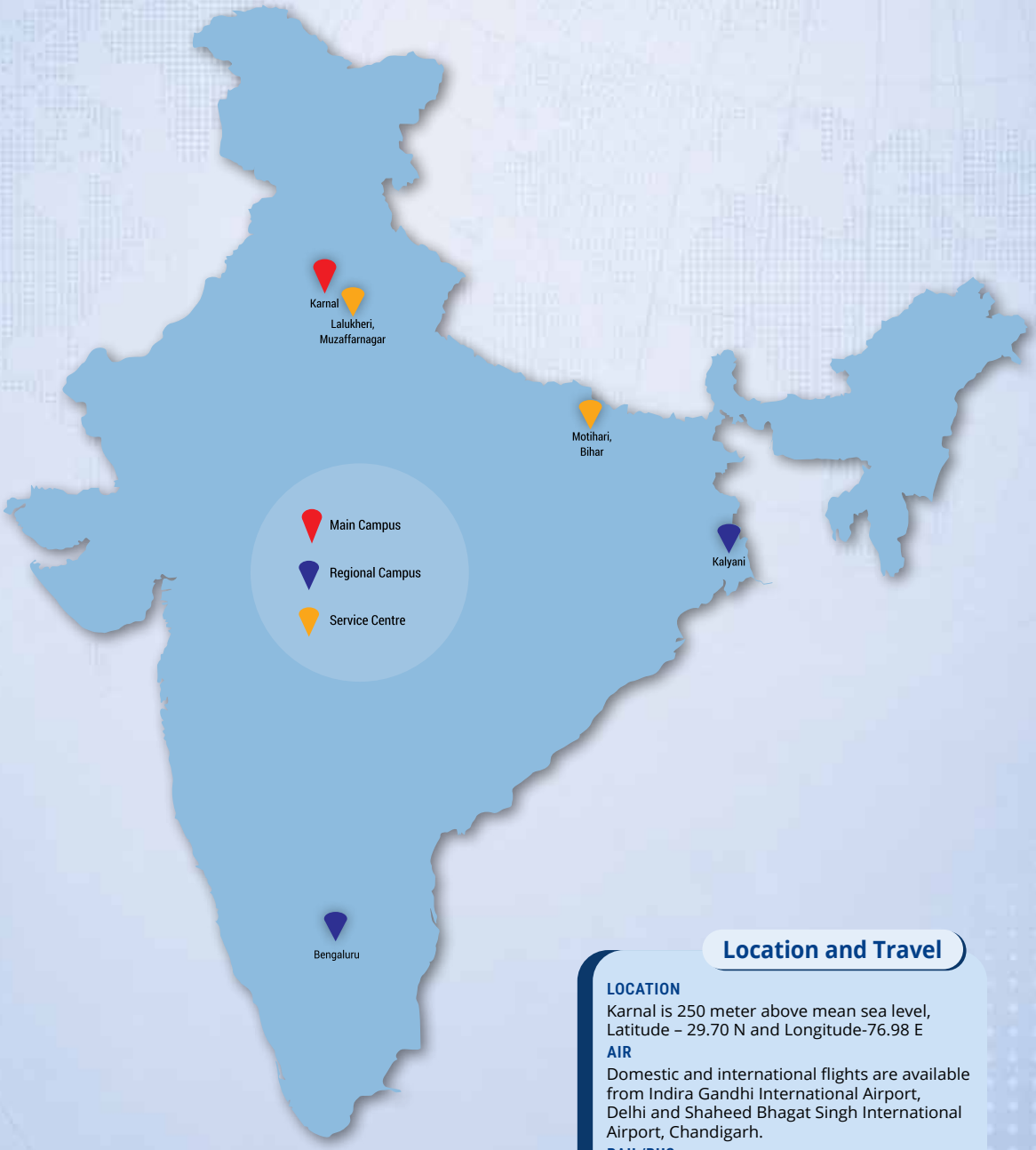

Location and Travel

LOCATION

Karnal is 250 meter above mean sea level, Latitude – 29.70 N and Longitude-76.98 E

AIR

Domestic and international flights are available from Indira Gandhi International Airport, Delhi and Shaheed Bhagat Singh International Airport, Chandigarh.

RAIL/BUS

Karnal is 130 KM from Delhi/Chandigarh and Institute is 1 KM from Railway station/Bus Stand.

CLIMATIC INFORMATION

Minimum Temperature in Winter: 3–5^{0}C

Maximum Temperature in Summer: 40–46^{0}C

Annual Rainfall: 750 mm

ICAR-NATIONAL DAIRY RESEARCH INSTITUTE

(Deemed University)

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