वार्षिक प्रतिवेदन
ANNUAL REPORT
2024

भा.कृ.अ.प.-केन्द्रीय भैंस अनुसंधान संस्थान
हिसार - 125 001 (हरियाणा) भारत

ICAR- Central Institute for Research on Buffaloes
Hisar- 125 001 (Haryana) India

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www.cirb.icar.gov.in

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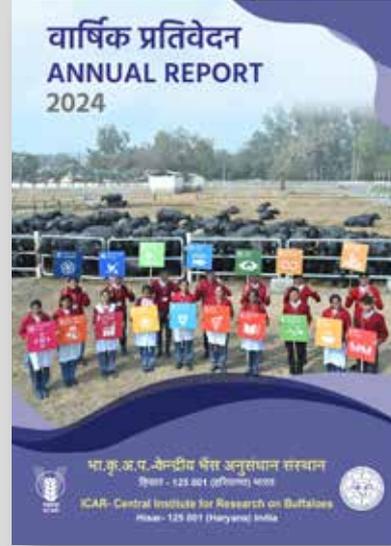

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CONTENTS

FROM DIRECTOR'S DESK

स्वदेशे सुरक्षिताः पशवः समृद्धिं जनयन्ति।

(Indigenous livestock, when protected and nurtured, bring prosperity to the land.)

In the heart of India's agrarian soul, where tradition and innovation converge, buffaloes stand as timeless sentinels of prosperity. As Director of the Central Institute for Buffalo Research (CIRB), it is my honour to present this annual report, a testament to the unwavering spirit of India's "*black rivers of plenty*"— the buffaloes that nourish our nation, empower our farmers, and defy the odds of a changing climate.

Buffaloes are not just livestock; they are India's pride. With 57% of the world's buffalo population, our nation serves as their true home. These magnificent animals, deeply embedded in India's cultural and economic fabric, contribute nearly 45% of the country's milk production despite making up only 35% of its bovine population. Their nutrient-rich milk forms the foundation of iconic dairy products like ghee and paneer, while their resilience—thriving in extreme heat, subsisting on coarse fodder, and resisting disease— makes them indispensable to farmers and a model of climate adaptability.

Despite their significance, most dairy innovations have been tailored for cattle, overlooking the distinct needs of buffaloes. To address this, the Institute is spearheading research and technological advancements specifically for buffalo farming. In collaboration with global institutions like IIT Roorkee and the University of Adelaide, we are developing precision livestock farming solutions that enhance efficiency, sustainability, and productivity. These IoT-based systems monitor critical physiological markers, enabling farmers to make informed decisions for better herd management.

Our research tackles key challenges in buffalo farming. We are improving reproduction and fertility through advanced reproductive technologies and AI-driven fertility management. To enhance nutrition, we are developing balanced feeding strategies and high-yield fodder cultivation methods to boost growth and milk production. Efforts to mitigate methane emissions focus on feed additives and genetic selection to promote environmental sustainability. We are also leveraging genomics and metabolomics to enhance disease resistance, milk quality, and lactation efficiency, while advancing breeding programs to preserve genetic diversity and improve productivity.

By addressing these critical areas, we aim to bridge the technological gap in buffalo farming, ensuring our innovations directly benefit farmers. Since its inception, the Institute has made significant strides in improving its buffalo herds and has established itself as a global leader in buffalo research. One of its most notable achievements is the conservation and propagation of elite, high-yielding buffalo germplasm. Additionally, our capacity-building programs have empowered farmers from diverse backgrounds, equipping them with the knowledge and skills to enhance buffalo productivity. Their trust in CIRB's training programs stands as a testament to our impact on livestock farming communities across India. As we move forward, CIRB remains committed to revolutionizing buffalo farming through cutting-edge research, technological innovation, and farmer-centric solutions for a more sustainable and prosperous future.

I take this opportunity to extend my deepest gratitude to Dr. Himanshu Pathak, Secretary, Department of Agricultural Research and Education, and Director General, ICAR, for his continued guidance, encouragement, and support. I also extend my sincere appreciation to Dr. Raghavendra Bhatta, Deputy Director General (Animal Sciences) and Dr. Gyendra Kumar Gaur, Assistant Director General (AP&B), for their valuable insights and direction. The dedication and collaborative efforts of the entire editorial board, along with the CIRB team, have been instrumental in shaping this report and driving the Institute's accomplishments over the past year.

Dr. Yash Pal
Director

निदेशक की कलम से

'स्वदेशे संरक्षिताः पशवः, समृद्धिं जनयन्ति'

अर्थात अपने देश में संरक्षित पशुधन राष्ट्र को समृद्धि प्रदान करता है।

केंद्रीय भैंस अनुसंधान संस्थान के निदेशक के रूप में यह वार्षिक प्रतिवेदन प्रस्तुत करना मेरे लिए अत्यंत गौरव और सम्मान की बात है। यह रिपोर्ट हमारे देश के 'काले सोने' यानी भैंसपालन के उस मजबूत जज़्बे की पहचान है, जो न केवल पोषण का स्रोत हैं बल्कि हमारे किसानों को सशक्त बनाती हैं और बदलती जलवायु की चुनौतियों का डटकर सामना करती हैं।

भैंसें केवल पशुधन नहीं, बल्कि भारत की आन-बान-शान हैं। विश्व की लगभग 57% भैंसें भारत में पाई जाती हैं — यह देश सर्वश्रेष्ठ नस्लों का मूल स्थान है। ये गौरवशाली पशु न केवल हमारी संस्कृति में रचे-बसे हैं, बल्कि देश की दूध उत्पादन प्रणाली की रीढ़ भी हैं। दुधारू पशुओं का केवल 35% होने के बावजूद, भैंसें राष्ट्रीय दुग्ध उत्पादन में लगभग 45% योगदान देती हैं। उनके पोषक तत्वों से भरपूर दूध से बने घी, पनीर और अन्य उत्पाद भारतीय आहार - परंपरा का अहम हिस्सा हैं।

भैंसों की अद्भुत विशेषताएं — जैसे उच्च तापमान में, कम पोषण वाले चारे पर उत्पादन बनाए रखना और रोग प्रतिरोधक क्षमता — इन्हें जलवायु परिवर्तन में किसानों के लिए और भी अनमोल बनाती हैं। किन्तु, विडंबना यह है कि अधिकांश डेयरी गाय पर केंद्रित रहे हैं, जिससे भैंसों की विशिष्ट आवश्यकताएं उपेक्षित रही हैं। इसे बदलने के लिए हम अग्रणी भूमिका निभा रहे हैं। हम भारतीय प्रौद्योगिकी संस्थान रुड़की और एडिलेड विश्वविद्यालय, ऑस्ट्रेलिया जैसे वैश्विक सहयोगियों के साथ मिलकर, भैंसों के लिए विशिष्ट डिजिटल और तकनीकी समाधान विकसित कर रहे हैं। हमारा अनुसंधान प्रजनन दक्षता बढ़ाने, रोग प्रतिरोधक क्षमता सुधारने, दूध की गुणवत्ता

एवं उत्पादन में वृद्धि लाने पर केंद्रित है। जीनोमिक्स और मेटाबोलोमिक्स के ज़रिए हम भैंसों की आनुवंशिक विविधता को बनाए रखते हुए उनके उत्पादक लक्षणों को उभार रहे हैं। इस

संस्थान ने न केवल अनुसंधान में वैश्विक पहचान बनाई है, बल्कि अपने उत्कृष्ट पशुधन संरक्षण कार्यक्रमों और प्रशिक्षणों के माध्यम से किसानों को ज्ञान और कौशल से सशक्त किया है। संस्थान की स्थापना के बाद से, हमने भैंसों में उल्लेखनीय सुधार किया है। हमारी क्षमतावर्धन गतिविधियाँ, देशभर के पशुपालकों को भैंस पालन की नवीनतम तकनीकों से जोड़ने में सफल रही हैं। प्रशिक्षण कार्यक्रमों में किसानों का विश्वास हमारी साख और प्रभाव का प्रमाण है।

इस अवसर पर, मैं कृषि अनुसंधान एवं शिक्षा विभाग के सचिव तथा भारतीय कृषि अनुसंधान परिषद के महानिदेशक डॉ. हिमांशु पाठक के प्रति उनके निरंतर मार्गदर्शन, प्रेरणा और समर्थन के लिए हार्दिक आभार प्रकट करता हूँ। साथ ही, डॉ. राघवेंद्र भट्टा, उप-महानिदेशक (पशु विज्ञान), तथा डॉ. ज्ञानेंद्र कुमार गौड़, सहायक महानिदेशक (पशु उत्पादन एवं प्रजनन), को उनकी दूरदृष्टि और सहयोग हेतु आभार व्यक्त करता हूँ। अंततः इस प्रतिवेदन के संपादकीय बोर्ड का समर्पण और सहयोग, संस्थान की उपलब्धियों को रेखांकित करने और इस रिपोर्ट को आकार देने में अत्यंत महत्वपूर्ण रहा है।

डॉ. यश पाल
निदेशक

EXECUTIVE SUMMARY 2024

- As of December 31, 2024, the Murrah herd at ICAR-CIRB, Hisar, consists of 531 buffaloes, while the Nili-Ravi herd at the Nabha Sub-Campus has 515. Murrah buffaloes have an earlier age at first calving (39.54 months) compared to Nili-Ravi (43.21 months). A total of 594 Murrah bulls and 156 Nili-Ravi bulls have been disseminated into the field for buffalo improvement.

- In 2024, 253417 semen doses were produced, 228257 doses were disseminated, generating ₹59.22 lakh in revenue from semen sales.

- The total revenue generated amounts to ₹528.09 lakh, with the highest contribution from milk sales at ₹365.09 lakh. Other significant sources include livestock sales (₹84.89 lakh), semen sales (₹25.94 lakh), and technology/royalty income (₹7.40 lakh) during 2023-24.

- The total budget estimate (BE) for the Institute stands at ₹4,378.00 lakh, with ₹4,222.00 lakh allocated to core activities. Additional allocations include ₹136.00 lakh under the Scheduled Caste Sub Plan (SCSP), ₹10.00 lakh under the Tribal Sub Plan (TSP), and ₹10.00 lakh for the North Eastern Hill (NEH) region.

- The institute prioritizes the genetic improvement of Murrah and other buffalo breeds through scientific breeding, data-driven analysis, and advanced computing systems. Genetic progress is monitored through herd and field progeny testing. Progeny testing is conducted at six institutional centers, with a new center at Livestock Research Station (LRS), Mamnoor added in 2024. Over 1,060 breedable buffaloes are maintained for future sire production.

- The 21st Annual Review Meeting (NPBI) was held at ICAR-IGFRI, Jhansi from 12-13 November 2024, marking 30 years of project progress. Key recommendations included data-driven breeding strategies and the need for stable leadership in coordinated projects.

- Conservation and genetic improvement units have been established for Nili Ravi and Bhadawari buffaloes, while field progeny testing and bull production programs are ongoing for Jaffarabadi and Surti breeds.

- The herd average milk yield stood at 2,396.64 kg. Bulls M-51 (CIRB) and 2594 (GADVASU) ranked as the top proven bulls for the next breeding cycle (January 2025–June 2026).

- In 2024, 146 high-genetic-merit calves were born in the Murrah herd at Hisar. The 21st set of test matings resulted in 168 pregnancies, while nominated matings with progeny-tested bulls achieved a 41% success rate.

- Efforts to improve the Nili-Ravi breed continued with the 9th set of test bulls undergoing progeny testing, leading to the birth of 157 high-genetic-merit calves in 2024. The herd achieved a 305-day lactation yield of 2,592 kg, with a wet average of 8.06 kg.

- In 2024, a total of 4,678 artificial inseminations were performed in the Murrah buffaloes of the field, resulting in a 51.54% conception rate. A total of 1,599 calvings were recorded, with milk production data collected for sire evaluation under the Field Progeny Testing (FPT) program at CIRB Hisar.

- Mastitis prevalence varied seasonally, with the highest incidence of subclinical mastitis (36.28%) in winter. Environmental factors such as humidity and mud contributed to the increase in cases of environmental mastitis during the rainy season.

- The Institute is developing innovative paper-based colorimetric tests for assessing buffalo reproduction, nutrition, and health. Prototypes for subclinical mastitis and ketosis detection in buffalo milk are under testing, offering cost-effective, non-invasive diagnostic tools for farmers. These innovations align with the Government of India's focus on precision and resource-efficient farming, supported by agencies such as BMGF, NLM, and DST.

- CRISPR-Cas9 technology was successfully used to edit the SRY gene in buffalo embryos, enabling the production of predetermined-sex embryos, which could revolutionize breeding programs. Additionally, CRISPR technology was applied to edit the MSTN gene in buffalo fibroblasts, leading to embryo development with improved muscle growth potential.

- A repository of cryopreserved somatic cells from elite buffalo breeds has been established, supporting genetic research and conservation efforts.

- Melatonin was found to enhance the maturation of inferior oocytes, reduce oxidative stress, and improve cloned embryo development, presenting a promising approach for improving buffalo cloning efficiency.

- Buffalo fetal fibroblasts were successfully reprogrammed into induced pluripotent stem cells (iPSCs), opening new avenues for genetic research and regenerative medicine.

- A Centre of Excellence for OPU-IVEP was established to enhance reproductive efficiency and accelerate genetic improvement in buffaloes.

- Malic acid-heat treatment of protein feeds improved feed efficiency, growth rates, and nitrogen retention while reducing methane emissions in Murrah buffalo calves.

- Diets supplemented with boiled *Cyamopsis tetragonoloba* (Guar) seeds altered rumen microbiota, showing potential as a low-cost anti-methanogenic feed additive.

- Genetically improved sorghum cultivars were evaluated for nutritional value and fermentation kinetics, demonstrating their potential as high-quality forage for buffaloes.

- Infrared thermography and machine learning were used for non-invasive monitoring of core body temperature and respiration rates in buffaloes, providing a stress-free alternative to traditional monitoring methods.

- Image analysis and machine learning helped develop a standardized body condition scoring (BCS) system for buffaloes, improving health and nutritional assessments.

- Institute has signed MoU between Sher-e-Kashmir University of Agricultural Sciences and Technology, Srinagar, DAU Shri Vasudev Chandrakar Kamdhenu Vishwavidyalaya, Durg, Uttar Pradesh and Indian Institute of Technology Roorkee, Uttarakhand for academic and research collaboration during 2024.

- Studies conducted in Punjab and Haryana indicated that farmers prefer Nili-Ravi and Murrah buffaloes due to their superior milk production and reproductive traits. However, challenges such as mastitis and high feed costs remain concerns.

- The dissemination of superior Murrah germplasm through FPT programs has significantly improved farmers' income and buffalo productivity.

- ICAR-CIRB organized 16 training programs in 2024, benefiting around 500 farmers, funded through institutional, SCSP, and TSP schemes. Additionally, entrepreneurship development training was conducted in collaboration with PNB, FTC, LUVAS, and NRFMTTI.

- Extension activities in 2024 included Kisan Sammelan, Kisan Gosthi, frontline demonstrations, participation in agricultural fairs, industrial interfaces, and celebrations such as Swachhta Abhiyaan, Milk Day, and International Women's Day, engaging both farmers and school children.

- ICAR-CIRB adopted two villages under SCSP—Nangla village in Fatehabad district, Haryana, and Gujjar Kheri village in Patiala district, Punjab—as model villages for disseminating buffalo-related technologies.

- Innovative extension models, including school-based programs and cyber extension, were implemented to enhance scientific knowledge dissemination and improve buffalo management practices.

- A total of 37 research manuscripts were published in reputed peer-reviewed journals during 2024.

- During 2024, 02 patents, 01 trademark, and 01 copyright were granted, with 02 additional patents filed under the ICAR-CIRB IP portfolio.

Staff Position

Name of the Post	Sanctioned	In position	Vacant
RMP	1	1	0
Scientist	44	24	20
Technical	40	26	14
Administrative	25	16	9
Skilled Supporting Staff	140	87	53
Total	250	154	96

Buffalo Production Improvements

Criteria	Status	
	Murrah breed at main Campus Hisar	Nili Ravi breed at Sub- Campus Nabha
Total number of animals (as on 31.12.2024)	531	515
Age at First Calving (Months)	39.54	43.21
Calf Mortality (%)	6.97	5.21
Dairy buffaloes herd performance		
Overall annual wet average (Kg)	9.85	8.06
Overall total lacatation milk yield (Kg)	3082	2691
Overall SLMY (Kg)	2964	2592
Service Period (days)	139	140
Calving Interval (days)	447	450
Conception rate (%)	45.53	43.05
Male germplasm		
Progeny tested bulls produced	44 (1-17th set)	15 (1-7th Set)
Semen doses produced	292799	3106
Frozen semen supplied	31129	6522
Revenue generated (Rs. Lakhs)	59.31	1.75
Bulls disseminated in field	594*	156

Last fourteen years #Since 2010-11

Agriculture farm production

Fodder	Main Campus Hisar	Sub Campus Nabha
Dry (Quintals)	1217	3305.5
Green (Quintals)	41294	53309
Grains (Quintals)	1392.35	4714.98

Other receipts   Rs. in Lakhs

Major/Minor/Detailed Head of Accounts	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24
Sale of Farm Produce						
Sale of Milk	277.21	336.20	370.31	371.56	386.12	365.09
Sale of Wheat Bhusa/Mustard Bhusa/Green Fodder	1.26	5.05	10.22	0.26	6.31	4.75
Sale of grain/wheat/paddy	55.00	4.83	7.92	3.41	4.89	3.70
Sale of Semen	28.46	27.54	23.83	30.95	20.29	25.94
Sale of Mineral Mixture	1.26	0.77	0.45	0.77	0.93	1.06
Sale proceed of dry trees	1.75	0.00	10.15	1.60	10.43	23.53
Sale of Books	0.06	0.66	0.03	0.15	0.02	0.01
Sale of Technology/Royalty	0.00	0.76	0.19	0.17	0.07	7.40

Sale proceeds of

Land & Building	0.00	0.00	0.00	0.00	0.00	0.00
Machine Tools & Plants Equipments/Vehicle etc.	0.00	0.00	0.00	8.81	0.00	0.00
Sale proceeds of Livestock	59.59	84.13	89.47	110.24	127.26	84.89
Rents (licence fee)	4.68	4.70	5.93	5.88	5.84	5.28
Application fees from Candidates Tuition Fees, diploma Charges etc.	0.00	0.00	0.00	0.00	0.30	0.30
Application fees from Candidates in connection with recruitment	0.01	0.00	0.00	0.00	0.00	0.00
Receipts from Service rendered by Instt./receipt from students	3.44	2.97	0.00	0.58	0.67	0.00
Misc Receipt	0.00	0.00	0.00	0.00	0.00	0.00
Sale of Tender form	1.69	0.79	0.73	0.87	0.00	0.00
Guest house charges	2.62	3.77	1.28	3.18	4.62	5.75
Total:	437.04	472.16	520.50	538.42	567.73	528.09
Target	409.43	397.78	397.78	445.000	435.33	440.50

Financial Outlay   Rs.in Lakhs

Name of Institute/Project	Sanctioned Budget 2024-25	Expenditure 2024-25 upto 31.12.2024
CIRB Main (As per BE)	4222.0	2960.32
CIRB SCSP(As per BE)	136.00	92.13
CIRB TSP (As per BE)	10.00	7.01
CIRB NEH	10.00	7.50
Total	4378.00	3066.96
Plan Schemes		
Network Project on Buffalo Improvement (As per BE)	592.00	402.14
Network Project on Buffalo Improvement, SCSP(As per BE)	48.00	23.50
AICRP on Nutritional and Physiology (PI: Dr R.K Sharma)	14.13	4.06
NAIF Project (PI: Dr. Sandeep Khurana)	7.91	5.15
NASF Project (PI: Dr. P.S Yadav)	72.75	33.38
NASF Project (PI: Dr. Dharmendra Kumar)	11.50	4.94
CABin Project (PI: Dr. Varij Nayan)	20.00	6.00
DBT Project on Investigating molecular basis of seasonal variation on seminal attributes for identification of probable biomarkers of semen quality in buffaloes (PI: Dr. Pradeep Kumar)	2.26	0.93
RKM project on Strengthening of Semen stations (PI: Dr. RK Sharma)	61.74	38.56
RKM project on Establishment of centre of excellence under Rastriya Gokul Mission (PI: Dr. Jerome A)		22.88
BMGF Project on Molecular Markers for Improving Reproduction in Cattle and Buffaloes (PI: Dr. Askok K Balhara)	5.78	1.50
BMGF Project on Climate smart buffalo farming using digital support systems (PI: Dr. Askok K Balhara)	457.22	145.99
NLM Project on Development of Urine-based Biosensor for Pregnancy Diagnosis in Ruminants (PI: Dr. Ashok K Balhara)	59.71	14.69
NLM Project on Applications of Infrared Thermography as innovative non-invasive technological solution in early mastitis detection (PI: Dr. Sunesh Balhara)	42.29	11.94
BMGF Project on PoC for ruminants expressing ligninase to reduce carbon footprints (PI: Dr. Dharmendra Kumar)	174.95	49.47
SERB Project on Development of mesenchymal stem cells and quercetin nanoparticles medicated scaffold (MSCs+QNPs-scaffold) to promote 3D diabetic wound repair and regeneration (PI: Dr. Dharmendra Kumar)	3.35	0.00
CRP Project (PI: Dr.Meeti Punetha)	10.50	5.76

कार्यकारी सारांश 2024

- 31 दिसंबर 2024 तक भा.कृ.अनु.प. - केंद्रीय भैंस अनुसंधान संस्थान, हिसार में मुर्रा नस्ल की 531 भैंसें थी, जबकि नाभा उप परिसर में नीली-रावी नस्ल की 515 भैंसें थी। मुर्रा भैंसों की पहली ब्यांत की औसत आयु (39.54 माह) नीली-रावी (43.21 माह) की तुलना में कम है। मुर्रा नस्ल के 594 झोटे और नीली रावी नस्ल के 156 झोटे नस्ल सुधार के लिए हित धारको को दिए गए।

- वर्ष 2024 में, 2,53,417 वीर्य स्ट्रॉ का उत्पादन किया गया, और 2,28,257 वीर्य स्ट्रॉ का वितरण किया गया, जिससे वीर्य बिक्री से ₹59.22 लाख का राजस्व प्राप्त हुआ।

- कुल राजस्व ₹528.09 लाख रहा, जिसमें सबसे अधिक योगदान दूध बिक्री से ₹365.09 लाख रहा। अन्य महत्वपूर्ण स्रोतों में पशुधन बिक्री (₹84.89 लाख), सीमेन बिक्री (₹25.94 लाख), और प्रौद्योगिकी/मूल्याधिकार आय (₹7.40 लाख) शामिल हैं।

- संस्थान का कुल बजट अनुमान ₹4378.00 लाख है, जिसमें मुख्य आवंटन ₹4222.00 लाख है। अतिरिक्त आवंटनों में अनुसूचित जाति उप-योजना के तहत ₹136.00 लाख, जनजातीय उप-योजना के तहत ₹10.00 लाख, और पूर्वोत्तर पर्वतीय क्षेत्र के लिए ₹10.00 लाख शामिल हैं।

- संस्थान वैज्ञानिक प्रजनन, डेटा-आधारित विश्लेषण और उन्नत कंप्यूटिंग सिस्टम के माध्यम से मुर्रा और भैंस संतान की नस्लों के आनुवंशिक सुधार को प्राथमिकता देता है। आनुवंशिक प्रगति को समूह और क्षेत्र परीक्षण के माध्यम से जांचा जाता है। संतान परीक्षण 6 संस्थागत केंद्रों में किया जाता है, जिसमें 2024 में एक नया केंद्र पशुधन अनुसंधान केंद्र मन्नूर जोड़ा गया। भविष्य में झोटा उत्पादन के लिए 1,060 से अधिक प्रजनन योग्य भैंसें रखी जाती हैं।

- 21वीं वार्षिक समीक्षा बैठक भा.कृ.अनु.प. - भारतीय चरागाह एवं चारा अनुसंधान संस्थान, झांसी में 12-13 नवंबर 2024 को आयोजित की गई, जिसमें 30 वर्षों की परियोजना प्रगति की समीक्षा की गई। प्रमुख सिफारिशों में डेटा-आधारित प्रजनन रणनीतियों और समन्वित परियोजनाओं के स्थिर नेतृत्व की आवश्यकता पर जोर दिया गया।

- नीली-रावी और भदावरी भैंसों के लिए संरक्षण और आनुवंशिक सुधार इकाइयां स्थापित की गई हैं, जबकि जाफराबादी और सुरती नस्लों के लिए क्षेत्र संतान परीक्षण और झोटा उत्पादन पर ध्यान केंद्रित किया गया है।

- औसत दुग्ध उत्पादन 2,396.64 किलोग्राम रहा। झोटा M-51 (केंद्रीय भैंस अनुसंधान संस्थान, हिसार) और 2594 (गुरु अंगद देव पशु चिकित्सा एवं पशु विज्ञान विश्वविद्यालय, लुधियाना) को अगले प्रजनन चक्र (जनवरी 2025 - जून 2026) के लिए शीर्ष प्रमाणित झोटों के रूप में स्थान दिया गया।

- 2024 में हिसार के मुर्रा नस्ल समूह में 146 उच्च आनुवंशिक गुणवत्ता वाले कटड़े पैदा हुए। 21वें परीक्षण समायोजन से 168 गर्भधारण हुए, और संतान-परीक्षित झोटों के साथ नामांकित समायोजन में 41% सफलता दर हासिल हुई।

- नीली-रावी भैंसों के आनुवंशिक सुधार के प्रयास जारी है, जिसमें 9वें परीक्षण समूह के झोटों का संतान परीक्षण किया गया और 2024 में 157 उच्च आनुवंशिक गुणवत्ता वाले कटड़े पैदा हुए। 305 दिन के दुग्ध उत्पादन से 2,592 किलोग्राम और गीला औसत 8.06 किलोग्राम प्राप्त किया।

- 2024 में, गाँवों की मुर्रा भैंसों में 4,678 कृत्रिम गर्भाधान किए गए, जिससे 51.54% गर्भधारण दर प्राप्त हुई। कुल 1,599 ब्यांत दर्ज किए गए, और मूल्यांकन के लिए दुग्ध उत्पादन के आंकड़े डेटा एकत्र किए गए।

- थनैला रोग की समस्याएं मौसम के अनुसार भिन्न रहीं, जिसमें सबसे अधिक उप-नैदानिक थनैला रोग संस्थान की भैंसों में (36.28%) सर्दियों में दर्ज किया गया। आर्द्रता और कीचड़ जैसे पर्यावरणीय कारक वर्षा ऋतु में केशो की संख्या बढ़ाने में सहायक रहे।

- संस्थान भैंसों के प्रजनन, पोषण और स्वास्थ्य आकलन के लिए कागज-आधारित रंग परीक्षण विकसित कर रहा

है। थनैला और कीटोसिस पहचान के प्रारंभिक प्रोटोटाइप परीक्षणाधीन हैं, जो किसानों के लिए सस्ते और गैर-आक्रामक निदान प्रदान करेंगे। यह शोध सरकार और विभिन्न एजेंसियों के संसाधन-कुशल कृषि प्रयासों के अनुरूप है।

- CRISPR-Cas9 जीन-संपादन तकनीक का उपयोग करके भैंस भ्रूणों में लिंग निर्धारण करने वाला वाई-जीन को सफलतापूर्वक संपादित किया गया, जिससे पूर्व-निर्धारित लिंग वाले भ्रूणों का उत्पादन संभव हुआ, जो प्रजनन कार्यक्रमों में क्रांति ला सकता है। CRISPR-Cas9 जीन-संपादन तकनीक का उपयोग MSTN जीन को निष्क्रिय करने के लिए किया गया, जिससे बेहतर मांसपेशी वृद्धि क्षमता वाले भ्रूण उत्पन्न हुए।

- प्रमुख भैंस नस्लों के क्रायो-संरक्षित दैहिक कोशिकाओं का एक संग्रह स्थापित किया गया, जिससे आनुवंशिक अनुसंधान और संरक्षण प्रयासों को समर्थन मिलेगा। मेलाटोनिन ने निम्न गुणवत्ता वाले अंडाणुओं की परिपक्वता में सुधार किया, ऑक्सीडेटिव तनाव को कम किया, तथा क्लोन भ्रूण के विकास को बढ़ाया, जिससे भैंस क्लोनिंग दक्षता में सुधार करने के लिए एक आशाजनक दृष्टिकोण प्रस्तुत हुआ। भैंस भ्रूण फाइब्रोब्लास्ट को सफलतापूर्वक प्रेरित बहु-शक्ति मूल कोशिकाएँ में पुन: अनुकूलन किया गया, जिससे आनुवंशिक अनुसंधान और पुनर्योजी चिकित्सा के नए द्वार खुले।

- प्रजनन क्षमता बढ़ाने और आनुवंशिक सुधार को गति देने के लिए अंडाणु संग्रहण एवं इन-विट्रो भ्रूण उत्पादन के लिए एक उत्कृष्टता केंद्र स्थापित किया गया।

- प्रोटीन आहार के मैलिक अम्ल-ताप उपचार से मुर्रा भैंस के कटड़ों में आहार दक्षता, वृद्धि दर और नाइट्रोजन धारण में सुधार हुआ, जबकि मीथेन उत्सर्जन में कमी आई। बबूल की पत्तियों से प्राप्त संघनित टैनिन के साथ आहार पूरकता ने जुगाली करने वाले जीवाणु को बदल दिया, जिससे मीथेन उत्पादन कम हुआ बिना पशु उत्पादकता से समझौता किए।

- आनुवंशिक रूप से उन्नत ज्वार की किस्मों का पोषण मूल्य और किण्वन गतिशीलता के लिए मूल्यांकन किया गया, जिससे भैंसों के लिए उच्च गुणवत्ता वाला चारा प्रदान करने की क्षमता दिखाई दी।

- इंफ्रारेड तापमान मापन और मशीन लर्निंग उपयोग करके भैंसों के मूल शरीर के तापमान और श्वसन दर की गैर-आक्रामक निगरानी की गई, जो पारंपरिक विधियों की तुलना में अधिक सटीक पाई गई।

- छवि विश्लेषण और मशीन लर्निंग का उपयोग करके भैंसों के लिए एक मानकीकृत शरीर स्थिति मूल्यांकन प्रणाली विकसित की गई, जो स्वास्थ्य और पोषण मूल्यांकन में सहायक होगी।

- संस्थान ने वर्ष 2024 के दौरान अकादमिक और अनुसंधान सहयोग के लिए शेर-ए-कश्मीर कृषि विज्ञान और प्रौद्योगिकी विश्वविद्यालय, श्रीनगर; दाऊ श्री वासुदेव चंद्राकर कामधेनु विश्वविद्यालय, दुर्ग, उत्तर प्रदेश; और भारतीय प्रौद्योगिकी संस्थान, रुड़की, उत्तराखंड के साथ समझौता ज्ञापन (MoU) पर हस्ताक्षर किए हैं।

- पंजाब और हरियाणा में किए गए अध्ययन से पता चला कि किसान बेहतर दूध उत्पादन और प्रजनन विशेषताओं के कारण नीली-रावी और मुर्रा भैंसों को प्राथमिकता देते हैं। हालांकि, थनैला और उच्च चारे की लागत जैसी चुनौतियों का समाधान करने की आवश्यकता है।

- क्षेत्रीय संतान परीक्षण कार्यक्रमों के माध्यम से उन्नत मुर्रा अनुवांशिक स्रोत के प्रसार ने किसानों की आय और भैंस उत्पादकता में सुधार किया। भैंस पालन करने वाले समुदायों में वैज्ञानिक हस्तक्षेप, उद्यमिता विकास और लैंगिक सशक्तिकरण पर ध्यान केंद्रित करते हुए एक सतत केंद्र स्थापित किया गया।

- नवाचार प्रसार नमूना, जैसे कि स्कूल-आधारित कार्यक्रम और साइबर विस्तार लागू किए गए, जिससे वैज्ञानिक ज्ञान का प्रसार और भैंस प्रबंधन प्रथाओं में सुधार हुआ।

- आईसीएआर-सीआईआरबी ने वर्ष 2024 में कुल 16 प्रशिक्षण कार्यक्रम आयोजित किए, जिनसे लगभग 500 किसानों को लाभ मिला। इन कार्यक्रमों का वित्तपोषण संस्थागत, एससीएसपी और टीएसपी योजनाओं के माध्यम से किया गया। इसके अतिरिक्त, पीएनबी-एफटीसी, लुवास

और एनआरएफएमटीटीआई के सहयोग से उद्यमिता विकास प्रशिक्षण भी आयोजित किया गया।

- वर्ष 2024 में प्रसार गतिविधियों में किसान सम्मेलन, किसान गोष्ठी, फ्रंट लाइन प्रदर्शन, कृषि मेलों में भागीदारी, औद्योगिक संवाद, और स्वच्छता अभियान, दुग्ध दिवस, एवं अंतर्राष्ट्रीय महिला दिवस जैसे आयोजनों के माध्यम से किसानों और स्कूली बच्चों को सक्रिय रूप से जोड़ा गया।

- आईसीएआर-सीआईआरबी ने एससीएसपी योजना के तहत दो गाँवों-नांगला (जिला फतेहाबाद, हरियाणा) और गुज्जरखेड़ी (जिला पटियाला, पंजाब) को गोद लिया और उन्हें मॉडल गाँव के रूप में विकसित किया, ताकि भैंस पालन से जुड़ी नवीनतम तकनीकों का प्रचार-प्रसार किया जा सके।

- वैज्ञानिक ज्ञान के प्रसार और भैंस प्रबंधन प्रथाओं में सुधार के लिए स्कूल-आधारित कार्यक्रमों और साइबर एक्सटेंशन सहित नवाचार प्रसार मॉडल लागू किए गए।

- वर्ष 2024 के दौरान, प्रतिष्ठित समीक्षित पत्रिकाओं में कुल 37 शोध पत्र प्रकाशित किए गए।

- वर्ष 2024 में, 02 पेटेंट, 01 ट्रेडमार्क, और 01 कॉपीराइट स्वीकृत किए गए, साथ ही आईसीएआर-सीआईआरबी आईपी पोर्टफोलियो के तहत 02 अतिरिक्त पेटेंट दाखिल किए गए।

भैंस के उत्पादन में विकास

मानदंड	स्थति	
	मुर्रा नस्ल, मुख्य परिसर हिसार	नीली- रावि नस्ल, उप परिसर नाभा
पशुओं की कुल संख्या (31.12.2020 को)	531	515
प्रथम ब्यांत उम्र	39.54	43.21
मृत्यु दर (%)	6.97	5.21
डेयरी भैसों का प्रदर्शन		
कुल मिलाकर वार्षिक औसत	9.85	8.06
कुल मिलाकर दुग्ध उपज	3082	2691
कुल मिलाकर एसएलएमवाई	2964	2592
सर्विस अवधि	139	140
ब्यांत अंतराल	447	450
गर्भाधान की दर	45.53	43.05
नर जर्मप्लाज्म		
प्रोजेनी टेस्टेड झोटों का उत्पादन	44 (1-17th set)	15 (1-7th Set)
हिमीकृत वीर्य टीके उत्पादित	292799	3106
हिमीकृत वीर्य आपूर्ति	31129	6522
राजस्व उत्पत्ति (रुपये, लाख में)	59.31	1.75
क्षेत्र में झोटों का प्रसार	594*	156

कृषि फार्म उत्पादन

चारा	हिसार, मुख्य परिसर	नाभा, उप परिसर
गेहूं का भूसा	1217	3305.5
हरा चारा	41294	53309
अनाज	1392.35	4714.98

राजस्व प्राप्ति (भारतीय रुपये में सभी आंकड़े)

प्रमुख / लघु / खातों का विस्तृत विवरण	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24
फार्म उत्पादों की बिक्री						
(i) दूध की बिक्री	277.21	336.20	370.31	371.56	386.12	365.09
(ii) गेहूं भूसा / सरसों भूसा / हरा चारा की बिक्री	1.26	5.05	10.22	0.26	6.31	4.75
(iii) अनाज / गेहूं / धान की बिक्री	55.00	4.83	7.92	3.41	4.89	3.70
(iv) वीर्य की बिक्री	28.46	27.54	23.83	30.95	20.29	25.94
(v) खनिज मिश्रण की बिक्री	1.26	0.77	0.45	0.77	0.93	1.06
(vi) सूखे पेड़ों की बिक्री प्रक्रिया	1.75	0.00	10.15	1.60	10.43	23.53
(vii) पुस्तकों की बिक्री	0.06	0.66	0.03	0.15	0.02	0.01
(viii) प्रौद्योगिकी / रॉयल्टी की बिक्री	0.00	0.76	0.19	0.17	0.07	7.40
बिक्री आय						
(i) भूमि और भवन	0.00	0.00	0.00	0.00	0.00	0

(ii) मशीन टूल्स और प्लांट उपकरण / वाहन आदि	0.00	0.00	0.00	8.81	0.00	0
(iii) पशुधन की बिक्री आय	59.59	84.13	89.47	110.24	127.26	84.89
किराए (लाइसेंस शुल्क)	4.68	4.70	5.93	5.88	5.84	5.28
अभ्यर्थी ट्यूशन फीस, डिप्लोमा शुल्क आदि से आवेदन शुल्क	0.00	0.00	0.00	0.00	0.30	0.30
भर्ती के संबंध में उम्मीदवारों से आवेदन शुल्क	0.01	0.00	0.00	0.00	0.00	0.00
संस्थान द्वारा प्रदान की गई सेवा से प्राप्त रसीदें / छात्रों से रसीद योजना से प्राप्तियां	3.44	2.97	0.00	0.58	0.67	0.00
विविध प्राप्ति	0.00	0.00	0.00	0.00	0.00	
(i) निविदा प्रपत्र की बिक्री	1.69	0.79	0.73	0.87	0.00	0.00
(ii) अतिथि गृह शुल्क	2.62	3.77	1.28	3.18	4.62	5.75
कुल	437.04	472.16	520.50	538.42	567.73	528.09
टारगेट	409.43	397.78	397.78	445.000	435.33	440.50

INTRODUCTION

INSTITUTE AT A GLANCE

The Central Institute for Research on Buffaloes (CIRB) was established on February 1, 1985 by acquiring the Progeny Testing Bull Farm from Haryana Government at Hisar. The Institute is dedicated to address the developmental needs of this virtuous species through interventions derived from research. The institute has come a long way towards addressing its mandated role. A sub-campus of the institute was established in December 1987 at Bir Dosanjh, Nabha, District Patiala (Punjab) with the transfer of Nili- Ravi Buffalo Farm from the Punjab State Government. Soon after its establishment, the institute came to lime-light in the **'buffalo world'** by successfully hosting 2nd World Buffalo Congress (1988), 4th and 9th Asian Buffalo Congress (2003 and 2018, respectively).

Institute has developed considerable expertise over the last three decades in improving buffalo's genetic performance and fertility management with the application of reproductive biotechnologies and efficient nutrient utilization technologies. Information generated at the institute and the services offered to stakeholders have contributed to the growth of buffalo industry as a whole and well-being of millions of milk producers. Under the Network Project on Buffalo Improvement, the ICAR-CIRB coordinated establishment of pedigreed nucleus breeding herds of six important buffalo breeds in their respective home tracts in collaboration with other ICAR institutes and the state agricultural universities. This has allowed creation of a repository of data and information on various aspects of buffaloes and to undertake focused technology transfer and extension activities across the country. The Institute has approved cadre strength of 44 scientists in various specializations, including the sub-campus at Nabha.

Mandate

- Basic and strategic research for enhancing technology development on all aspects of buffalo productivity
- Information repository and dissemination of buffalo products technologies.

The Vision

- To develop and propagate high yielding elite buffalo germplasm for quality milk and meat production while retaining inherent draughtability across different regions of the country.

The Mission

- To improve buffaloes through identification, conservation and propagation of elite germplasm having high efficiency of reproduction and nutrient utilization for sustainable production and commercialization.

The Focus Areas

In view of the institute mandate and existing infrastructure and manpower, five major thrust areas and programs have been identified for research, as per recommendations made by Research Advisory Committee and Institute Research Council:

- Genetic Resource Improvement Program
- Feed Resource Utilization and Improvement Program
- Optimization of Reproductive Efficiency Program.
- Buffalo Management Program
- Extension

DIVISIONS

The institute research activities are managed under three subject specialized divisions with specific objectives and required infrastructure.

I. Division of Animal Genetics and Breeding

Genetic resources improvement programme is the major programme to undertake studies on genetic improvement of Murrah and Nili-Ravi breeds by implementing efficient breeding plans, envisaged with scientific breeding, using powerful computing systems, maintaining vast pedigree records with necessary technological interventions in the areas of nutrition and reproduction. Genetic improvement is evaluated through associated herd and field progeny testing, performance recording and genetic analysis of data under Network mode. Data resource is generated to develop 'genome-to-phenotype' models for predicting animal's genetic merit. Research focus is on developing methods to measure different conformation and performance traits for selecting high scoring germplasm to line-up the parents of next generation. Sound phonemic and genomic data collection has generated an authentic data resource, to understand the genetics of relevant but complex traits such as milk yield, faster gain in quality meat and reproductive traits. Grading superior buffaloes by digital imaging of animals, linking conformation/body size indices to productivity, identifying genetic variants through SNP technology elucidating genetic markers are aimed at developing selection tools.

II. Division of Animal Nutrition and Feed Technology

The nutrition laboratories have the most modern equipment and facilities to undertake research on various aspects related to buffalo nutrition, aimed at developing economic growth and production rations by incorporating agro-industrial by-products. Feed and Forage Quality Control and Processing, Rumen Biome, Protein Nutrition, Toxicology and Mineral Nutrition laboratories are well-equipped and functional. Major studies include working out nutrient requirements of different categories of buffaloes for milk, meat and growth, with evaluation of different feed and fodder ingredient available in different regions.

III. Division of Animal Physiology and Reproduction

Facilities have been developed in the division for undertaking studies on semen technology, embryo biotechnology including OPU-IVF, embryo transfer and cloning, cell culture, biochemistry and molecular biology, and endocrinology in order to understand reproductive functions, development and function of the mammary gland, besides other physiological facets which have remained little explored in buffalo.

IV. Semen Freezing Lab

Semen Freezing Lab was established during 2007-08 with most modern facilities for collection, processing, freezing and preservation of semen as per OIE guidelines to fulfil the requirements of the Network Project on Buffalo Improvement and to supply high quality semen in the field. Facilities include CASA, flow cytometry, fluorescent microscope, DIC and Phase contrast microscopes, biofreezer for cryopreservation of Murrah semen. Frozen semen is provided to the developmental agencies, farmers and inseminators engaged in buffalo improvement program. The lab has current stock of more than four lakh doses of frozen semen from nearly 250 Murrah breeding bulls out of which more than sixty-four thousand doses are from progeny tested bulls. Frozen semen doses are also prepared from farmers' champion/ superior bulls, which are available for introduction in organized herds and farmers' animals. Frozen semen production has significantly improved during recent years.

V. Animal Farms

Highly pedigreed herds of over 500 Murrah buffaloes and an equal number of Nili-Ravi buffaloes, including followers, constitute the breeding herds at Hisar and Nabha, respectively. There are covered sheds for indoor housing of adult buffaloes attached with covered calf pens together with open paddocks for loose housing. At Hisar, a mechanized and automated shed for buffalo feeding, cleaning, milking and data recording system has been created, which is being equipped with necessary facilities for automated slurry management and milking. There is provision for housing of 200 buffaloes, 180 heifers and 10 down calvers besides 5 individual pens for young calves (30 in each). Sub-Campus. Nabha is equipped with 12 unit cluster automatic milking machine for clean and hygienic milk production.

The production performance viz. wet average and 305 days or less milk yield of Murrah herd has improved from 4.80 kg/day and 1508 kg during 1992-93 to 9.85 kg/day and 3082 kg in 2024. The reproductive performance of the herd also improved in terms of age at first calving and calving interval.

Buffalo No.	D.O.B.	Highest 305d or less MY (kg) / lactation no.	Best Peak Yield (kg)	Sire No.	Set No.
5179	24/03/17	5170 / 2	26.8	3591 PT(CIRB)	11
5074	01/08/16	4602 / 2	18.0	6139(NDRI)	15
5175	14/03/17	4553 / 3	23.0	2501(GADVASU)	16
5509	27/07/19	4520 / 2	20.0	2594(GADVASU)	17
4817	12/10/14	4507 / 5	23.5	4100(CIRB)	14
5151	07/01/17	4444 / 2	21.0	4592(CIRB)	16
4692	28/01/14	4431 / 5	20.0	1994 PT(GADVASU)	9
5259	11/09/17	4391 / 3	20.0	4705(CIRB)	16
4978	25/10/15	4366 / 2	18.9	1693 PT(LUVAS)	10
4899	01/05/15	4350 / 3	20.2	6044 PT(NDRI)	14
4767	12/08/14	4308 / 4	20.6	2369(GADVASU)	14
4613	18/08/13	4180 / 4	20.2	5943(NDRI)	13
5523	16/08/19	4169 / 2	18.0	2565(GADVASU)	17
E182	19/05/17	4149 / 2	20.5	Not Known	-
4251	29/10/10	4138 / 3	22.0	2133 PT(GADVASU)	11
5354	21/04/18	4065 / 3	17.5	R-12(Field)	-
5021	17/02/16	4029 / 2	21.0	4354 PT(CIRB)	15
5203	13/06/17	4029 / 4	20.0	1027(LUVAS)	16
5103	12/10/16	4019 / 4	18.0	4889(CIRB)	16

ICAR-CIRB Buffalo Herd status 2024

S. No.	Category	Addition						Disposal					
		M	NR	M	NR	M	NR	M	NR	M	NR	M	NR
		OB	OB	B	B	P	P	D	D	S	S	CB	CB
Female													
01.	Calves below 3 months	32	16	61	75	-	-	06	07	-	-	17	16
02.	Calves 3-12 months	44	26	-		-	-	03	01	01	-	45	51
03.	Heifers a) 1-2 years	71	60	-		-	-	-	-	03	-	67	42
	b) Above 2.0 years	80	123	-		-	-	01	-	10	08	98	103
04.	Buffaloes in Milk	136	93	-		-	-	01	03	22	06	125	135
05.	Buffaloes Dry	48	53			-	-	02	03	26	23	45	48
	Sub Total	**411**	**371**	**61**	**75**	**-**	**-**	**13**	**14**	**62**	**37**	**397**	**395**
Male													
01.	Calves below 3 months	16	19	66	82	-	-	09	03	01	02	10	30
02.	3-12 months	47	33			-	-	04	02	15	05	51	47
03.	1) 1-2 years	23	25	-		-	-	-	-	15	43	36	16
	2) > 2 years	15	27			-	-	-	1	04	11	20	18
04.	Breeding bulls	16	08	-		-	-	-	-	04	07	16	08
05.	Bullocks	-	-	-		-	-	-	-	-	-	-	-
06.	Teasers	-	01	-		-	-	-	-	-	01	-	01
	Sub Total	**117**	**113**	**66**	**82**	**-**	**-**	**13**	**06**	**39**	**69**	**131**	**120**
	Grand Total	**528**	**484**	**127**	**157**	**-**	**-**	**26**	**20**	**101**	**106**	**528**	**515**

M = Murrah (at Main Campus, Hisar) **NR**= Nili Ravi (at Sub Campus, Nabha), OB = Opening Balance D = Death S = Sale R = Received B = Birth P = Purchased

ICAR-CIRB Calving statistics (1st January -31st December 2024)

Month	Male (number)		Female(number)		Abortions & Still Birth(number)		Overall (number)	
	M	NR	M	NR	M	NR	M	NR
January	5	07	3	05	--	02	8	14
February	6	09	1	08	--	-	7	17
March	8	03	4	03	--	01	12	07
April	-	08	-	03	--	-	-	11
May	-	03	-	05	--	-	-	08
June	4	01	7	03	--	02	11	06
July	13	04	10	12	01	-	24	16
August	13	06	13	07	--	-	26	13
September	14	10	13	11	01	-	28	21
October	7	15	7	05	--	01	14	21
November	4	05	4	05	01	-	9	10
December	3	11	7	08	--	-	10	19
Overall	77	82	69	75	03	06	149	163

M = Murrah (at Main Campus, Hisar) NR= Nili Ravi (at Sub Campus, Nabha),
Sex ratio Murrah (Male: Female) = 49:51(approx.) **Sex ratio Nili Ravi** (Male: Female) = 55:45 (approx.)

ICAR-CIRB Disposal of animals in 2024

Category	Surplus sold		Udder Health		Repd. problem		Weak & old		Death		Total	
	M	NR	M	NR	M	NR	M	NR	M	NR	M	NR
Female < 6 months 6-12 months	- -	- -	- -	- -	- -	- -	- 01	- -	06 03	08 -	06 04	08 -
Heifers 1-2.5 yrs > 2.5 yrs	- -	- 08	- -	- -	- 10	- -	03 -	- -	01 -	- -	04 10	- 08
Buffaloes Dry Milch	- -	29 -	12 10	- -	12 10	- -	02 02	- -	01 02	06 -	27 24	35 -
Sub Total	-	37	22		32	-	08	-	13	14	75	51
Male < 6 months 6-12 months	03 13	02 05	- -	- -	- -	- -	- -	- -	09 04	05 -	12 17	07 05
>1 yr	19	54	-		-	-	-	-	-	01	19	55
Breeding bulls	04	07	-	-	0	-	-	-	-	-	04	07
Bullock +Teaser	-	01	-	-		-	-	-	-	-	-	01
Sub total	39	69	-	-	9	-	-	-	13	06	52	75
G. Total	39	106	22	0	32	0	08	0	26	20	127	126

M = *Murrah (at Main Campus, Hisar)* **NR**= *Nili Ravi (at Sub Campus, Nabha)*

ICAR-CIRB Month wise mortality of animals in 2024

Month	Details	0-3 (female) M	0-3 (female) NR	3-6 M	3-6 NR	6-12 M	6-12 NR	>1yr M	>1yr NR	>2yrs M	>2yrs NR	All M	All NR	0-3 (male) M	0-3 (male) NR	3-6 M	3-6 NR	6-12 M	6-12 NR	>1yr M	>1yr NR	>2yr M	>2yr NR	All M	All NR	Total M	Total NR
Jan	No	20	11	30	18	20	14	86	54	253	278	409	375	15	17	30	22	23	14	30	29	22	37	120	119	529	494
	Died	--	--	--	--	--	--	--	--	--	01	--	01	01	01	--	--	01	--	--	--	--	--	02	01	02	02
Feb	No	19	16	31	19	21	13	70	53	250	282	392	383	14	19	32	21	22	19	25	31	18	33	111	123	503	506
	Died	01	--	02	--	--	--	--	--	--	--	03	--	--	01	01	--	--	--	--	--	--	--	01	01	04	01
Mar	No	12	16	40	16	16	15	70	52	254	287	392	376	12	18	28	18	27	21	32	36	23	33	122	126	514	512
	Died	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Apr	No	10	13	39	11	19	23	70	52	253	265	391	364	10	18	26	15	29	27	34	27	21	30	118	117	509	481
	Died	--	--	--	--	--	--	01	--	01	--	02	01	--	--	--	01	--	--	--	--	--	--	--	01	02	02
May	No	9	11	36	14	15	25	61	53	265	264	386	367	10	13	33	17	23	33	33	27	22	30	121	120	507	487
	Died	--	--	--	01	--	--	--	--	--	--	--	02	--	02	--	--	--	--	--	--	--	--	--	--	--	02
Jun	No	8	10	39	14	18	26	58	54	252	264	375	368	8	12	30	16	22	35	26	28	22	30	108	121	483	489
	Died	--	01	--	--	--	--	--	--	--	01	--	02	--	--	01	--	--	--	--	--	--	--	--	--	01	02
Jul	No	15	19	38	12	15	28	51	55	261	264	380	378	18	08	26	17	24	36	31	33	23	28	122	122	502	500
	Died	--	--	01	01	--	--	--	--	02	01	02	02	--	--	--	01	--	--	--	--	--	01	--	02	02	04
Aug	No	24	22	35	10	16	32	65	42	265	278	405	384	22	11	24	13	16	35	35	36	23	27	120	122	525	506
	Died	--	--	--	--	--	--	--	--	01	01	01	01	--	--	--	--	--	--	--	--	--	--	--	--	01	01
Sep	No	28	30	34	10	18	29	55	38	272	274	407	381	24	20	28	12	25	28	39	10	26	24	142	94	549	475
	Died	--	--	--	--	--	--	--	--	--	01	--	01	02	--	--	--	--	--	--	--	--	--	02	--	02	01
Oct	No	26	21	30	19	16	22	60	44	279	278	411	384	23	31	23	08	23	31	45	14	29	21	143	105	545	489
	Died	03	02	--	--	--	--	--	--	01	--	04	02	04	--	01	--	--	--	--	--	--	--	05	--	09	02
Nov	No	22	20	28	20	15	23	69	42	284	283	418	388	22	29	18	11	21	28	52	16	30	25	143	109	561	497
	Died	01	--	--	01	--	--	--	--	--	--	01	01	01	01	--	--	--	--	--	--	--	--	--	--	02	02
Dec	No	17	16	25	28	20	23	67	42	268	286	397	396	29	30	12	20	10	27	38	16	34	27	131	120	528	515
	Died	--	01	--	--	--	--	--	--	--	--	--	01	01	--	--	--	--	--	--	--	--	--	--	--	01	01

M = Murrah (at Main Campus, Hisar) NR= Nili Ravi (at Sub Campus, Nabha)

ICAR-CIRB Buffalo conception rate in 2024

No. of AIs / Criteria	Ist I M	Ist I NR	Ist C M	Ist C NR	Ist CR M	Ist CR NR	IInd I M	IInd I NR	IInd C M	IInd C NR	IInd CR M	IInd CR NR	IIIrd I M	IIIrd I NR	IIIrd C M	IIIrd C NR	IIIrd CR M	IIIrd CR NR	IVth & above I M	IVth & above I NR	IVth & above C M	IVth & above C NR	IVth & above CR M	IVth & above CR NR	Overall I M	Overall I NR	Overall C M	Overall C NR	Overall CR M	Overall CR NR
Heifers	69	74	37	26	53.62	35.14	33	39	11	18	33.33	46.15	15	19	8	4	53.33	21.05	29	30	8	9	27.59	30.00	146	162	64	57	43.84	35.19
Adult	154	122	79	56	51.3	45.90	78	82	38	36	48.72	43.90	23	35	10	16	43.48	45.71	58	50	18	22	31.03	44.00	313	289	145	130	46.33	44.98
Overall	223	196	116	82	52.02	41.84	111	121	49	54	44.14	44.63	38	54	18	20	47.37	37.04	87	80	26	31	29.89	38.75	459	451	209	187	45.53	41.46

M =Murrah (at Main Campus, Hisar) NR= Nili Ravi (at Sub Campus, Nabha)

I = No. of animals inseminated; C= No. of animals conceived; CR% = Conception rate (%)

ICAR-CIRB Bull-wise conception rate 2024

Sr. No.	Bull No.		Set No.		Total No. of AI		Total Conceived		CR%	
Breed	M	NR	M	NR	M	NR	M	NR	M	NR
1.	297	27	21st	5th	13	2	4	-	30.77	-
2.	5414	252	21st	6th	24	8	12	6	50.00	75.00
3.	2383	254	16th	6th	18	17	16	7	88.89	41.18
4.	1053	312	16th	7th	12	36	3	18	25.00	50.00
5.	M 29	352	16th	7th	12	26	7	10	58.33	38.46
6.	1454	728	20th	10th	3	24	2	7	66.67	29.17
7.	5629	753	21st	10th	20	63	11	35	55.00	55.56
8.	7768	773	21st	10th	27	18	18	3	66.67	16.67
9.	5638	782	21st	10th	16	35	10	14	62.50	40.00
10.	5690	800	21st	10th	36	24	16	10	44.44	41.67
11.	2979	852	21st	10th	30	71	14	18	46.67	25.35
12.	4354	858	15th	10th	22	94	5	37	22.73	39.36
13.	5764	856	21st	10th	40	9	14	5	35.00	55.56
14.	2990	865	21st	10th	38	3	16	-	42.11	-
15.	109	912	21st	10th	31	8	11	6	35.48	75.00
16.	5723	968	non-set	10th	1	18	1	10	100.00	55.56
17.	112	-	21st	-	27	-	18	-	66.67	-
18.	4889	-	16th	-	11	-	3	-	27.27	-
19.	7630	-	21st	-	17	-	9	-	52.94	-
20.	6044	-	14th	-	2	-	1	-	50.00	-
21.	7990	-	21st	-	23	-	9	-	39.13	-
22.	3014	-	21st	-	9	-	3	-	33.33	-
23.	4592	-	16th	-	11	-	2	-	18.18	-
24.	2357	-	14th	-	13	-	4	-	30.77	-
25.	M51	-	17th	-	3	-	0	-	0.00	-
Overall		-	-	-	459	456	209	186	45.53	40.78

M = Murrah (at Main Campus, Hisar) NR= Nili Ravi (at Sub Campus, Nabha)

ICAR-CIRB Buffalo herds production status 2024

Lact. No	Number		Av. Total Lactation Yield (kg)		Av. Lactation length (days)		305-days yield (kg)		Av. Peak Yield (kg)	
	M	NR	M	NR	M	NR	M	NR	M	NR
1st	45	36	2665	2562±102.6	311	343±8.34	2577	2373±70.5	12.92	11.1±0.33
2nd	31	31	3232	2679±109.64	319	304±8.98	3086	2607±93.67	15.44	14.0±0.34
3rd	27	15	3304	2763±152.76	326	280±8.62	3138	2753±149.67	16.61	15.9±0.86
4th	19	08	3272	3025±203.02	304	322±13.53	3188	2935±165.40	16.61	14.75±0.83
5th and above	15	17	3408	2765±140.80	327	305±9.59	3279	2724±136.68	17.39	13.80±0.72
Overall	137	107	3082	2691±58.68	317	315±4.86	2964	2592±50.94	15.22	13.18±0.28

M = Murrah (at Main Campus, Hisar) NR= Nili Ravi (at Sub Campus, Nabha)

ICAR-CIRB Buffaloes reproduction performance 2024

Traits	Value	1		2		3		4		5 & above		Overall	
Breed		M	NR	M	NR	M	NR	M	NR	M	NR	M	NR
Av. Age at First Calving (Months)	N ΣX SE	39 39.54 ± 0.47	59 43.21 ±0.49										
Av. Service Period (Days)	N ΣX SE			37 138.86 ± 13.80	23 176 ±13.80	23 136.09 ± 15.60	21 115 ±13.79	18 160.28 ± 21.87	12 121 ±16.47	27 125.70 ± 15.19	19 137 ±12.87	105 138.54 ± 8.00	75 140 ±7.54
Av. Dry Period (Days)	N ΣX SE			37 135.92 ± 10.76	23 156 ±11.58	23 119.26 ±11.14	12 120 ±11.90	18 143.83 ± 15.81	12 158 ±19.55	27 125.74 ± 10.00	19 150 ±15.48	105 131.01 ± 5.83	75 145 ±7.08
Av. Calving Interval (Days)	N ΣX SE			37 446.76 ± 13.87	23 484 ±13.89	23 444.78 ± 15.71	21 423 ±13.93	18 469.44 ± 21.62	12 435 ±16.45	27 435.96 ± 15.19	19 449 ±13.06	105 447.44 ± 8.00	75 450 ±7.56

M = Murrah (at Main Campus, Hisar) **NR**= Nili Ravi (at Sub Campus, Nabha)

ICAR-CIRB Month wise milk sold in year 2024

Month	Total Milk Produced (kg)	
	M	NR
Jan, 2024	35596.00	27246.3
Feb, 2024	31588.00	26125.4
Mar, 2024	32025.50	29432.2
Apr, 2024	30158.00	25888.9
May, 2024	28028.00	26340.8
Jun, 2024	22247.50	24251.5
Jul, 2024	22753.00	23513.9
Aug, 2024	25999.00	23513.7
Sep, 2024	29659.00	23010.3
Oct, 2024	32297.00	27519.1
Nov, 2024	29978.00	29442.9
Dec, 2024	32008.00	31570.0
Total	352337.00	317855.0

M = Murrah (at Main Campus, Hisar) NR= Nili Ravi (at Sub Campus, Nabha)

ICAR-CIRB Buffalo herd production performance 2024

Month	In milk		Dry		Total		% in Milk		Wet Av.(kg)		Herd Av.(kg)	
Breed	M	NR	M	NR	M	NR	M	NR	M	NR	M	NR
Jan	134	97	50	49	184	146	73	66	10.98	9.04	8.00	5.99
Feb	132	102	46	50	178	152	74	67	10.30	8.74	7.67	5.87
Mar	130	110	43	55	173	165	75	67	9.70	8.65	7.29	5.75
Apr	125	111	48	54	173	165	72	67	10.05	7.77	7.23	5.21
May	115	108	58	48	173	156	67	69	9.53	7.83	6.35	5.43
Jun	105	102	64	57	169	158	62	65	8.55	7.89	5.31	5.10
July	102	97	60	64	162	161	63	60	8.69	7.80	5.47	4.71
Aug	107	101	58	65	165	166	65	61	10.09	7.46	6.52	4.58
Sept	121	101	55	65	176	166	69	61	10.46	7.62	7.21	4.62
Oct	134	113	50	57	184	170	73	67	10.01	7.81	7.26	5.21
Nov	132	122	54	53	186	175	71	70	9.58	8.07	6.78	5.63
Dec	129	126	51	53	180	180	72	70	9.79	8.07	7.04	5.67
Overall	122	108	53	56	175	463	70	66	9.85	8.06	6.86	5.31

M = Murrah (at Main Campus, Hisar) NR= Nili Ravi (at Sub Campus, Nabha)

ICAR-CIRB Buffalo herd production performance since 1992-93 (Part I)

Year	In milk		Dry		Total		% in Milk		Wet Av (kg)		Herd Av (kg)	
Breed	M	NR	M	NR	M	NR	M	NR	M	NR	M	NR
1992	165	98	111	53	276	151	60.60	64	4.80	5.86	2.83	3.42
1993	153	81	125	58	178	139	55.00	58	5.65	5.75	3.10	3.39
1994	181	92	85	44	266	136	68.10	67	6.09	6.01	4.15	4.18
1995	153	86	82	35	235	121	65.19	71	6.43	5.61	4.19	3.99
1996	122	81	83	52	205	133	59.56	61	5.62	5.71	3.35	3.49
1997	121	113	76	40	197	153	61.38	74	6.12	6.03	3.75	4.45
1998	133	104	73	42	206	146	64.52	72	6.77	6.13	4.37	4.26
1999	137	85	72	39	209	124	65.48	68	6.85	6.01	4.49	4.23
2000	148	96	78	33	226	129	65.39	74	6.68	6.31	4.37	4.69
2001	147	86	70	38	217	124	67.70	69	6.59	6.85	4.46	4.82
2002	143	106	71	38	214	144	67.00	73	6.27	6.56	4.20	4.83
2003	151	106	72	37	223	143	67.69	74	6.49	6.35	4.39	4.70
2004	154	100	69	47	224	147	68.97	67	6.39	6.86	4.40	4.65
2005	151	114	77	46	238	160	66.37	71	6.57	6.85	4.36	4.84
2006	137	119	92	48	229	167	59.81	71	6.45	6.20	3.86	4.40
2007	146	102	71	54	217	156	67.32	65	6.64	6.73	4.47	4.46
2008	133	122	66	44	199	166	66.00	73	6.50	6.91	4.35	5.03
2009	106	110	65	58	171	168	62.00	65	7.01	7.00	4.35	4.66
2010	109	98	64	43	173	141	62.97	70	7.45	7.11	4.69	4.93
2011	110	84	58	40	168	124	65.38	68	7.83	7.74	5.12	5.30
2012	109	90	69	49	178	139	62.24	65	7.74	8.26	4.76	5.34
2013	105	94	65	52	170	146	61.78	64	8.01	8.25	4.95	5.32
2014	116	99	50	41	166	140	69.97	71	8.25	8.48	5.77	5.98
2015	114	110	62	41	176	151	64.83	72	8.04	8.51	5.21	6.22
2016	110	102	57	53	167	155	65.82	65	8.08	7.96	5.32	5.23
2017	115	97	54	45	169	142	67.78	68	8.71	8.52	5.90	5.84
2018	101	109	54	38	155	147	65.08	74	8.92	8.82	5.80	6.54
2019	118	99	49	56	167	155	70	64	9.53	9.09	6.70	5.83
2020	131	102	51	46	182	148	72	69	9.79	8.94	7.02	6.17
2021	132	102	48	43	180	145	73	71	10.18	8.70	7.50	6.70
2022	127	107	53	52	180	156	71	67	10.06	8.28	7.09	5.64
2023	122	100	50	50	172	150	71	67	10.26	8.62	7.27	5.80
2024	122	108	53	56	175	163	70	66	9.85	8.06	6.86	5.31

M = *Murrah (at Main Campus, Hisar)* **NR**= *Nili Ravi (at Sub Campus, Nabha)*

ICAR-CIRB Buffalo herd production performance since 1992-93 (Part II)

Year	Av. Total Lact. Milk Yield (kg)		Av. Lact. Length (days)		Av. 305d or less Milk. Yield (kg)	
Breed	M	NR	M	NR	M	NR
1991	1761 (154)	2017 (68)	374 (154)	373 (68)	1552 (154)	1813 (68)
1992	1804 (137)	1974 (105)	395 (137)	309 (105)	1508 (137)	1921 (105)
1993	1980 (148)	1776 (70)	419 (148)	328 (70)	1686 (148)	1744 (70)
1994	1930 (206)	2043 (77)	334 (206)	350 (77)	1787 (206)	1944 (77)
1995	1936 (147)	2049 (70)	313 (147)	354 (70)	1855 (147)	1894 (70)
1996	1879 (173)	2092 (81)	313 (173)	392 (81)	1775 (173)	1807 (81)
1997	1784 (123)	2126 (67)	304 (123)	354 (67)	1688 (123)	2056 (67)
1998	1762 (153)	2153 (97)	284 (153)	341 (97)	1702 (153)	2056 (97)
1999	2138 (141)	1968 (99)	313 (141)	337 (99)	2042 (141)	1874 (99)
2000	1997 (173)	1890 (89)	306 (173)	305 (89)	1914 (173)	1812 (89)
200	1954 (152)	1926 (86)	290 (152)	296 (86)	1898 (152)	1885 (86)
2002	1987 (148)	2007 (105)	303 (148)	293 (105)	1902 (148)	1941 (105)
2003	1910 (148)	1968 (93)	299 (148)	307 (93)	1837 (148)	1895 (93)
2004	2017 (167)	1974 (116)	319 (167)	315 (116)	1886 (167)	1848 (116)
2005	2047 (149)	2190 (102)	321 (149)	306 (102)	1921 (149)	2090 (102)
2006	1995 (170)	1921 (118)	322 (170)	304 (118)	1882 (170)	1795 (118)
2007	1954 (169)	1787 (122)	299 (169)	302 (122)	1891 (169)	1629 (122)
2008	2076 (138)	2036 (108)	325 (138)	289 (108)	1926 (138)	1929 (108)
2009	2285 (102)	1927 (146)	361 (102)	302 (146)	1995 (102)	1822 (146)
2010	2471 (113)	2042 (115)	337 (113)	292 (115)	2247 (113)	1972 (115)
2011	2598 (116)	2045 (88)	338 (116)	279 (88)	2374 (116)	1998 (88)
2012	2478 (110)	2048 (123)	318 (110)	264 (123)	2335 (110)	2017 (123)
2013	2394 (98)	2297 (109)	333 (98)	285(109)	2291 (98)	2241 (109)
2014	2502 (110)	2464 (115)	313 (110)	303(115)	2355 (110)	2384 (115)
2015	2483 (152)	2564 (110)	322 (152)	305(110)	2336 (152)	2471 (110)
2016	2567 (133)	2452 (136)	312 (133)	298(136)	2457 (133)	2377 (136)
2017	2480 (140)	2363 (110)	295 (140)	282(110)	2424(140)	2321 (110)
2018	2641 (123)	2797 (111)	305 (123)	311 (111)	2567 (123)	2679 (111)
2019	2673 (88)	2670 (81)	300 (88)	301 (81)	2607 (88)	2589 (81)
2020	2821 (164)	2645 (141)	306 (164)	303 (141)	2704 (164)	2576 (141)
2021	2977 (153)	2585 (119)	304 (153)	294 (119)	2867 (153)	2525 (119)
2022	2920 (151)	2651 (115)	298 (151)	299 (115)	2846 (151)	2571 (115)
2023	3060 (140)	2784 (101)	306 (140)	320 (101)	2952 (140)	2670 (101)
2024	3082 (137)	2691(107)	317 (137)	315(107)	2964 (137)	2592(107)

M = *Murrah (at Main Campus, Hisar)* **NR**= *Nili Ravi (at Sub Campus, Nabha); Figures in Parentheses are Number of observation*

Agricultural Farms

The institute at main campus has a total area of 780 acres at Hisar, out of which about 50 per cent land is arable and under fodder cultivation for institute livestock. The sub-campus has 516 acres of highly fertile land, which meets the requirements of green fodder, dry fodder and cereal grains for Nili-Ravi animals herd at Nabha. The institute is self-sufficient in meeting its grain and green fodder requirements for its herds, while majority requirement of dry fodder is also met from its own agricultural farms production. Excess grains are sold to earn extra revenue. During the year 2024, the total green and dry fodder production during the year was 41294 and 1217 quintals, respectively, while grain production was 1392.35 quintals. At Sub-Campus Nabha, the total green and dry fodder production during the year was 53309 and 3305.5 quintals, respectively, while grain production was 4714.98 quintals. Institute takes guidance from specialized agriculture institutes of ICAR and SAUs for land reclamation, advanced farming techniques and for meeting its requirements of quality seeds of fodder and grain crops.

Feed Units: Feed units, one at each campus, are engaged in preparation of concentrate feed for feeding to farm animals by formulating feed for different categories of animals. Feed unit prepares about 650 tonnes of concentrate feed for feeding to farm animals. In addition, approx. 17 tonnes of area specific mineral mixture is being prepared annually for farm animals as well as for sale to the farmers for its popularization. Feed processing unit and attached grain / cake store cover an area of about 4500 square feet together with an open drying place of about 1500 sq. ft. This unit is equipped with automatic feed grinder cum mixer of capacity (10 Q/hr) with lifts for grinding and mixing of concentrate mixture. Similarly, another feed unit with automation is available at sub-campus. These feed units allow the institute to ensure quality of the concentrate fed to the animals as well as experimentation.

Guest house and student hostel: Institute guest house has fourteen well furnished rooms for accommodating 28 guests at a time. It has separate reception with attached well-furnished neat and clean lounge and dining hall to cater to the requirements of visitors as well as get together for institute fraternity. Recently, student hostel added in the institute campus having eight well furnished rooms for accommodating 16 persons at a time.

Farm Machinery and workshop: This section is having nine tractors equipped with agricultural implements such as straw making reaper, zero tillage seed drill machine, chaff cutter, harrow, fodder harvester cum chopper and a laser laveller to improve the farm efficiency. A tractor driven rain gun system for irrigation was also installed. In addition, a TMR (Total mixed ration) machine has also been procured and being used. The workshop section of sub-Campus Nabha is also equipped with agricultural implements such as nine tractors, straw making reaper, laser laveller, zero tillage seed drill machine, chaff cutter, harrow, fodder harvester cum chopper and six tractor trolleys to improve the farm efficiency.

Electrical section: Electrical section of the institute is responsible for providing round the clock electric supply to the laboratories of institute with zero fault maintenance motto at lowest possible cost. It maintains 11 KV sub-station comprising of 500 KVA transformer, OCB, ACB, LT panels and two DG sets of 250 and 110 Kva capacities for power backup. Section attends day to day electric maintenance related complaints of different labs, guest house and residential units. Repair, servicing and maintenance of more than 100 air conditioners, geysers, electric motors upto 25hp, street lights, different size underground LT cables and HT and LT overhead lines of the agriculture farm of the institute are part of the day to day activity. Operation and maintenance of audio visual equipment of the seminar hall like; power amplifiers, audio mixer, dbx- complete sound management system and LCD projections are taken care of. The institute has shifted to use LED lights for conserving energy. Instituted shifted 100% on LED lights to save electricity.

Estate Section: Estate Section of this institute is responsible for maintenance, modification and repairs works in all the residential, office building, animal sheds and water channels in the agriculture farm. Estate section ensures water supply and sewage disposal to the whole campus. Day to day maintenance activities including cleaning of roads, building and pathways in the campus are also executed through this section.

Landscaping: This section looks after greens at the campus including gardens, roadside maintenance and colony parks. Tree plantation, pruning of trees, removal of fallen dry trees, removal of horticulture wastes, plantation / landscaping at campus, creation & maintenance of nurseries of saplings of trees, shrubs & seedbeds of ground covers & seasonal flowers are the responsibilities of this section. The institute campus bears a neat and green look through plantation of appropriate ornamental plants, trees and agro-forestry trees throughout campus for a clean and healthy environment.

Land: At main campus, 30 acres of saline soil was reclaimed by growing paddy followed by barley crops. In this area, crops were taken for the first time since the inception of the institute. Due to encouraging results, it is proposes to grow paddy in another 30 acres of saline soil during next year. About 75 acres of agricultural farm land was levelled with laser leveller. Last year bushes were uprooted from 170 acres of land that was lying unused. This year about 50 acres of this land has been laid out with roads, channel and blocks for use in crop production. The emphasis is on increasing productivity per acre of land with optimum resource use.

National and International Collaborations

Over the years, the institute has established collaborations with various national and international institutions. Projects were undertaken with various externally funded agencies at this institute sponsored by DBT, DST, USAID, NAIP, NASF, DADF, BMGF, Network / All India Coordinated projects and other external agencies. Collaboration is continuing with several ICAR institutes, including NDRI, IVRI, IASRI, NBAGR, NIANP, CSWRI, IARI and SAUs like CCS HAU, LUVAS, PAU, GADVASU, RAJUVAS, BASU and some KVKs for postgraduate research in the field of buffalo husbandry, nutrition, physiology and reproduction. For breed improvement activities, Network Project on Buffalo Improvement is being implemented in collaboration with several ICAR institutes and SAUs located in the home tracts of various buffalo breeds.

Priority setting, monitoring and evaluation of research activities of Institute

The institute receives advice on research and management through Quinquennial Review Team (QRT), Research Advisory Committee (RAC), Institute Research Committee (IRC) and Institute Management Committee (IMC) which consists of different stakeholders including prominent researchers, policy makers and progressive farmers. A number of sections like Priority Setting, Monitoring and Evaluation Cell, RFD Cell, Institute Technology Management Unit (ITMU) and Agriculture Knowledge Management Unit (AKMU) cater to different responsibilities for smooth functioning of research activities.

ICAR-CIRB Buffalo herd production performance 2024

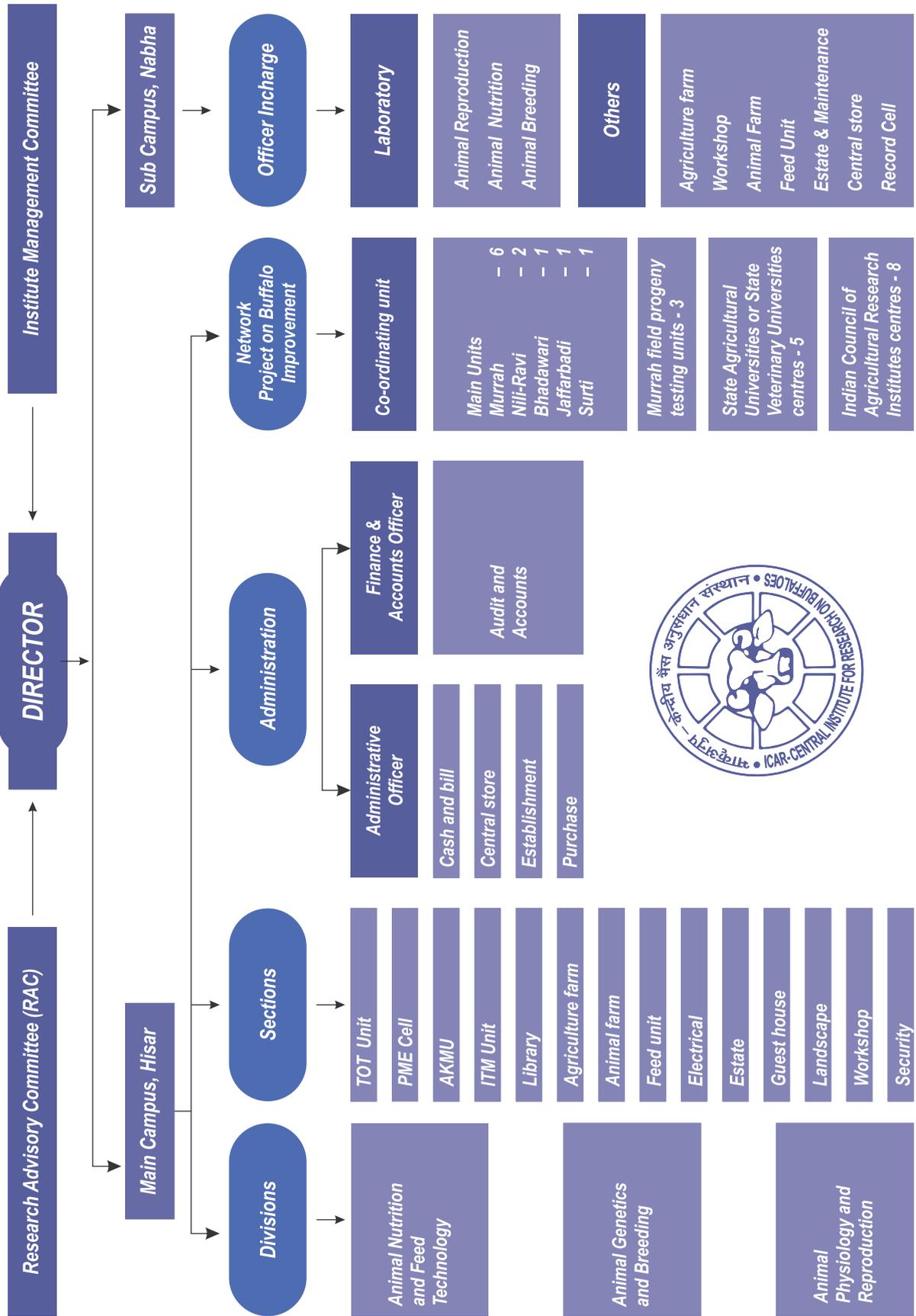| Month	In milk		Dry		Total		% in Milk		Wet Av.(kg)		Herd Av.(kg)	
Breed	M	NR	M	NR	M	NR	M	NR	M	NR	M	NR
Jan	134	97	50	49	184	146	73	66	10.98	9.04	8.00	5.99
Feb	132	102	46	50	178	152	74	67	10.30	8.74	7.67	5.87
Mar	130	110	43	55	173	165	75	67	9.70	8.65	7.29	5.75
Apr	125	111	48	54	173	165	72	67	10.05	7.77	7.23	5.21
May	115	108	58	48	173	156	67	69	9.53	7.83	6.35	5.43
Jun	105	102	64	57	169	158	62	65	8.55	7.89	5.31	5.10
July	102	97	60	64	162	161	63	60	8.69	7.80	5.47	4.71
Aug	107	101	58	65	165	166	65	61	10.09	7.46	6.52	4.58
Sept	121	101	55	65	176	166	69	61	10.46	7.62	7.21	4.62
Oct	134	113	50	57	184	170	73	67	10.01	7.81	7.26	5.21
Nov	132	122	54	53	186	175	71	70	9.58	8.07	6.78	5.63
Dec	129	126	51	53	180	180	72	70	9.79	8.07	7.04	5.67
Overall	122	108	53	56	175	463	70	66	9.85	8.06	6.86	5.31

M = Murrah (at Main Campus, Hisar) NR= Nili Ravi (at Sub Campus, Nabha)

ICAR-CIRB Buffalo herd production performance since 1992-93 (Part I)

Year	In milk		Dry		Total		% in Milk		Wet Av (kg)		Herd Av (kg)	
Breed	M	NR	M	NR	M	NR	M	NR	M	NR	M	NR
1992	165	98	111	53	276	151	60.60	64	4.80	5.86	2.83	3.42
1993	153	81	125	58	178	139	55.00	58	5.65	5.75	3.10	3.39
1994	181	92	85	44	266	136	68.10	67	6.09	6.01	4.15	4.18
1995	153	86	82	35	235	121	65.19	71	6.43	5.61	4.19	3.99
1996	122	81	83	52	205	133	59.56	61	5.62	5.71	3.35	3.49
1997	121	113	76	40	197	153	61.38	74	6.12	6.03	3.75	4.45
1998	133	104	73	42	206	146	64.52	72	6.77	6.13	4.37	4.26
1999	137	85	72	39	209	124	65.48	68	6.85	6.01	4.49	4.23
2000	148	96	78	33	226	129	65.39	74	6.68	6.31	4.37	4.69
2001	147	86	70	38	217	124	67.70	69	6.59	6.85	4.46	4.82
2002	143	106	71	38	214	144	67.00	73	6.27	6.56	4.20	4.83
2003	151	106	72	37	223	143	67.69	74	6.49	6.35	4.39	4.70
2004	154	100	69	47	224	147	68.97	67	6.39	6.86	4.40	4.65
2005	151	114	77	46	238	160	66.37	71	6.57	6.85	4.36	4.84
200	137	119	92	48	229	167	59.81	71	6.45	6.20	3.86	4.40
2007	146	102	71	54	217	156	67.32	65	6.64	6.73	4.47	4.46
2008	133	122	66	44	199	166	66.00	73	6.50	6.91	4.35	5.03
2009	106	110	65	58	171	168	62.00	65	7.01	7.00	4.35	4.66
2010	109	98	64	43	173	141	62.97	70	7.45	7.11	4.69	4.93
2011	110	84	58	40	168	124	65.38	68	7.83	7.74	5.12	5.30
2012	109	90	69	49	178	139	62.24	65	7.74	8.26	4.76	5.34
2013	105	94	65	52	170	146	61.78	64	8.01	8.25	4.95	5.32
2014	116	99	50	41	166	140	69.97	71	8.25	8.48	5.77	5.98
2015	114	110	62	41	176	151	64.83	72	8.04	8.51	5.21	6.22
2016	110	102	57	53	167	155	65.82	65	8.08	7.96	5.32	5.23
2017	115	97	54	45	169	142	67.78	68	8.71	8.52	5.90	5.84
2018	101	109	54	38	155	147	65.08	74	8.92	8.82	5.80	6.54
2019	118	99	49	56	167	155	70	64	9.53	9.09	6.70	5.83
2020	131	102	51	46	182	148	72	69	9.79	8.94	7.02	6.17
2021	132	102	48	43	180	145	73	71	10.18	8.70	7.50	6.70
2022	127	107	53	52	180	156	71	67	10.06	8.28	7.09	5.64
2023	122	100	50	50	172	150	71	67	10.26	8.62	7.27	5.80
2024	122	108	53	56	175	163	70	66	9.85	8.06	6.86	5.31

M = Murrah (at Main Campus, Hisar) NR= Nili Ravi (at Sub Campus, Nabha)

ICAR-CIRB Buffalo herd production performance since 1992-93 (Part II)

Year	Av. Total Lact. Milk Yield (kg)		Av. Lact. Length (days)		Av. 305d or less Milk. Yield (kg)	
Breed	M	NR	M	NR	M	NR
1991	1761 (154)	2017 (68)	374 (154)	373 (68)	1552 (154)	1813 (68)
1992	1804 (137)	1974 (105)	395 (137)	309 (105)	1508 (137)	1921 (105)
1993	1980 (148)	1776 (70)	419 (148)	328 (70)	1686 (148)	1744 (70)
1994	1930 (206)	2043 (77)	334 (206)	350 (77)	1787 (206)	1944 (77)
1995	1936 (147)	2049 (70)	313 (147)	354 (70)	1855 (147)	1894 (70)
1996	1879 (173)	2092 (81)	313 (173)	392 (81)	1775 (173)	1807 (81)
1997	1784 (123)	2126 (67)	304 (123)	354 (67)	1688 (123)	2056 (67)
1998	1762 (153)	2153 (97)	284 (153)	341 (97)	1702 (153)	2056 (97)
1999	2138 (141)	1968 (99)	313 (141)	337 (99)	2042 (141)	1874 (99)
2000	1997 (173)	1890 (89)	306 (173)	305 (89)	1914 (173)	1812 (89)
2001	1954 (152)	1926 (86)	290 (152)	296 (86)	1898 (152)	1885 (86)
2002	1987 (148)	2007 (105)	303 (148)	293 (105)	1902 (148)	1941 (105)
2003	1910 (148)	1968 (93)	299 (148)	307 (93)	1837 (148)	1895 (93)
2004	2017 (167)	1974 (116)	319 (167)	315 (116)	1886 (167)	1848 (116)
2005	2047 (149)	2190 (102)	321 (149)	306 (102)	1921 (149)	2090 (102)
2006	1995 (170)	1921 (118)	322 (170)	304 (118)	1882 (170)	1795 (118)
2007	1954 (169)	1787 (122)	299 (169)	302 (122)	1891 (169)	1629 (122)
2008	2076 (138)	2036 (108)	325 (138)	289 (108)	1926 (138)	1929 (108)
2009	2285 (102)	1927 (146)	361 (102)	302 (146)	1995 (102)	1822 (146)
2010	2471 (113)	2042 (115)	337 (113)	292 (115)	2247 (113)	1972 (115)
2011	2598 (116)	2045 (88)	338 (116)	279 (88)	2374 (116)	1998 (88)
2012	2478 (110)	2048 (123)	318 (110)	264 (123)	2335 (110)	2017 (123)
2013	2394 (98)	2297 (109)	333 (98)	285(109)	2291 (98)	2241 (109)
2014	2502 (110)	2464 (115)	313 (110)	303(115)	2355 (110)	2384 (115)
2015	2483 (152)	2564 (110)	322 (152)	305(110)	2336 (152)	2471 (110)
2016	2567 (133)	2452 (136)	312 (133)	298(136)	2457 (133)	2377 (136)
2017	2480 (140)	2363 (110)	295 (140)	282(110)	2424(140)	2321 (110)
2018	2641 (123)	2797 (111)	305 (123)	311 (111)	2567 (123)	2679 (111)
2019	2673 (88)	2670 (81)	300 (88)	301 (81)	2607 (88)	2589 (81)
2020	2821 (164)	2645 (141)	306 (164)	303 (141)	2704 (164)	2576 (141)
2021	2977 (153)	2585 (119)	304 (153)	294 (119)	2867 (153)	2525 (119)
2022	2920 (151)	2651 (115)	298 (151)	299 (115)	2846 (151)	2571 (115)
2023	3060 (140)	2784 (101)	306 (140)	320 (101)	2952 (140)	2670 (101)
2024	3082 (137)	2691(107)	317 (137)	315(107)	2964 (137)	2592(107)

M = Murrah (at Main Campus, Hisar) NR= Nili Ravi (at Sub Campus, Nabha); Figures in Parentheses are Number of observation

ICAR-Central Institute for Research on Buffaloes

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Research Advisory Committee (RAC)

Institute Management Committee

                    DIRECTOR

Main Campus, Hisar                    Sub Campus, Nabha

Divisions    Sections    Administration    Network Project on Buffalo Improvement    Officer Incharge

Divisions:
  Animal Nutrition and Feed Technology
  Animal Genetics and Breeding
  Animal Physiology and Reproduction

Sections:
  TOT Unit
  PME Cell
  AKMU
  ITM Unit
  Library
  Agriculture farm
  Animal farm
  Feed unit
  Electrical
  Estate
  Guest house
  Landscape
  Workshop
  Security

Administration:
  Administrative Officer
    Cash and bill
    Central store
    Establishment
    Purchase
  Finance & Accounts Officer
    Audit and Accounts

Network Project on Buffalo Improvement:
  Co-ordinating unit
    Main Units
    Murrah          – 6
    Nili-Ravi       – 2
    Bhadawari       – 1
    Jaffarbadi      – 1
    Surti           – 1
    Murrah field progeny testing units - 3
    State Agricultural Universities or State Veterinary Universities centres - 5
    Indian Council of Agricultural Research Institutes centres - 8

Officer Incharge:
  Laboratory
    Animal Reproduction
    Animal Nutrition
    Animal Breeding
  Others
    Agriculture farm
    Workshop
    Animal Farm
    Feed Unit
    Estate & Maintenance
    Central store
    Record Cell
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ICAR-CENTRAL INSTITUTE FOR RESEARCH ON BUFFALOES

RESEARCH ACHIEVEMENTS

GENETICS AND BREED IMPROVEMENT

Buffalo Genetic resources improvement programme is the major agenda undertaken for genetic improvement of Murrah and other buffalo breeds. Continuous efforts have been made to understand, characterize and take forward positives for breed improvement programme. The Division of Animal Genetics and Breeding (AGB) at the institute is the coordinating centre for Network Project on Buffalo Improvement, addressing important breeds and operating through different centres across India. Genetic improvement is targeted by implementing efficient breeding plans, envisaged with scientific breeding, using powerful computing systems maintaining large pedigrees of animals and vigilant technological interventions in the area of nutrition and reproduction. Genetic improvement is evaluated through associated herd and field progeny testing, performance recording and genetic analysis of data. An effective dissemination of high class buffalo germplasm with recording of performance data in fields through Field Progeny Testing Programme is generating data resource to develop 'genome-to-phenotype' models for predicting animal's genetic makeup. Keeping pace with international developments made in the subject as well as looking into national priorities, significant contribution have been made through a number of research projects undertaken in different areas of germplasm conservation, qualitative genetics, population genetics and molecular genetics.

Network Project on Buffalo Improvement

TK Datta, RK Sharma, SK Phulia, Sanjay Kumar, Pradeep Kumar, Dharmendra Kumar, Jerome A and Supriya Chhotaray

The Network Project on Buffalo Improvement was initiated in 1993 at 5 different Murrah centres and ICAR-Central Institute for Research on Buffalo, Hisar was coordinating centre. The project was started with the aim to produce genetically superior bulls for improvement of buffaloes. This has ensured sustained maintenance and production of improved germplasm on large scale for use in buffalo improvement program and for establishing linkages with institutions. Progeny testing in Murrah Breed is carried out at six participating institutional /SVU centres viz. CIRB Hisar, NDRI Karnal, IVRI Izatnagar, GADVASU Ludhiana, LUVAS Hisar and ICAR Research Complex for Eastern Region Patna. LRS Mamnoor (PVNRTVU, Telangana) has been added to NPBI as participating centre for Murrah in year 2024. Three field units of Murrah were also initiated in 2001 at CIRB Hisar, NDRI Karnal and GADVASU Ludhiana with the aim to produce more number of daughters per bull for evaluating the breeding bulls with higher accuracy. A total of 1060 breedable buffaloes are being maintained at institutional Murrah centres for production of high genetic merit male and female calves to be used for production of future sires.

Five other breeds and progeny testing units were added in year 2001. Elite herds of Jaffarabadi, Surti, Bhadawari and Nili Ravi breeds of buffaloes are being maintained in their respective breeding tracts. Nili-Ravi and Bhadawari breed centres are functioning as conservation and improvement units and Jaffarabadi and Surti breed centre are concentrating on field progeny testing along with maintaining the elite herd for bull production and testing. A breedable herd of 646 (Nili-Ravi-358, Jaffarabadi-154, Surti-72 and Bhadawari-62) is being maintained at the above four breeds.

Participating centres under NPBI

Coordinating Unit, CIRB, Hisar

Sr. No.	Name of Centre	Breed	Year of start
ICAR Institutes			
I	ICAR-CIRB, Hisar	Murrah	1993
II	ICAR-NDRI, Karnal	Murrah	1993
III	ICAR-IVRI, Izatnagar	Murrah	1993
IV	ICAR- IGFRI, Jhansi	Bhadawari	2001
V	ICAR-CIRB, Sub - Campus Nabha	Nili-Ravi	2001
VI	ICAR Research Complex, ER Patna	Murrah	2014
Animal Science/Agricultural Universities			
I	GADVASU, Ludhiana	Murrah	1993
II	LUVAS, Hisar	Murrah	1993
III	JAU, Junagarh	Jaffarabadi	2001
IV	RAJVASU, Vallabhnagar	Surti	2001
V	GADVASU, Ludhiana	Nili-Ravi	2018
VI	LRS Mamnoor (PVNRTVU, Telangana)	Murrah	2024
Field Unit			
I	ICAR-CIRB, Hisar	Murrah	2001
II	ICAR-NDRI, Karnal	Murrah	2001
III	GADVASU, Ludhiana	Murrah	2001

Progeny test evaluation of 17th set bulls (Murrah) used during July 2017 to December 2018

Bull No	Location	Date of Birth	Dam No.	Sire No./ Set No	Dam's best lact. yield (305 or less days) kg	No. of Daughters Completed 1st lact	Average Daughter FLMY (kg)	Daughter Maximum FLMY (kg)	Breeding Value	% Super-iority	Rank
M-51	CIRB	03-02-2006	22 P	274 P	4668	68	2528.83	3239.50	2558.57	6.76	I
2594	GADVASU	30-07-2014	2221	1994 PT/ Set 9	3557	85	2515.36	3900.00	2532.78	5.68	II
2565	GADVASU	24-01-2014	2522	2269/Set 13	3287	82	2465.14	3201.00	2469.72	3.05	III
6942	NDRI	23-08-2014	6627	4439/Set 14	3533	51	2402.30	3752.00	2400.18	0.15	IV
Dara	Field	29-09-2014	Rani	Not Known	PY 28.9 kg	36	2389.05	3151.00	2393.37	-0.14	V
M-53	CIRB	25-02-2006	23 P	FT 328	3789	30	2387.87	3155.50	2388.72	-0.33	VI
1148	LUVAS	28-04-2015	894	6066/Set 14	3587	30	2375.52	2988.00	2385.31	-0.47	VII
4715	CIRB	27-03-2014	3351	4093/Set 14	3059	88	2369.31	2997.05	2381.14	-0.65	VIII
4837	CIRB	30-11-2014	3417	2422 PT/ Set 8	3076	47	2365.61	3166.15	2374.48	-0.92	IX
7010	NDRI	27-12-2014	415	4100/Set 14	3068	70	2359.41	3304.00	2370.78	-1.08	X
Sikander	Field	15-07-2013	Rani	Not Known	PY 28.9 kg	81	2352.53	3209.90	2368.49	-1.17	XI
2558	GADVASU	20-12-2013	2279	1875 PT/ Set 8	3574	26	2347.73	3296.00	2351.36	-1.89	XII
4687	CIRB	20-01-2014	3156	1994 PT/ Set 9	3309	67	2346.38	3327.25	2350.63	-1.92	XIII
4733	CIRB	14-06-2014	4216	6044 PT/ Set 14	2851	52	2336.61	3662.30	2346.97	-2.07	XIV
2607	GADVASU	17-12-2014	2605	2369/Set 14	3899	37	2321.76	3302.00	2342.03	-2.28	XV
B1/330	CIRB	29-12-2006	05B/900	FT 326	4595	32	2295.54	3066.00	2331.72	-2.71	XVI

Herd Average: 2396.64 kg (N=882)

Bull no. M-51 (CIRB), and 2594 (GADVASU) ranked 1st and 2nd, respectively were declared as proven bulls for nominated mating during January 2025 to June 2026.

Breeding bulls of 21st set for test mating

Test mating of 14 Murrah bulls of 21st set initiated in July 2023 and completed on 30th December 2024 at associated centres of Murrah main unit and field progeny testing unit for genetic improvement under NPBI.

Bull no.	D.O.B.	Dam No.	Sire No.	Dam's All Lact Milk Yield (305 or less days) (kg)	Highest Yield/ Best Peak
109 (LUVAS)	17/09/19	1068	53M Set 17	3128/3660/3432/3206	3660/16.3
112 (LUVAS)	29/09/19	943	6942 Set 17	2735/3276/2919/4390/3720/2619	4390/17.2
297 (IVRI)	08/08/17	869	4705 Set 16	2385/2922/2806/ 3234/3407	3407/17.5
2979 (GADVASU)	26/11/20	3083	2689 Set 18	2411/3440	3440/21.6
2990 (GADVASU)	24/12/20	2741 Pur	1219 Set 18	2104/3416/3723/2180 (Auct)	3723/21.2
3014 (GADVASU)	06/10/20	Dhano	Birla Field	4420 (Estimated on PY)	PY: 24.56
5414 (CIRB)	03/10/18	4593	4998 Non-Set	2708/3321/3025/3177/3183	3321/19.0
5629 (CIRB)	29/01/20	4613	2645 Set 18	2475/3501/4043/4180/3767	4180/20.2
5638 (CIRB)	24/02/20	5223	2234PT Set 13	3364/3691	3691/19.5
5690 (CIRB)	02/08/20	5021	4905 Set 18	3573/4029/3416	4029/21.0
5764 (CIRB)	22/11/20	4989	4905 Set 18	2708/3616/2675/3644	3616/17.5
7630 (NDRI)	05/09/18	6852	M-51 Set 17	3343/2147/2217/2341	3343/15.5
7768 (NDRI)	04/02/19	6922	2607 Set 17	2862/3251/3323/2125	3323/16.5
7990 (NDRI)	19/08/20	6626	183 PT Set 12	3394/3991/3090/3109/3033	3991/18.0

A total of 21 Murrah bulls were selected under 22nd set initiated in January 2025 and will be completed on 30th June 2026 at associated centres of Murrah main unit and field progeny testing unit for genetic improvement under NPBI.

21st Annual Review Meeting of Network Project on Buffalo Improvement (NPBI), was held at ICAR-IGFRI, Jhansi on 12-13 November, 2024. In this meeting, the progress of the project for the year 2023-24 was reviewed for all respective centers. The meeting was chaired by Dr. Raghavendra Bhatta, DDG (AS), ICAR, New Delhi. Dr. T K Datta, Director, ICAR-CIRB, Hisar & Project Coordinator, NPBI, Dr. G K Gaur, ADG (AP & B), Dr. H K Narula, Principal Scientist (AP & B) from ICAR Headquarter, New Delhi and Dr. R K Sharma, Incharge NPBI attended the meeting. The inaugural session of the ARM was also attended by Dr. P Kaushal, Director ICAR-IGFRI, Jhansi, all Heads of all Divisions of IGFRI.

DDG (AS) in his address stressed on integrating the fodder availability vis-à-vis the genetic potential of animals. He also emphasized on compilation of the 30 years' progress of the project as a consolidated document. He highlighted the importance of proper data recording and statistical analysis for meaningful policy interventions. In PC presentation, Dr. T K Datta, Director CIRB evinced the technical programme of the project in details.

Genetic Improvement of Murrah Buffalo

Sanjay Kumar, Pradeep Kumar, RK Sharma, SK Phulia, Supriya Chhotaray, Avijit Dey, Madhu Singh, Rupali Rautela and Rajesh Kumar

A total of 146 (77 male and 69 female) calves of high genetic merit were born at CIRB during the year 2024. The test mating (355 inseminations) of 21st

set was carried out during the year resulting in 168 pregnancies. Nominated mating (101 inseminations) using 9 progeny tested bulls of 14th, 15th and 16th sets were also carried out resulting in 41 pregnancies. The herd average (6.86 Kg), 305 days lactation milk yield (2964 kg), total lactation milk yield (3082 kg), peak yield (15.22 kg), were achieved in CIRB Murrah herd during the year. A total of 70% animals were found in milk and average dry period of 131 days was recorded in institute Murrah herd. Average lactation length of 316 days (n=137) was recorded during the year. The reproductive traits viz., service period, calving interval and AFC were 139 days, 447 days and 39.54 months, respectively during the year. Out of 93 elite animals, 19 buffaloes recorded more than 4000 kg and another 26 buffaloes recorded 3500-4000 kg in 305 days lactation during the year. A total of 08 breeding bulls from CIRB were selected out of total 21 bulls from 5 Murrah centres under 22nd set of progeny testing programme, the use of which was initiated from January 2025.

Field Progeny Testing of Bulls (FPT) – CIRB Hisar

Sanjay Kumar and Supriya Chhotaray

Under field progeny testing program (FPT) semen of test bulls is used for artificial insemination in the field, followed by pregnancy diagnosis, calving records and follow up of progenies till the completion of first lactation for milk records on the basis of monthly test day recording. During the period from January 2024 to December 2024, 4678 artificial inseminations were performed using test bulls of 21st set. The conception rate in the field was worked out to be 51.54%. In this period 2411 pregnancies were confirmed and 1599 calving (males 827, females 772) were recorded. Besides, 206 daughters (2 of 17th, 92 of 18th and 112 of 19th set) with an average age at first calving of 40.43 months were also calved, out of which 165 completed the lactation and rest were sold before completion of lactation. The milk production records of 294 daughters in the field sired by 17th set of bulls were used for sire evaluation. The physical identification using ear tagging has been done in all female progenies born in the field. As on 31st December 2024, 1284 female progenies of 18th to 21st set of different age are standing at various field unit centres for future recordings.

Genetic Improvement of Nili-Ravi buffaloes

FC Tuteja, MH Jan, Ashish Bhaladhare, N Paul, Aishwarya S H and SK Kakraliya

The objective of this project is to genetically improve Nili-Ravi Buffaloes through Progeny testing programme. The test mating of 9th set of bulls and, the preliminary selection and breeding soundness examination of 10th set of bulls is underway. The progeny testing of 5th set of bulls is also completed and the top two bulls have been selected for nominated mating. A total of 157 (82male and 75 female) calves of high genetic merit were born this year. The test and nominated matings (401 inseminations) using PT bulls, bulls of 9th sets were carried out resulting in 167 pregnancies. The overall conception rate during this period was 43.31%. The overall mortality of 3.12% and calf mortality of 5.21% were recorded during year 2024. During this period, 37daughters completed 1st lactation. The overall wet average (8.06kg), herd average (5.31 kg), 305 days lactation milk yield (2592 kg), total lactation yield (2691 kg), peak yield (13.2 kg), percentage of animals in milk (66%) and lactation length (315 days) were achieved in Nili-Ravi herd. Improvement in reproductive traits viz., service period (146 days), AFC (43.31 months) calving interval (455 days) and dry period 147) were achieved during year 2024. The total milk produced during this year was 3,17,855.0 kg. A total of 3106 doses were produced at Sub-Campus Nabha, out of which 1086 doses were used for insemination, 5436 doses were sold for insemination of buffaloes in field, and 145 doses were transferred to GADVASU Ludhiana for insemination and pedigree testing. Total of 91animals were sold through public auction and on 15 book value to famers, universities and various developmental agencies.

Immunoreagent design, drug discovery and –omics approaches for buffalo production and reproduction

Supriya Chhotaray, SK Phulia, Rajesh Kumar and MA Iquebal

Differential expression pattern of genes in mammary epithelial cells (MECs) of healthy vs sub-clinically mastitic Murrah buffaloes were studied using whole transcriptomic from milk derived secretory RNA of MECs. The RNA was isolated manually from the milk crescent epithelial cells for which milk sampling was performed at ICAR-CIRB and 6 samples were collected from healthy (n=3) and sub-clinical mastitic (n=3) buffaloes those were CMT +ve and had a somatic cell count of 2-4 Lakhs. Isolated RNA samples after quality, quantity and purity check were sent for sequencing. The raw data (paired-end reads) of RNA sequence was obtained in Fastq format which was further processed using both galaxy server and R software. Most of the steps including quality check, trimming, alignment and feature count was done by utilizing galaxy server, a web-based platform. In detail, FastQC (Version 0.12.1) was employed to assess base quality and adapter content. Fastp (Version 0.24.0) then used to trim the low-quality reads and adapters used in the library preparation step. Hisat2 (Version 2.2.1) was used to map the reads to the Bubalus bubalis reference genome. Quantification of gene expression was performed using featureCounts (Version 2.0.8). The differential gene expression analysis was performed using the DESeq2 package (v1.46.0) in R (version 4.4.2, released on 2024-10-31). The analysis and data visualization were conducted within the RStudio environment (Version 2024.12.0+467). DESeq2 was employed to identify significantly differentially expressed genes (DEGs) by comparing expression levels between healthy and mastitis groups. A total of 33,347 genes were analyzed. This analysis concluded that there were 560 significant differentially expressed genes (padj<0.05) and 18005 non-significant genes. Various plots were obtained as an output of DEseq2. The distribution of significant and non-significant genes was illustrated by volcano plots. The set of significant DEGs included 163 upregulated genes and 397 downregulated. The DESeq analysis also showed a bar plot of top 20 significant DEGs which compared Log2fold change of these genes. The top 10 significant DEGs were HIP1R, SDS, LOC112583072, HIC1, LOC102408963, CPM, LOC102403789, RPL27A, CMTM6, HTRA1.

Development of state-of-the-art decision support system for selection and evaluation of elite buffaloes under the progeny testing program

Supriya Chhotaray, Sanjay Kumar and Sunesh Balhara

Pedigree analysis of 1,850 buffaloes of ICAR-CIRB herd revealed a mean equivalent complete generation (ECG) of 1.36 with a maximum of 5 generations traced. Pedigree completeness exceeded 50% up to two generations back, reflecting challenges in retrieving older data. The effective population size (N_e) was 281±91, indicating high genetic diversity (GD = 0.996) and narrower bottlenecks (f_e/f_a = 1.03). Overall inbreeding in the herd was found to be low, with only 0.32% of the population exhibiting an inbreeding coefficient above 12.5%. The generation interval averaged 4.9 years, with the longest interval observed in the dam-to-son pathway. These findings highlight the genetic variability and low inbreeding in the herd, making it suitable for future advanced selection programs aimed at enhancing genetic gains without significant loss of diversity. Data from 4300 daughters of 214 sires recorded under the NPBI since its inception, collected from 1992 to 2018, were analysed for breeding value estimation and genetic trend assessment. The study finds an annual genetic
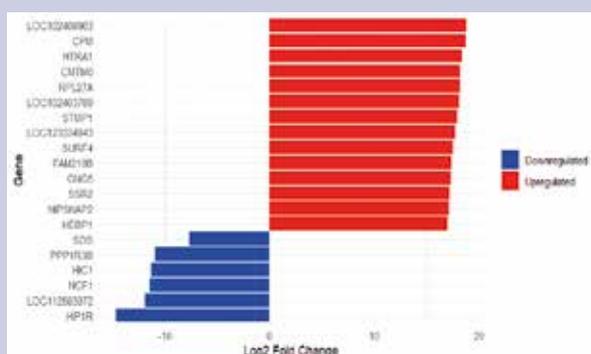
Top 20 differentially expressed genes
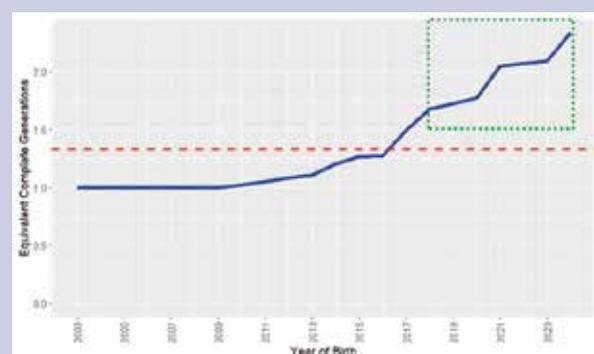
Birth year-wise pedigree depth of the CIRB Murrah herd
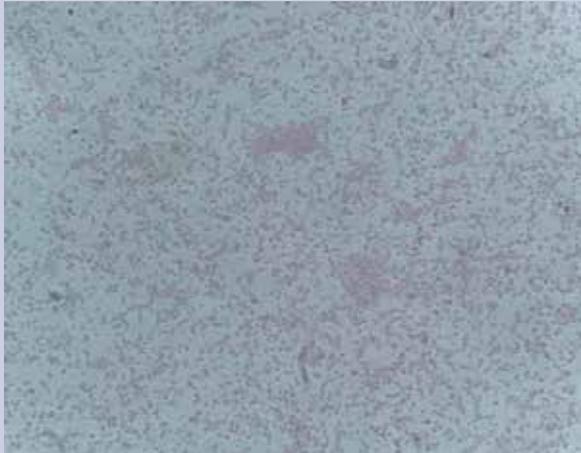
Gram-negative coccobacilli on Gram Staining

Pure culture (small, smooth, gray, transparent and nonhemolytic colonies) of Pasteurella pneumotropica on 5% blood agar

gain of 1.29 kg/animal/year, resulting in a significant increase in milk production and economic benefits for smallholder farmers.

Implications of nutrition for the ability of buffaloes to withstand gastrointestinal parasite infections

Sanjay Kumar, Avijit Dey and Supriya Chhotaray

Project is started with the aim to analyze the nutritional involvement during G.I. parasitism in buffaloes and to develop the strategies to withstand G.I. parasite infection through suitable nutritional intervention. Examination of approx. 400 faecal samples of buffaloes of different age group of either sex for GI infestation was done from the villages adopted for field progeny testing programme. After knowing the level of parasitic infection, suitable nutritional interventions will be formulated and fed to buffaloes in the FPT village to overcome the GI parasitism.

Isolation of *Pasteurella pneumotropica* in subcutaneous abscesses of buffalo heifer and their Antibiotic Susceptibility

Ashok Boora, Sarita Yadav, Nishu and Ekta Hooda

The Pasteurellaceae family consists of the genera *Pasteurella*, *Actinobacillus*, and *Haemophilus.* The actinobacillus/pasteurella group of organisms are opportunistic pathogens which are more commonly commensals and opportunistic pathogens. This study reports two cases of subcutaneous abscesses, located at the mandible and near the base of the ear in buffalo heifers aged two and half years at ICAR-CIRB herd. The causative microorganism was isolated from pus samples and identified as *Pasteurella pneumotropica* based on conventional methods and result of VITEK 2 Systems (BioMerieux). The Gram stain from the pure culture showed small gram-negative coccobacilli. Blood agar plates showed small, smooth, gray, transparent and nonhemolytic colonies after 24 h of incubation in 5% CO_2, but no growth was detected

Subcutaneous abscesses located at the mandible and near the base of the ear in buffalo heifers aged two and half years.
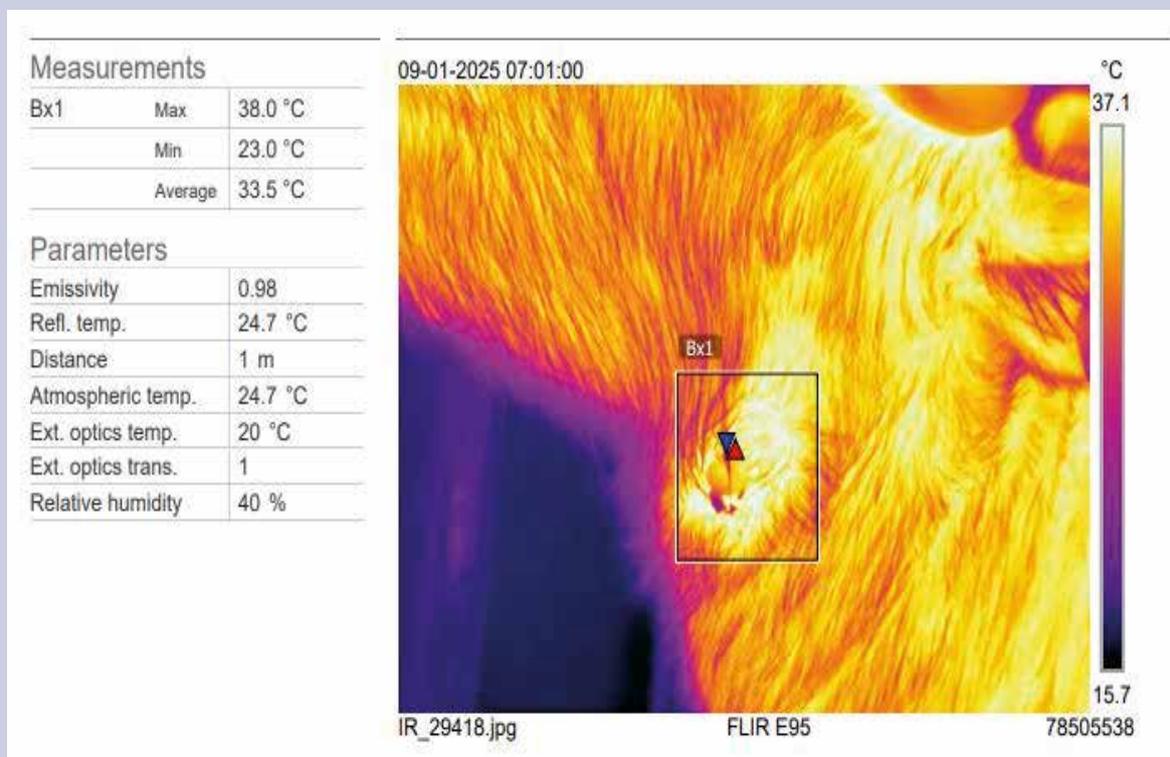
Thermal image of neck area affected by subcutaneous abscesses

on MacConkey agar. Isolates were positive for oxidase and catalase. Phenotypic tests done with the VITEK 2 Systems,version 07.01 (bioMerieux,) resulted in an identification of *P. pneumotropica*. *Pasteurella pneumotropica* (99% Probability), were evaluated for antibiotic susceptibility by disc diffusion method in accordance with the standards of Clinical Laboratory Standards Institute) using commercially manufactured antimicrobial discs (Himedia). Isolates were resistant to Ceftriaxone CTR (30μg), Amoxycillin/Sulbactam AMS (30/15 μg), Cefoperazone/Sulbactam CFS (75/30μg), Penicillin G P (10 units/disc), Erythromycin E (15 μg), whereas lower susceptibility rates to Gentamicin GEN (10μg), Tetracycline TE (30μg), Oxytetracycline O (30μg) and ampicillin AMP (10 μg) were observed. This study highlights the isolation of multidrug-resistant *P. pneumotropica* from subcutaneous abscesses in buffalo heifers. The zoonotic potential and antibiotic resistance of this pathogen should not be neglected, calling for rational antibiotic use in veterinary practice. Treatment: Strepto-Penicillin (DCR) 2.5gm Injection for 5 days, chlorpheniramine (CPM) 10 ml I/M , Povidone iodine dressing

Seasonal prevalence of mastitis in buffaloes, at ICAR-CIRB, at the animal level

Ashok Boora, Sarita Yadav and Nishu

Winter: November-February, Spring: March-April, Summer: May-June, Rainy: July-August, Autumn: September-October, Clinical mastitis cases (CM), Subclinical mastitis cases (SCM), as a mixed infection along with environmental mastitis or contagious mastitis. A decrease in the number of lactating animals in a herd due to the dry period in buffaloes (time when a buffalo stops producing milk).

Season	Animals screened	Culture positive mastitis cases	CM	SCM	Contagious mastitis	Environmental mastitis
Winter	113	48 (42.48%)	7 (6.19%)	41 (36.28%)	39	9 (7.96%)
Spring	98	21 (21.42%)	8 (8.16%)	13(13.26%)	14	7 (7.14%)
Summer	92	15 (16.3%)	2(2.17%)	13(14.13%)	13	2 (2.17%)
Rainy	59#	11 (18.64%)	6 (10.17%)	5(8.47%)	6*	11 (18.64%)
Autumn	54	13 (24.07%)	7 (12.96%)	6 (11.11%)	10*	9*(16.67%)

The occurrence of clinical mastitis in buffaloes during different seasons was given in the highest number of clinical mastitis (CM) cases are observed in the Spring season, with 8 cases (8.16% of animals screened). However, there is no statistically significant difference in the number of clinical mastitis (CM) cases across the

different seasons (P-value 0.152). Similarly, maximum number of subclinical mastitis (SCM) cases are observed in the winter season, with 41 cases (36.28% of animals screened), statistically significant (P-value 0.00003). The highest number of environmental mastitis cases occurred during the rainy season .However, the difference in the number of environmental mastitis cases across seasons is not statistically significant (p-value is 0.399). The increased prevalence of environmental mastitis during the rainy season is likely due to elevated moisture and humidity, which enhance pathogen proliferation. Additionally, muddy, and contaminated conditions facilitate pathogen contact with the udder and complicate hygiene maintenance, further exacerbating the risk. In the present study, winter recorded the highest prevalence of culture-positive mastitis cases at 42.48%, with a substantial proportion being subclinical mastitis (36.28%). In contrast, spring and summer recorded less frequency of culture-positive mastitis, at 21.42% and 16.3% respectively, with subclinical mastitis predominating over clinical mastitis. The rainy season, influenced

by a reduced sample size due to the dry-off period in buffaloes, showed a comparatively lower incidence of culture-positive mastitis. Autumn also showed a reduced percentage of culture-positive mastitis cases, along with a slight rise in environmental mastitis. These findings showed the seasonal variability in mastitis prevalence and emphasize the need for targeted control measures during high-risk periods. The data indicate that winter could be an important season for managing mastitis, especially subclinical cases, due to its association with the physiological state of buffaloes. During winter, buffaloes, as seasonal breeders, typically enter their early lactation phase, which may contribute to an increased incidence of mastitis. The seasonal reproductive cycle and concurrent lactation phase likely interact to influence mastitis prevalence, highlighting the importance of targeted management strategies during this period. The possible reason is that water buffaloes are seasonally polyestrous and maximum calving in the study area occurred from October to January.

IMPROVEMENT OF REPRODUCTIVE EFFICIENCY AND ASSISTED REPRODUCTIVE TECHNOLOGIES

Evaluation of Semen Characteristics and Fertility Parameters of Cloned Bulls and Performance of Clones Progenies-Phase-II

PS Yadav, Dharmendra Kumar, RK Sharma, Pradeep Kumar, Meeti Punetha and Rajesh Kumar

The success of animal cloning is largely constrained by oocyte quality, which is closely associated with the cell's reprogramming capacity. Oocyte quality is commonly evaluated based on the number of cumulus cell layers, with at least one-third of collected cumulus-oocyte complexes (COCs) being discarded as substandard due to insufficient cumulus cell coverage. Melatonin, known for its antioxidant properties and diverse biological roles, has emerged as a promising agent for enhancing the quality of inferior oocytes, thereby improving their potential for embryo development. This study aims to enhance the quality of inferior oocytes through melatonin supplementation (10^{-9} M) during in vitro maturation (IVM) and to explore its effects on subsequent cloned embryo production and underlying mechanisms. The findings reveal that melatonin significantly ($p<0.05$) improves the maturation of inferior oocytes, reduces oxidative stress by lowering reactive oxygen species (ROS) levels, and enhances mitochondrial function by increasing glutathione (GSH) levels. Moreover, melatonin supplementation increases the total cell number in cloned blastocysts derived from inferior oocytes, thereby improving blastocyst formation rates. Epigenetic analysis shows that 10^{-9} M melatonin enhances H3K9ac acetylation and reduces H3K27me3 methylation in cloned blastocysts compared to the control group. Overall, melatonin supplementation during IVM not only improves the maturation of inferior oocytes but also promotes cloned buffalo embryo development by mitigating oxidative stress and inducing favourable epigenetic modifications. These results suggest that melatonin holds potential for enhancing the quality of poor oocytes and advancing buffalo cloning techniques.
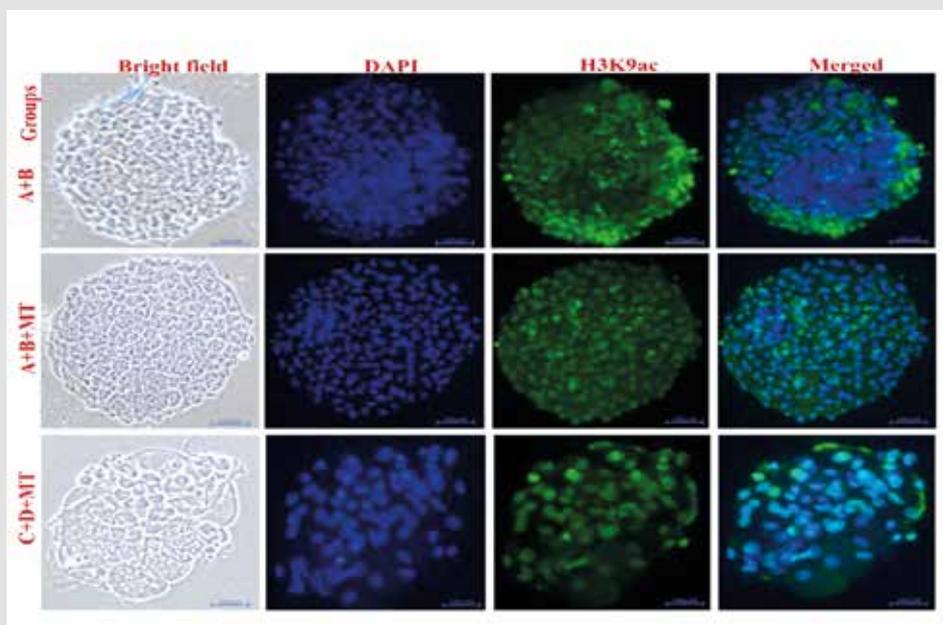
Representative fluorescence images of the H3K9ac in different groups

Consortium Research Platform on Agro-Biodiversity

Meeti Punetha, Dharmendra Kumar and PS Yadav

The cryopreservation of somatic cells provides a sustainable solution for the long-term storage of genetic material, ensuring its accessibility for both research and conservation initiatives. This study focused on the isolation, culture, characterization, and cryopreservation of somatic cells from various buffalo breeds, alongside the establishment of a repository to facilitate the sharing of these cells and related data with the scientific community. Skin tissue samples were collected from Murrah, Nili-Ravi, Bhadawari, Surti, Dharwadi, Assamese, Mehsana, and Banni buffalo breeds and processed for fibroblasts isolation. Somatic cells were successfully derived from tail-skin biopsies, with no notable differences in cell morphology, proliferation, or attachment rates across breeds. The isolated cells displayed a flat, spindle-shaped morphology, expressed vimentin (a fibroblast-specific marker), and lacked cytokeratin-18 expression (an epithelial marker). In total, 785 cryovials, each containing 1×10^5 cells were preserved, with at least 45 cryovials stored per animal. Post-thaw cell viability, assessed via flow cytometry, ranged between 70–80%. The functionality of selected cryopreserved cells was further confirmed through somatic cell nuclear transfer (SCNT) experiments, demonstrating their ability to produce cloned embryos and buffaloes. This cell repository represents a significant resource for genetic research and conservation, underscoring the importance of somatic cell cryopreservation from elite livestock to advance genetic studies and conservation strategies.

Generation of predetermined sex buffalo embryos using CRISPR mediated gene editing technology

Meeti Punetha

The study aimed to elucidate the role of the SRY gene in sexual determination in buffalo embryos using CRISPR-Cas9 technology. A crRNA targeting the HMG domain of the SRY gene was designed using the CRISPOR algorithm. Using the validated guide, we proceeded to investigate the role of the SRY gene in sexual determination by electroporation of CRISPR-Cas9-RNPs targeting the SRY gene into buffalo embryos at 20 V, 5P, 3 ms as optimised earlier. Sex determination of the blastocysts was confirmed, and genetic changes in the SRY gene were identified through direct sequencing of PCR products from genomic lysates using SRY-specific primers. Sanger sequencing alignment for SRY-targeted mutant embryos revealed various deletions and insertions corroborated by in silico analyses predicting consequential changes in amino acid sequences. These mutations corresponded with altered gene expression patterns in blastocysts. SOX9 expression, pivotal for male development, was notably reduced in SRY-edited embryos compared to controls

Skin-tissue from Murrah (n=4); Nili Ravi (n=4); Bhadawari (n=4); Surti (n=4); Dharwadi (n=4); Assamese (n=1); Toda (n=2) were collected and process for fibroblast isolation

(p ≤ 0.05), paralleled by elevated Wnt4 expression associated with female development pathways. Thus, our findings contribute crucial insights into buffalo sex differentiation mechanisms and offer potential applications in enhancing reproductive strategies in breeding programmes. Although we attempted to study the expression of other male and female-specific genes, but their expression was stage specific reflecting the complex and coordinated nature of developmental biology. Consequently, the temporal variability limited our ability to investigate these genes comprehensively, which was a limitation of our study.
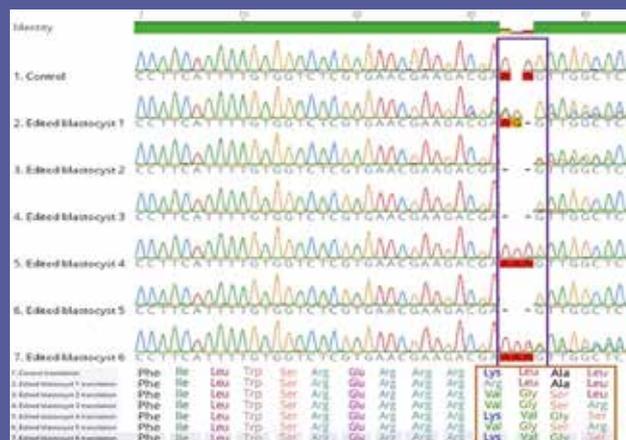
Chromatograms of the targeted region in control and six SRY-edited blastocysts. Modifications are highlighted within the purple box. Additionally, resultant changes at the amino acid level in male SRY-mutant blastocysts are indicated within the orange box. These analyses were performed using Geneious Prime software.

PoC for ruminants expressing ligninase to reduce carbon footprints

Dharmendra Kumar, Meeti Punetha, Pradeep Kumar and Supriya Chhotaray

The primary challenge in using cereal straws as feed lies in their high lignin content, which is difficult to digest due to the limited availability of ligninase in the rumen. This study aims to establish proof-of-concept for expressing recombinant ligninase in mammalian salivary gland cells. The salivary glands play an important role in the ruminants and are classified as major and minor. In ruminants, the major salivary glands are parotid, submandibular, and sublingual, while minor salivary glands are buccal and labial. Among them, parotid gland is the largest salivary gland in goats and is responsible for major salivary secretion. Given the lack of availability of goat parotid acinar cell line, we isolated and established the acinar cell from caprine salivary gland. These cells achieved consistent
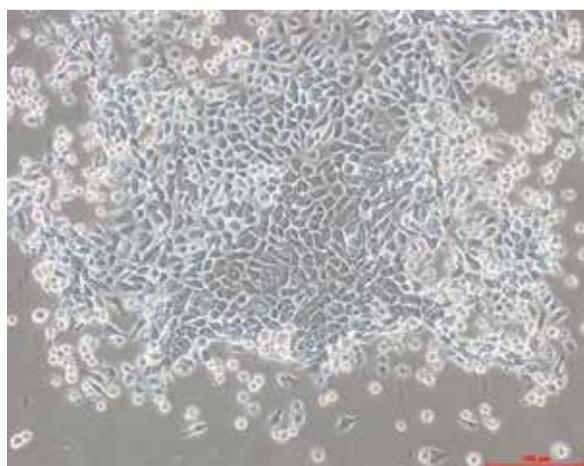
Representative morphology of salivary gland cells

cell growth and confirmed acinar-like morphology under culture conditions evaluated through microscope. These cells were further passaged to check whether the acinar cells maintain a differentiated state for long period. Additionally, fetal fibroblasts derived from caprine were also isolated, cultured, characterized and cryopreserved. These cells will be used to express recombinant ligninase and its functional activity will be further assessed. The established goat fetal fibroblasts will be genetically modified to express recombinant ligninase and subsequently used to produce transgenic goat embryos though SCNT. As an alternative approach, established zygote electroporation approach shall be used for transduction of ligninase expressing construct into single-stage zygotes to produce transferable-quality transgenic goats.

Production of broiler livestock and poultry using CRISPR technology

Dharmendra Kumar, Meeti Punetha, Pradeep Kumar, Supriya Chhotaray, RK Sharma and Rajesh Kumar

During the reporting period, for the editing of MSTN-gene using CRISPR in buffalo, we used two approaches. In the first approach, MSTN targeted guides targeting exon 1 were transfected to fetal buffalo fibroblast cells via electroporation at 300V, 10ms, 1sqP in 4mm cuvette. The cleavage efficiency was found to be 34.1% when analysed using Tide software. Single cells were further isolated, cultured and expanded from these electroporated fibroblasts. The targeted region was further amplified using MSTN specific primers and sent for Sanger sequencing. Out of 37 cell colonies sent for sequencing 5 colonies were found to be edited. Two of
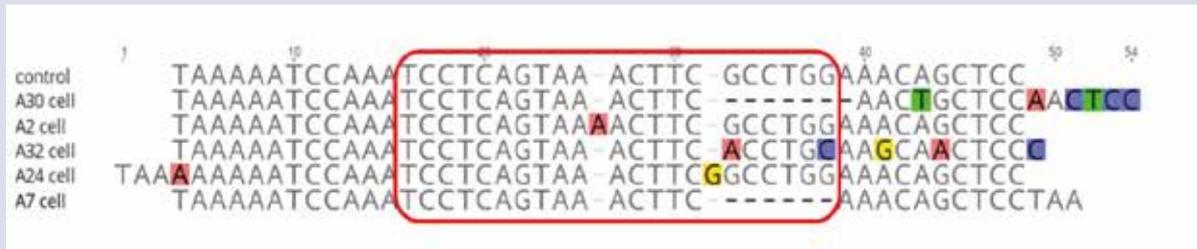
Validation of MSTN mutation in single cell fibroblast using Clustal-W analysis

these edited cells were further confirmed for genotypes and were found to be biallelic mutated which was later used for production of MSTN mutated embryos via SCNT. A total of 10 reconstruct were made and out of which 1 blastocyst was transferred in one synchronized females. Pregnancy of the transferred blastocyst is due. More trials for production of SCNT blastocyst using mutated cell line is under culture.

In the second approach, 118 buffalo zygotes generated from IVF were electroporated using 12hpi, 20V, 5P, 3 ms in 1 mm cuvette. This method was early optimised electroporation conditions which resulted in significantly (P<0.05) higher biallelic editing (54.16 ± 2.94) when compared to monoallelic (19.64 ± 3.79); mosaic (14.86±4.63), and wild (11.29 ±2.11) types. The presumed MSTN edited buffalo embryos (n=4) were transferred to the recipients and pregnancy is due.

In vitro production of oocyte- and spermatozoa-like cells from pluripotent stem cells of farm animals

Dharmendra Kumar, Meeti Punetha and Pradeep Kumar

The buffalo fetus tissue has been obtained from Delhi slaughterhouse and fibroblasts derived fetal skin through enzymatically digested with 0.25% trypsin-EDTA followed by PBS wash. The dissociated cells were cultured in a D-10 medium containing high-glucose DMEM supplemented with 10% FBS, 2mM L-glutamine, 1mM sodium pyruvate, 1% NEAA, 1% antibiotics under a humidified 5% CO_2 in air atmosphere at 37.5°C. The cells at passage 3-5 were used for electroporation with transposon plasmid containing transcription factors Oct4, Sox2, Klf4, cMyc, Nanog, and Lin28 (PB-OSKMLN) and transposases (pCMV-PB). Approximate 1 x 10^5 fetal fibroblasts were transfected by electroporation using 1.5-.02 µg PB-OSKMLN and 0.5 µg pCMV-PB transposases. The transfected cells were seeded into gelatinized 6-well plate in D-10 medium. One day later, the medium was changed to remove dead cells. After initiation of the change in morphology of fibroblasts, medium was changed to iPS medium containing D-10 supplemented with LIF and bFGF. Around 10–12 days after electroporation, the fibroblast cells exhibited morphological changes, forming round structures that developed into loose cell aggregates by days 16–18 . Presumptive iPS cells were cultured in 5% CO_2 in air at 37°C. Gelatinized plates or tissue culture grade plastic plates were used for iPS cell culture. For sub-passaging, a mechanical splitting method was employed. The
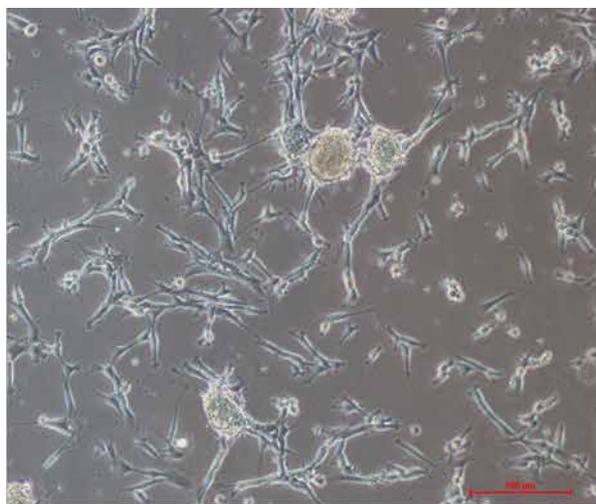
Morphology of fibroblasts started changing
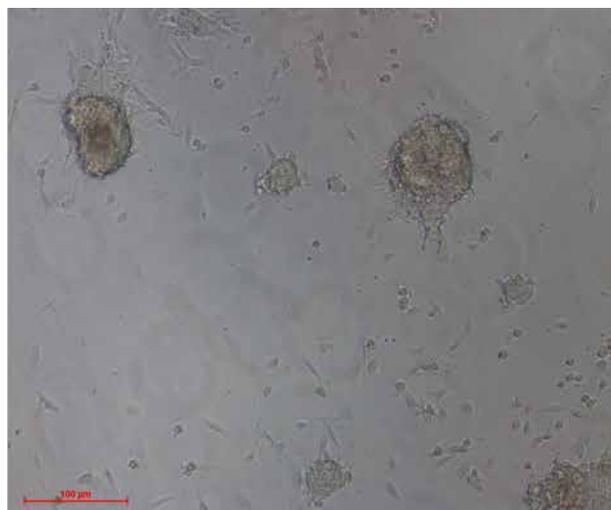
Morphology of iPS like cells

Reprogramming of buffalo fetal fibroblasts to iPS like cells

generated iPS like cells were characterized using expression of alkaline phosphatise (AP) followed by expression of pluripotency related surface markers. Currently, generated iPS cells are able to maintain in in vitro culture and regularly passaging through mechanical splitting method.

Development of mesenchymal stem cells and quercetin nanoparticles medicated scaffold (MSCs+QNPs-scaffold) to promote 3D diabetic wound repair and regeneration

Dharmendra Kumar

The current studies plan to use quercetin, a potent flavonoid, exhibits wound-healing properties due to its antioxidant effects and ability to regulate cytokines and growth factors. Additionally, mesenchymal stem cells (MSCs) therapies have shown promising healing potential for various wound types over the past decade, owing to their remarkable self-renewal capacity, multi-lineage differentiation, and secretion of exosomes, soluble growth factors, and cytokines. Keeping the importance of MSCs and quercetin, adipose tissue from rat has been collected at LUVAS under aseptic conditions. Collected adipose tissue was transported to CIRB and where tissue was mechanically and enzymatically (collagenase + BSA) digested and kept in CO_2 incubator (5% in humidify chamber) for isolation

of MSCs in culture media composed of DMEM/F12, 20% FBS, 1% antibiotic, 0.5% ITS. MSCs took 5-7 days to start emerging and attended confluency within 8-10 days. These cells were maintained in in vitro culture conditions and passage through trypsinization. At every passage representative samples were cryopreserved through slow freezing method in 10% DMSO. The morphology of MSCs was like a fibroblast cells and cellular viability of cells was assessed by the Trypan blue exclusion test. Apart from this MSCs were characterized using immunocytochemistry specific cell surface markers like CD 29. Characterizations using molecular markers are under process.

Establishment of Centre of Excellence for Buffalo ovum-pick up and in-vitro embryo production (OPU-IVEP)

Jerome A, RK Sharma, Dharmendra Kumar, Meeti Punetha, Rupali Rautela and Rajesh Kumar

In recent years, several stimulation protocols have been developed and commercial media are available for in vitro production of embryos. Thus, despite the limited success reported previously, ovum-pick up and in-vitro embryo production (OPU-IVEP) needs to be explored in this species for enhancing the reproductive efficiency of females, reducing generation intervals, and accelerating genetic improvement progress. OPU-IVEP has the specific advantage that oocytes are to be
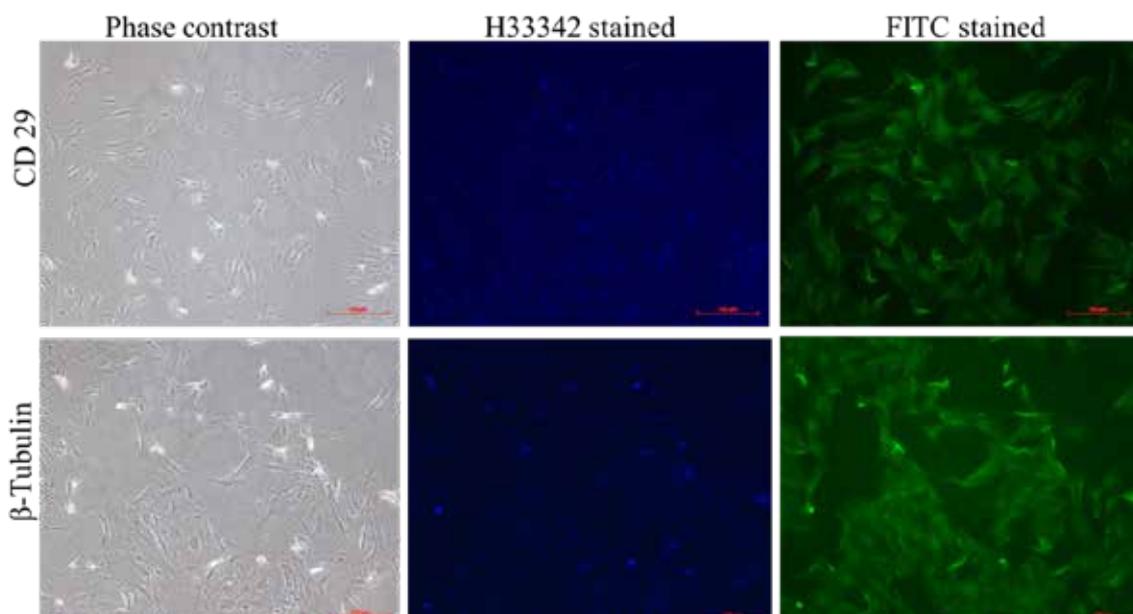
Immunocytochemistry of MSCs showing positive signals for CD29. Tubulin staining was used as positive staining controls

repeatedly collected (7 to 10 days interval) from live animals with known pedigree superior germplasm. Considering the potential application of OPU-IVEP in buffalo, comprehensive research on the aspect of donor response as well the donor fertility along with overall net calf production following OPU sessions needs to be established. Due the scarce results of in vivo embryo recovery in superovulated buffaloes, the association of OPU with IVEP represents an alternative method of exploiting and multiplying genetic for superior. Historically, OPU-IVEP in buffaloes produced lower outcomes than in bovines. However, a series of recent studies have demonstrated the commercial potential of these techniques in the buffalo species.

Two main biological problems seem to be related to the low efficiency of the OPU-IVEP technique in buffaloes: low number of follicles on the ovary that results in low oocyte recovery per OPU and poor oocyte quality retrieved. Considering this, the project is designed to address the standardization the use of OPU-IVEP in production of superior buffalo germplasm. In this context, ICAR-CIRB shall establish a Centre of Excellence on Buffalo OPU-IVF funded by DADF, GoI under Rashtriya Gokul Mission (RGM) to the tune of 11.55 crores. Due the scarce results of in vivo embryo recovery in superovulated buffaloes, the association of OPU with IVEP represents an alternative method of exploiting and multiplying genetic for superior. Historically, OPU-IVEP in buffaloes produced lower outcomes than in bovines. However, a series of recent studies have demonstrated the commercial potential of these techniques in the buffalo species. This project is designed to address the use of OPU-IVEP in production of superior buffalo germplasm.

Infrared thermography and machine learning for prediction of core body temperature and respiration rate in buffaloes

Ekta Hooda, Gurpreet, AK Balhara, S Yadav, Sanjay Kumar, Ashok Boora, SK Phulia, Mehar S Khatkar and Sunesh Balhara

Precision livestock farming (PLF) technologies are revolutionizing animal health management by providing non-invasive, efficient tools to monitor vital parameters such as core body temperature (CBT) and respiration rate (RR). Traditional methods like rectal thermometry and visual RR observation are invasive, labor-intensive, and impractical for long-term monitoring, especially in buffaloes, which play a vital economic role in India. This study employed advanced infrared thermography (IRT) and machine learning techniques to address these challenges, focusing on Murrah buffaloes.

Data were collected from a group of adult female buffaloes at ICAR-CIRB under controlled environmental conditions using a FLIR E95 thermal imaging camera. Temperatures at a specific eye region were extracted from the thermal images and synchronized with corresponding rectal and environmental temperature measurements to ensure data consistency and accuracy. The analysis revealed a strong correlation (Pearson's $r = 0.70$) between the eye region temperature and rectal temperature. A composite model was developed using five algorithms—Random Forest, XGBoost, Support Vector Machine, k-Nearest Neighbors, and Ridge Regression—combined with a Generalized Linear Model (GLM). The model achieved coefficient of determination value of 0.62, a root mean squared
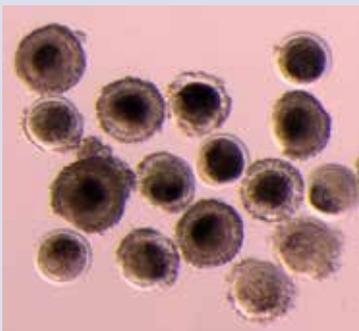
Buffalo oocytes collected through OPU   *Matured Buffalo oocytes following IVM*   *Buffalo embryos in IVC*   *Buffalo blastocyst following IVC*
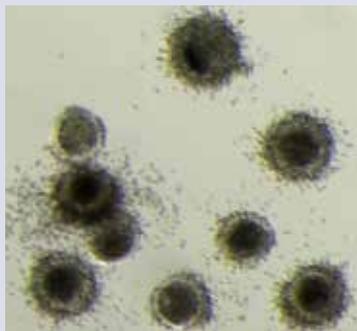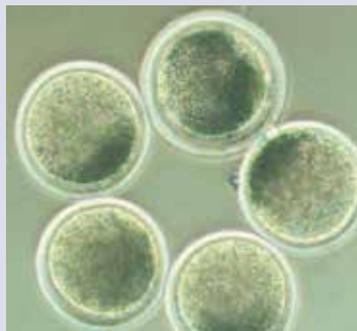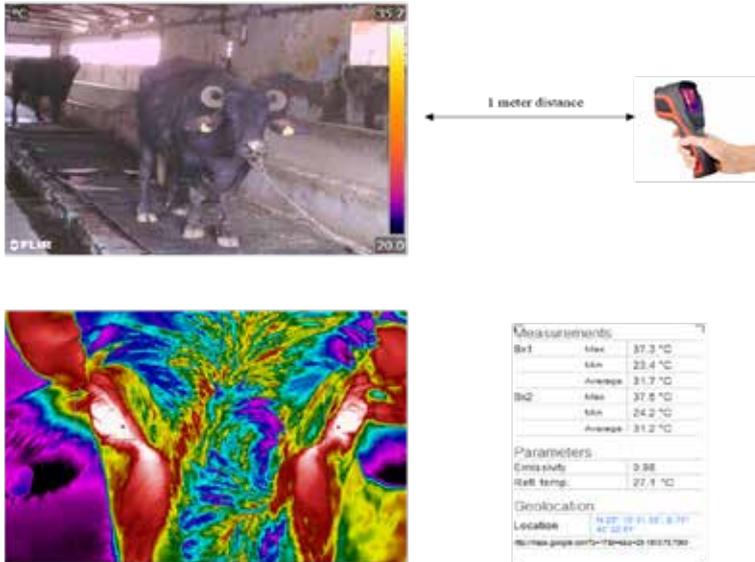
Thermographic imaging for recording eye temperature in buffaloes

micro environment for various age groups to capture temperature fluctuations around the nasal region, corresponding to inhalation and exhalation cycles. The data was validated by manually counting the breaths and were counted using a digital camera separately. For both video and infrared recordings, the number of breaths per minute (i.e., RR) was calculated using the following equation:

$$\text{RR (breaths/minute)} = \frac{60}{x}xy$$

where 60 is the number of seconds in a minute, x is the time taken to complete the specified breaths and y is the number of specified breaths.

error (RMSE) of 0.2275, and a mean absolute error (MAE) of 0.1822, outperforming individual base models. The actual and predicted values of CBT showed a statistically significant positive correlation depicting good prediction accuracy using the final model.

These findings demonstrated the feasibility of using IRT and machine learning for accurate, non-invasive CBT prediction in buffaloes. This approach has significant implications for advancing precision livestock farming, reducing animal stress, and improving veterinary diagnostics.

In a parallel study, we explored the application of IRT for non-invasive monitoring of respiration rate (RR) in Murrah buffaloes. Thermal videos were recorded in a

Example infrared images showing the thermal changes that occur at the nostrils during inhalation, when cold air (illustrated as blue arrows) is drawn in through the nostrils from the environment, and exhalation, when warm air (illustrated as red arrows) is expelled through the nostrils back in the environment

This approach was designed to overcome the limitations of traditional RR measurement methods, such as observing flank movements or using respiratory belt transducers, which are labor-intensive, invasive, and
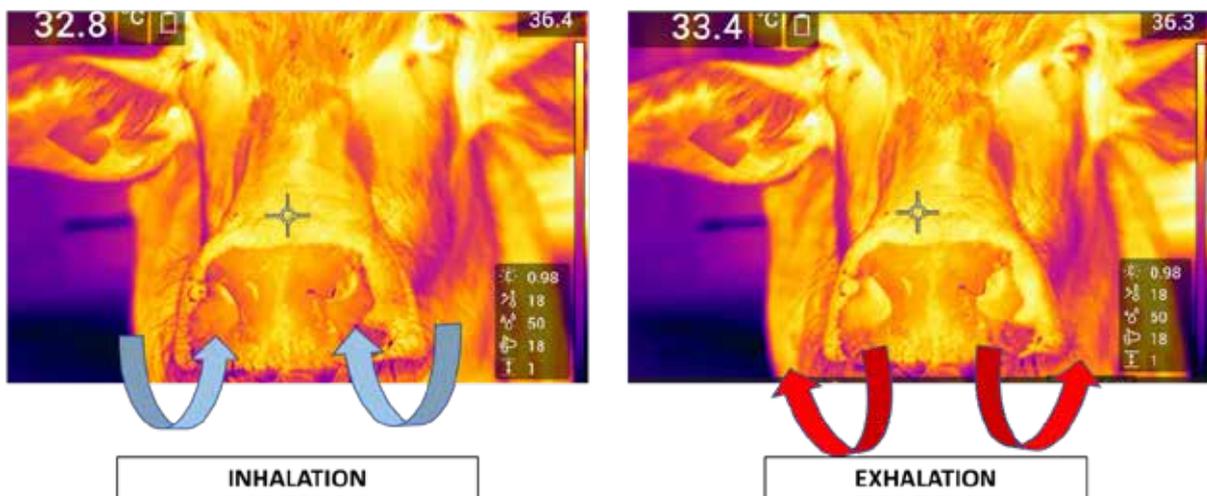
Thermopgrams indicating change in teperatures during inhalation and exhalation process in buffaloes

potentially stressful to animals. Thermal imaging successfully detected and quantified respiratory cycles across buffaloes of varying age groups, demonstrating its reliability for continuous RR monitoring. The automated detection process leveraged temperature changes near the nostrils, providing a practical alternative to contact-based sensors or manual observation. This approach was particularly advantageous for younger buffaloes, where traditional methods often fail due to behavioral challenges and anatomical differences.

Colorimetric array: A tool for assessing animal health, reproduction, and physiology in cost effective manner

Indu Duhan, Renu Chaudhary, Sunesh Balhara, MS Khatkar and AK Balhara

Colorimetric arrays detect biochemical changes through visible color shifts, observable by the naked eye or basic imaging tools. They provide a non-invasive, rapid, and cost-effective method for monitoring physiological states. These systems use chemical dyes or indicators that react with specific analytes, such as pH, ions, metabolites, or hormones, triggering physical and chemical property changes. These arrays rely on a detection mechanism where:

- Multiple recognition elements in a patterned array produce distinct responses, generating unique color codes for identifying multiple analytes simultaneously.
- Color changes are captured via flatbed scanners or digital cameras and converted into RGB data for precise analyte recognition through software and data analysis.

Integration with smartphones streamlines recognition, offering faster, more accurate, and cost-effective results through RGB-based color detection apps. Common substrates used include cellulose filter paper, nitrocellulose, and printing paper, valued for their porosity, hydrophilicity, low cost, and ease of fabrication. Compared to traditional sensors, colorimetric arrays offer:

- Lower-cost detection methods.
- Broader analyte detection using a single colorimetric array.
- Greater versatility in analyzing complex mixtures or structurally similar analytes.

Utility in the recognition of bio-analytes:

- Colorimetric array has been utilized as a microfluidic device to determine the concentration of lactate dehydrogenase (LDH) in human serum. Photolithography technique has been used for the development of hydrophobic microwells. The microwells were then seeded with phenazine methosulfate/nitrotetrazolium blue chloride (PMS/NBT) system to yield a 3 × 10 array. The LDH catalyzed dehydrogenation process resulted into a blue-violet color response, which was directly proportional to the concentration of LDH. The results, captured using a gel documentation system and a regular camera, indicated that the paper-based microwell array showed excellent specificity for LDH, with no interference from other components found in serum.
- A 3 × 9 paper-based colorimetric sensor array for the detection of alkaline phosphatase (ALP) in human serum was developed by the combination of 5-bromo-4-chloro-3-indolyl phosphate salt
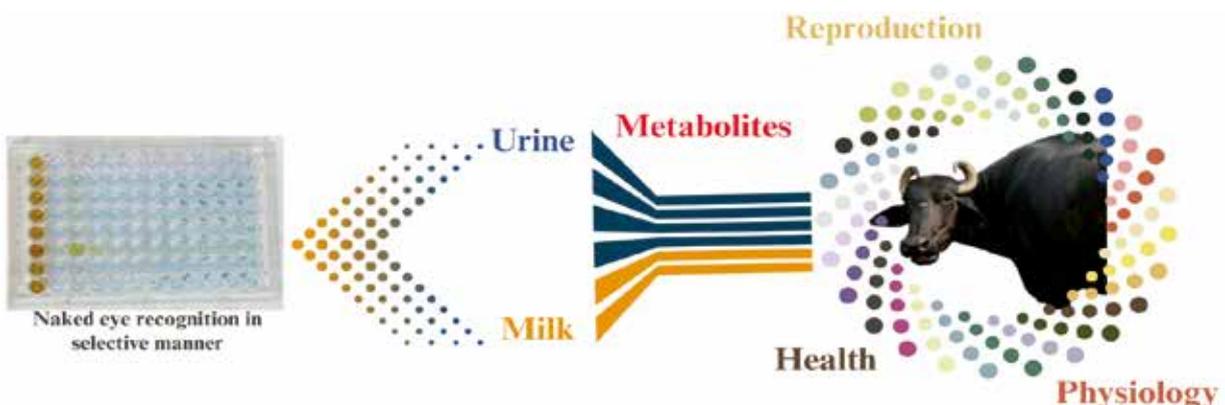
Colorimetric array applications in buffalo production research

(BCIP) and nitrotetrazolium blue tetrazolium (NBT). The human serum in this detection system also exhibited color enhancement, improving the detection accuracy and achieving the visualized semiquantitative detection of ALP by the paper-based colorimetric array.

- In another study, a 3 × 3 paper-based colorimetric sensor array was developed using nine commercial indicators and dyes for glucose detection in urine. By incorporating calibration spots, this paper-based colorimetric array was able to self-calibrate light signals across varying lighting conditions, imaging distances, and angles on different smartphones. Compared to other paper-based colorimetric devices, this array demonstrated enhanced applicability and accuracy, achieving 100 % accuracy in both discrimination and recognition.

- The discrimination of eight agents (caffeine, procaine, phenacetin, levamisole, benzocaine, lidocaine, aminopyrine and acetaminophen) from cocaine was also made using paper based colorimetric array. The array displayed a detection accuracy of 100 % with a detection limit of 1-10 mmol/L.

- The applicability of colorimetric array was not only limited to human studies but also extended to freshness monitoring for ensuring food safety. A paper-based colorimetric sensor array in a form of QR code based on the color difference of pH indicators and metalloporphyrins has been developed to monitor acidity change, volatile alcohols and ammonia emitted by decomposing meats. Integrating the developed array with smartphone camera offers real time monitoring of meat freshness at different storage temperatures and in different storage time.

- Aquatic toxicity due to accumulation of heavy metal residues has been assessed with 3 x 3 paper-based colorimetric sensor array using pyridylazo and porphyrin indicators.

Incorporating Image Analysis in body condition scoring of buffaloes for health assessment

Gurpreet, MS Khatkar, Ekta Hooda, Sunesh Balhara, AK Boora, RK Sharma and AK Balhara

Body Condition Scoring (BCS) is a reliable method to evaluate the nutritional and health status of livestock. A comprehensive analysis involving 196 farm buffaloes from ICAR-CIRB, Hisar animal farm and 63 field buffaloes was conducted to assess their physical condition.

High-quality images of buffaloes from both farm and field environments were collected including four different angles. These images were scored based on the buffaloes' physical conditions using a standardized ordinal scale of 1 to 5, where 1 indicates poor condition and 5 indicates excellent condition. A thorough review of literature was done in order to better understand the scoring criteria that helped in learning about the specific body parts and fat deposits that indicate a buffalo's condition.

For the scoring process, RStudio was used to create a program which displayed the images on one side of the screen while the corresponding scores were entered on the other. The program generated a .csv file containing the scored data as an output, making the process efficient and systematic. To ensure the accuracy and reliability of the scoring process, inputs of four experienced experts in buffalo management were sought for each animal for the purpose of model training.

Various images angles for tentative body condition scoring of buffaloes

BCS scoring in buffaloes: arrows indicate landmarks
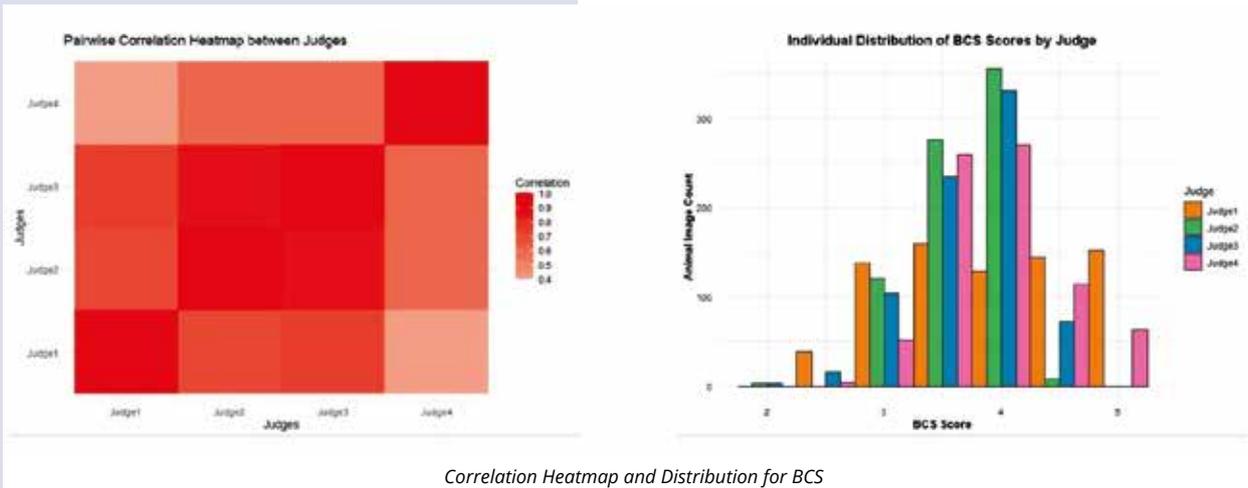
Correlation Heatmap and Distribution for BCS

Before analysing the data, a thorough cleaning process to ensure accuracy was undertook where duplicate or unclear images were removed, particularly those where the animals' body parts were not clearly visible. Only high-quality images with proper lighting and clear views were retained for scoring, ensuring the integrity of the dataset. The average score for CIRB farm buffaloes came out to be 3.81 ± 0.58 with a minimum score of 2 and maximum score of 5 and statistically significant intra-class correlation were found between the scores obtained by each of the judges.

Table: Descriptive Summary for BCS by each Judge

Judge	Mean	SD	Median	Min	Max	IQR
Judge1	3.931669	0.769438	4.0	2.5	5.0	1.0
Judge2	3.659001	0.387741	3.5	2.0	4.5	0.5
Judge3	3.716820	0.469777	4.0	2.0	4.5	0.5
Judge4	3.912615	0.526207	4.0	2.5	5.0	0.5

Sequestrating X- and Y-sperm using receptor-ligand based approach in buffalo

Pradeep Kuma, Meeti Punetha, Dharmenra Kumar, RK Shamra and TK Datta

Semen sexing technology offer significant potential for improving the production efficiency of livestock industries. Recent studies have demonstrated that X-sperm in mammalian species express X-chromosome-derived toll-like receptors 7 and 8 (TLR 7/8). Activation of TLR 7/8 on X-sperm by the agonist R848 selectively inhibits X-sperm motility, enabling the separation of X- and Y-sperm populations. The use of R848-preselected sperm for fertilization leads to skewed sex ratios in resultant embryos or offspring. This approach provides a promising strategy for sex selection in animal breeding programs. In this study, we aimed to investigate the presence of these two receptors TLR 7/8 on buffalo spermatozoa and explore the feasibility of using TLR 7/8 ligand resiquimod (R848) to separate buffalo X- and Y sperm. In this study, an immunofluorescence assay was used to analyze the expression of TLR 7/8 in buffalo sperm, and CASA was used to analyze the effect of R848 on sperm motility. The efficiency of X and Y sperm separation was determined using IVF-generated embryo sexing. The immunofluorescence result shows that TLR 7/8 are present in buffalo sperm. When the buffalo semen was incubated with 0.03, 0.3, 3µM concentration of R848 for 1 hour, the average path velocity (VAP), average straight-line velocity (VSL), and average curvilinear velocity (VCL) of buffalo sperm were significantly decreased (p<0.005). Finally, based on the findings from both CASA parameters and flow cytometric assessments, the concentration of 0.3 µM R848 was selected for further in-vitro blastocyst production. Sperm were treated with 0.3 µM R848 in 3 mL modified human tubal fluid (mHTF) medium for 1 hour to facilitate sex separation. Following treatment, the sperm were separated into an upper and a lower layer, which were then used for in vitro fertilization.

IVF and embryo Sexing
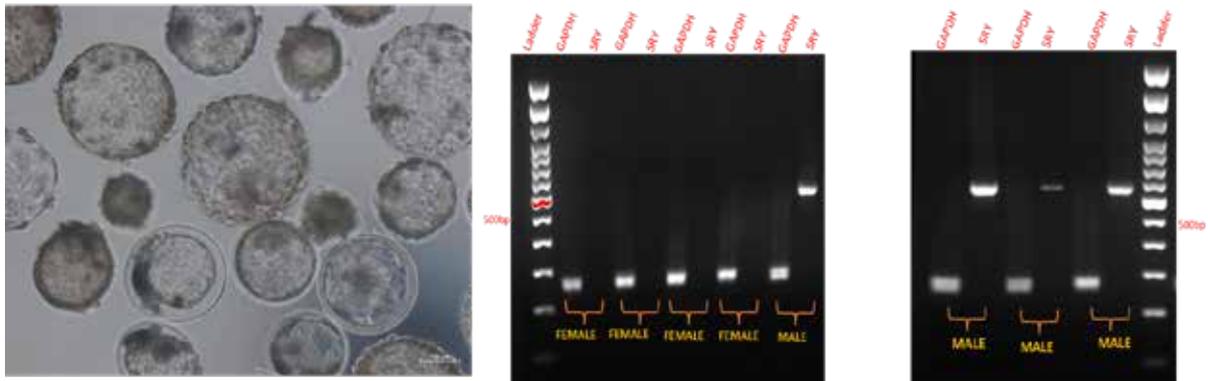
Representative picture of blastocyst production after treatment of R848 (0.3 µM) and the sex of the buffalo embryo after treatment of R848.

In the upper layer, we found 74.54% male embryos; similarly, we found 75.63% female embryos from the lower layer. This study develops a simple new method for efficiently separating X and Y sperm in buffalo, enabling the selective production of male or female progenies.

Buffalo sperm dosage in relation to functional parameters and field fertility outcome

Sajjan Singh, Pradeep Kumar, Jerome A, RK Sharma and Gururaj M

The effect of dilution (@12 and 16 million/straw) buffalo sperm viability and functional parameters were studied. The parameters included sperm post-thaw motility, plasma membrane integrity, thermal resistance, kinematic parameters were estimated. Also, the sperm mitochondrial membrane potential as well as mitochondrial superoxide status was documented.

It was deduced that no significant difference in post-thaw motility, plasma membrane integrity, thermal resistance, kinematic parameters, sperm mitochondrial membrane potential, mitochondrial superoxide was evident in three different semen doses. For deduction of field conception rate 20 million/straw (2110 doses), 16 million/straw (2165 doses) and 12 million/ straw (2135 doses) were disseminated for field insemination. The conception rate of 20 million/ straw, 16 million/straw and 12 million/ straw were 52.03 % (1098/2110), 52.97 % (1147/2165) and 51.99 % (1110/2135), respectively. Reduction of sperm dosage per insemination can pave way for efficient utilization of resources by increase cost benefit ratio with enhanced production of semen doses for wider dissemination of superior buffalo germplasm to the stakeholders to increase productivity.
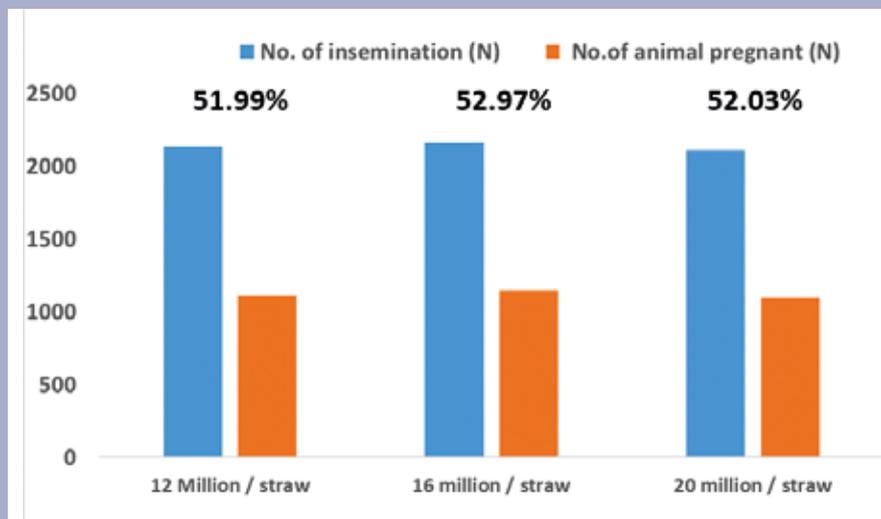
Conception rate at three differet doses of frozen semen straws

FEED RESOURCE UTILIZATION AND IMPROVEMENT

Dietary rumen protected proteins: Effects on feed efficiency and methane emissions of murrah buffalo calves

Shubham Thakur, Avijit Dey and TK Datta

Feeds rich in rumen protected protein that are associated with reduced methane production would be of higher relative importance as components of ruminant feeding systems. The current study aimed at combining malic acid and heat treatment (MAH), a novel technique to enhance the rumen undegradable fraction of feed protein in order to augment post-ruminal amino acid availability to the animals. This study consisted of two experimental trials: *in vitro* and in *vivo*. The *in vitro* trial was conducted with 0% (control), 50% (T-1), and 100% (T-2) replacement levels of untreated protein feeds (guar korma and groundnut cake) with MAH-treated guar korma and groundnut cake in total mixed rations. *In vitro* findings revealed significant (p< 0.05) reduction of methane production and ammonia-nitrogen levels in T-1 and T-2 groups without adversely affecting other *in vitro* fermentation parameters, such as feed degradability and volatile fatty acid production. The *in vivo* trial was conducted with eighteen female Murrah buffalo calves, divided into three groups in a completely randomized design (control, T-1, and T-2) over a 90-day period. The results revealed a significant (p< 0.05) increase in growth rate (57.62%) and an improvement in feed efficiency (54.15%) in the T-2 group compared to the control. The digestibility coefficients of nutrients viz. dry matter, organic matter, crude protein, neutral detergent fibre, and acid detergent fibre were also improved (p<0.05) in animals of T-2 group. A reduction (38.62%) in methane production was evidenced in calves replaced with 100% MAH treated protein feeds (T-2). An enhanced (p<0.05) nitrogen retention (% of N intake and absorbed) was demonstrated in buffalo calves fed with MAH treated guar korma and groundnut cake as protein supplements. Therefore, the study demonstrated that the malic acid-heat treatment is an effective technology to protect protein from ruminal degradation for enhancing production performance and abate the environmental impact of livestock rearing.
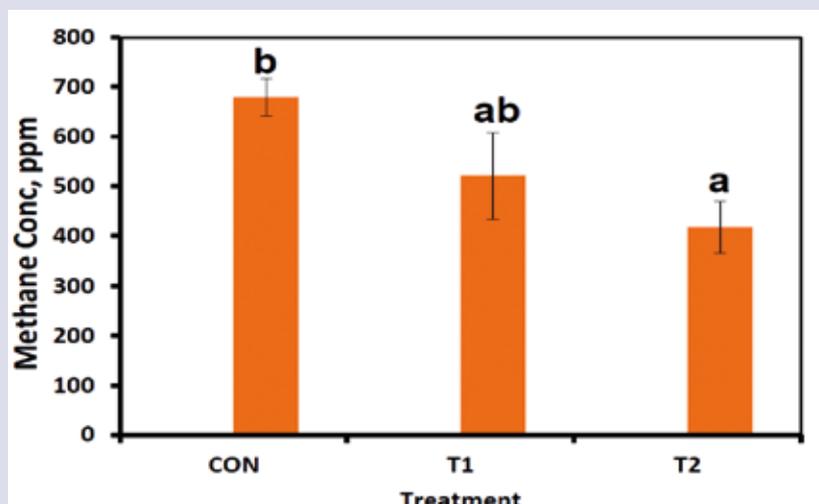
Methane emissions among calves on different dietary regimes

Ruminal hyper-ammonia producing bacteria: Inhibition by bioactive plant compounds

Y Mery Chanu, SS Paul, Avijit Dey and *Jerome A*

Hyper ammonia producing bacteria (HABs) are the class of microbes present in the stomach of ruminants, responsible for rapid rate of ammonia production from protein degradation beyond the capacity of the animals for its utilization. Thus, ruminant nutritionists are interested on decreasing ruminal protein degradation and ammonia genesis by focusing on controlling activity of HABs. The present investigations were carried out to determine predominant hyper ammonia producing bacteria in rumen of buffaloes, their isolation and characterisation as well as inhibition of these isolates with various sources of plant secondary compounds (tannins, saponins and essential oils). Study employing high throughput sequencing of amplicons of 16S rRNA gene from genomic DNA recovered from enrichment culture of HABs of buffalo rumen indicated that at phylum level *Proteobacteria* (61.1 to 68.2%) was the most predominant HAB. *Acidaminococcus* was most predominant among identified genera. *In-vitro* experiments were conducted with enrichment culture of buffalo rumen contents incubated with different types of feed additives such as essential oils (eucalyptus oil, lemon grass oil and clove oil) and extracts of plants (*Sapindus mukorossi* fruits and *Ficus bengalensis* leaves) each at graded dose levels. The reduction in ammonia production by clove and lemon grass oils was evident due to presence of major bioactive compounds especially, eugenol and limonene, which have strong antimicrobial activity. However, clove oil and Indian soapberry/ reetha (*Sapindus mukorossi)* fruit were found promising and effective in reducing the growth, protease production and ammonia production of HABs culture.

Taxonomy assignment of isolates using Ribosomal Database Project Classifier and results of 16S rRNA gene similarity search in GenBank.

Isolates	Accession number	Taxonomy assigned using RDP classifier	Nearest taxon in Genbank (isolates)		% Identity	Bit Score	E-value
			Accession number	Taxonomy			
HAB 2	PQ099813	Eggerthellaceae	KP 944195.1	*Paraeggerthella hongkongensis*	93	551 bits (610)	7e-153
HAB 3	PQ099814	Enterobacteriaceae	AB604196.1	*Escherichia coli* O124:H	99	880 bits (476)	0.0
HAB 4	PQ099815	Clostridiaceae	GU237022.1	*Escherichia coli* O111:H	99	870 bits (471)	0.0
HAB 5	PQ099816	Enterobacteriaceae	AB604196.1	*Escherichia coli* O124:H	99	880 bits (476)	0.0
HAB 7	PQ099817	Enterobacteriaceae	EF051572.1	*Clostridium botulinum strain* CDC 1656	97	401 bits (217)	3e-108
HAB 14	PQ099818	Enterobacteriaceae	GU237022.1	*Escherichia coli* O111:H-	95	741 bits (401)	0.0
HAB 18	PQ099819	Morganellaceae	KC210851.1	*Morganella morganii strain* LTC1	95	662 bits (358)	0.0
HAB 20	PQ099820	Streptococcus	LC269367.1	*Streptococcus sp.* JCM 7891	99	793 bits (429)	0.0

Nutritive value and Fermentation Kinetics of Superior Energy sorghum Cultivars

Avijit Dey and AV Umakanth

The potential of energy sorghums as quality forages were evaluated under the "Genetic enhancement of energy sorghums for renewable fuels and fodders" project in collaboration with IIMR, Hyderabad. Number of fodder samples of genetically improved cultivars developed by IIMR, Hyderabad were evaluated at CIRB, Hisar for proximate principles, in vitro digestibility and gas production potential. A large variation in the composition, digestibility and fermentation patterns were recorded, which indicates potential selection of improved cultivars for quality assessment in buffaloes.

Nutritional value of genetically improved energy sorghum cultivars

Cultivars No.	OM	CF%	EE %	Ash %	CP %	NDF %	ADF %	ADL %
1.	90.98	37.30	1.64	9.02	6.57	74.40	44.31	5.87
2.	92.77	34.49	1.35	7.23	6.20	69.83	41.60	5.49
3.	91.05	37.91	1.66	8.95	4.90	71.36	44.78	5.80
4.	91.24	32.32	1.20	8.76	5.62	74.41	39.59	5.83
5.	89.23	38.09	1.17	10.77	4.95	65.33	46.48	5.72
6.	87.98	37.86	1.25	12.02	4.67	70.81	44.98	6.86
7.	92.50	35.29	1.57	7.50	3.97	68.73	42.18	10.88
8.	92.89	35.44	1.66	7.11	5.10	70.99	43.34	6.40
9.	94.06	37.58	1.93	5.94	3.50	72.48	41.64	6.07
10.	92.86	37.08	1.77	7.14	4.47	70.81	45.64	7.79
11.	92.32	36.10	1.73	7.68	3.62	69.57	42.88	6.46
12.	90.07	32.97	1.88	9.93	5.05	68.37	40.37	5.39
13.	86.69	36.50	1.50	13.31	3.99	70.78	46.81	5.64
14.	88.76	34.47	1.98	11.24	3.57	70.61	44.31	6.59
15.	89.48	33.64	1.78	10.52	4.58	68.76	41.96	5.24
16.	90.05	34.08	2.20	9.95	4.04	70.48	44.08	5.64
17.	89.78	37.14	1.71	10.22	4.94	73.52	44.67	6.26
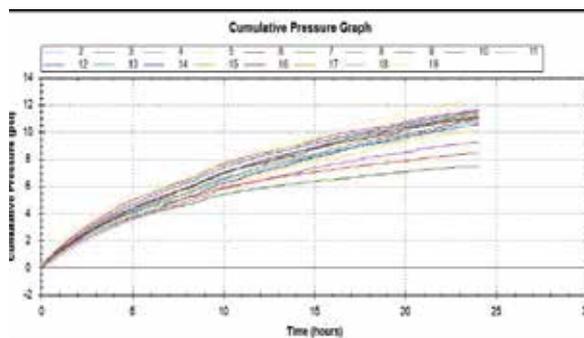
Gas production kinetics of energy sorghum cultivars

Development of a colorimetric paper-based dry strip test for detection of mastitis

Nisha Verma, Jyoti Sangwan, AK Boora, S Balhara, AK Balhara and Sarita Yadav

Mastitis is a prevalent disease in dairy buffaloes, with bacterial culture test as the gold standard for diagnosing intramammary infections (IMI), indirect methods such as somatic cell count (SCC) and CMT score are often used due to its higher cost. Mastitis significantly alters milk composition due to local inflammation, glandular tissue damage, increased leukocyte counts, and serum component infiltration from increased blood-milk barrier permeability, leading to elevated levels of enzymes like lactate dehydrogenase, alkaline phosphatase, catalase, and esterase, released during inflammation and tissue disruption. Consequently, the measurement of enzyme activities in milk has emerged as a potential diagnostic tool for detecting subclinical mastitis (SCM). This study aimed to assess the test performance of SCC and alkaline phosphatase in milk samples from buffaloes for identifying IMI-positive and IMI-negative animals and to develop a colorimetric paper-based dry strip test for detection of mastitis. To develop a dry strip for the detection of alkaline phosphatase (ALP) activity, it is essential to first establish a standardized protocol using a wet chemistry-based method, ensuring the retention of sensitivity, specificity, and accuracy in detecting ALP activity. This step is crucial to ensure the dry strip's efficacy in practical field applications.

The California mastitis test (CMT) was conducted buffalo-side on the farm for screening of subclinical mastitis. Mastitis was categorized as subclinical mastitis when milk sample indicated a positive CMT score, SCC > 1,50,000 cells per ml milk and was without visible abnormality. A cut-off point of 150,000 somatic cells /ml was considered as an indication of the presence of subclinical mastitis. Samples for ALP analysis were processed with ammonium sulphate for protein precipitation, the whey extracted was
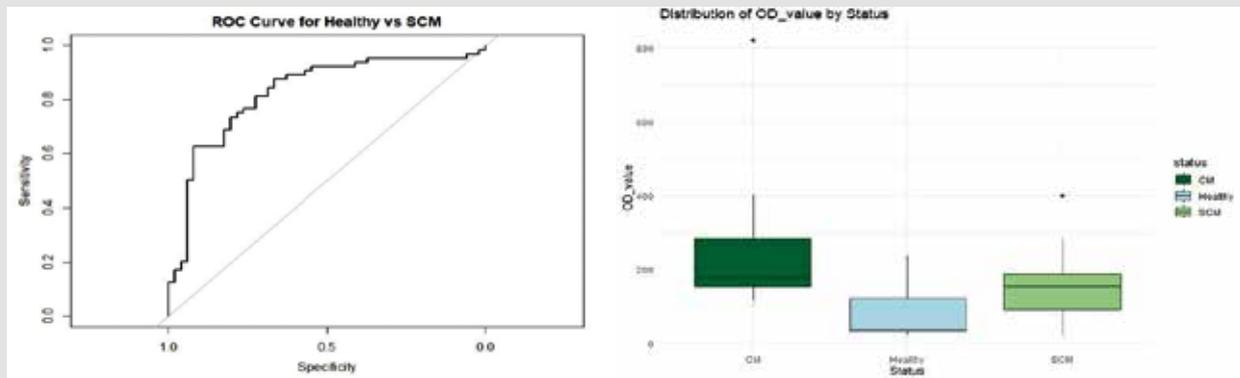
The boxplot shows that the OD values are highest in the Clinical Mastitis (CM) group, intermediate in the Subclinical Mastitis (SCM) group, and lowest in the Healthy group
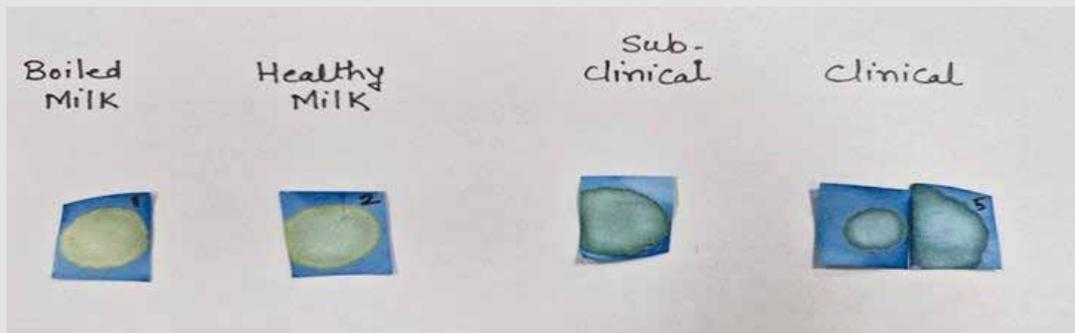
Visual colour intensity change from blue to green, in response to the change in alkaline phosphatase concentration/activity in buffalo milk using wet chemistry :(a) Buffalo serum (b) boiled milk, (c) healthy raw milk, (d) buffalo subclinical mastitis milk, SCC 1600 x 10³ cells/ml, CMT score 2 (e) clinical mastitis milk, SCC 2200 x 10³ cells/ml, CMT score 3.

frozen at –20°C, and enzyme activity was determined spectrophotometrically, with ALP activity (U/L) analysed as per Neumann, 1967. Out of 118 milk samples from 70 buffaloes screened using the California Mastitis Test (CMT) and Somatic Cell Count (SCC), 38 samples (32.20%) tested positive for subclinical mastitis (SCM), and 12 samples (10.17%) were confirmed as clinical mastitis cases. These samples were also tested for ALP activity. The optimal cutoff value for ALP, determined by maximizing Youden's Index on the ROC curve, was identified as 149.39. This threshold effectively distinguishes between the Healthy and SCM groups, with OD values below 149.39 classified as Healthy and those above classified as CM range. In the detection of mastitis, a colour change from blue to bluish-green was observed in both subclinical and clinical mastitis milk samples, indicating elevated enzyme activity. In contrast, a less pronounced colour change occurred in healthy milk, while no change was observed in boiled milk, highlighting ALP differences associated with mastitis.

Development of a dry strip test for detecting subclinical ketosis in buffalo milk

Jyoti Sangwan, Nisha Verma, AK Boora, Sunesh Balhara, AK Balhara and Sarita Yadav

Ketosis is a common metabolic disorder in dairy animals, caused by a severe negative energy balance when energy demand exceeds intake. This results in high levels of ketone bodies—acetoacetate (AcA), beta-hydroxybutyrate (BHB), and acetone—in the blood, urine, and milk. Ketosis leads to reduced milk production, poor health, and reproductive problems, making early detection essential for timely intervention.

Subclinical ketosis (SCK) occurs when ketone body levels rise in the blood without visible symptoms. Among ketone bodies, BHB is the most stable in blood and is considered the "gold standard" for SCK diagnosis. Cows are typically classified as having SCK when their blood BHB concentration exceeds 1,200 µmol/L. Currently, dairy farmers diagnose ketosis using tests that measure ketone levels in blood or urine. While portable blood ketone meters are used in field settings, analyzing ketones in milk offers a more practical, non-invasive alternative for routine monitoring.

Since ketone levels in milk correlate with those in blood, we explored the possibility of using milk samples for SCK detection. Various commercial on-farm diagnostic kits, including strips, powders, and tablets, change color in response to ketone levels, providing a semi-quantitative estimation. However, milk's opacity can
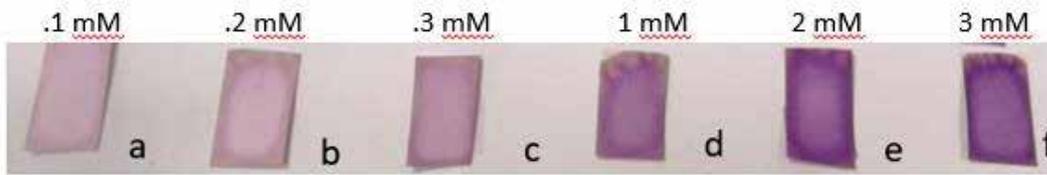
Visual colour intensity change from light purple to a more pronounced colour changes, in response to the change in acetoacetate concentration in buffalo milk whey using dry paper strip: (a) 0.1mM (b) 0.2 mM (c) 0.3 mM urine sample (d) 1 mM (e) 2 mM (f) 3 mM

interfere with results of some test methods, requiring sample pretreatment to remove proteins.

To develop an effective dry strip test for SCK detection in buffaloes, we first established a standard protocol using a wet chemistry method based on the nitroprusside reaction. This reaction causes a color change depending on the acetoacetate concentration in milk whey. The visual color change from light purple to a deeper shade helps estimate ketone levels as follows: (a) 0.1 mM, (b) 0.2 mM, (c) 0.3 mM, (d) 1.0 mM, (e) 2.0 mM and (f) 3.0 mM.

We conducted a study on 30 lactating buffaloes, collecting milk samples weekly from 5 days postpartum (Days in Milk - DIM) until 9 weeks. Acetoacetate (AcA) concentrations were measured, and a threshold value of 0.05 mmol/L was used to classify an animal as SCK-positive.

Our findings showed that:

- The highest occurrence of SCK was in the early postpartum period (weeks 1 to 3).
- Buffaloes with SCK displayed fluctuating AcA levels, with noticeable peaks around the second and seventh weeks postpartum.
- Healthy buffaloes maintained consistently low AcA levels throughout the study.

Characterization of the ruminal microbiota in Murrah buffalo fed condensed tannin enriched diet
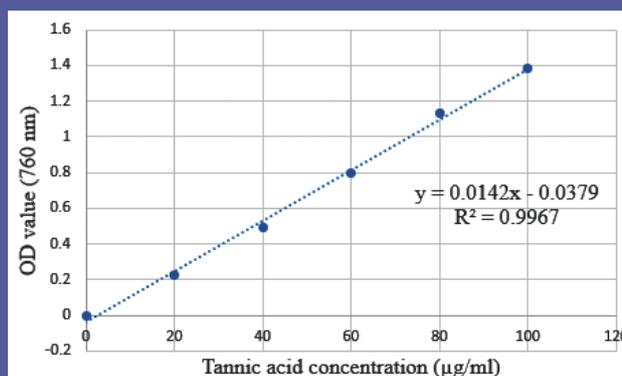
Sarita Yadav, Ashok Boora and Sunesh Balhara

The aim of project is to manipulate rumen manipulate microbes to use/for using condensed tannin rich sources to reduce enteric methane production in
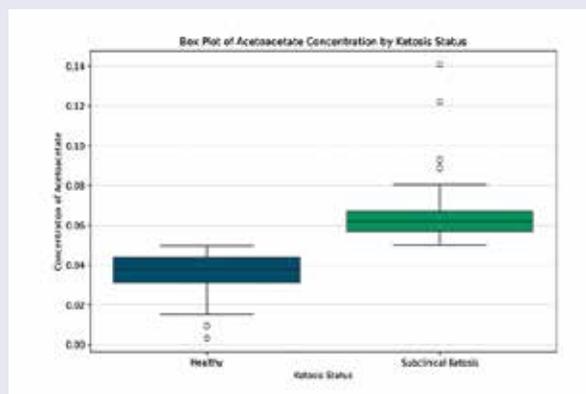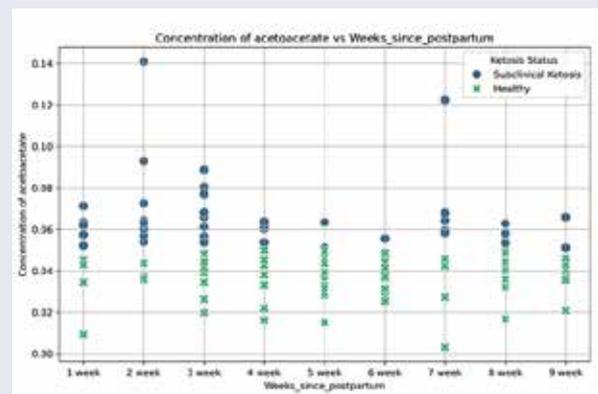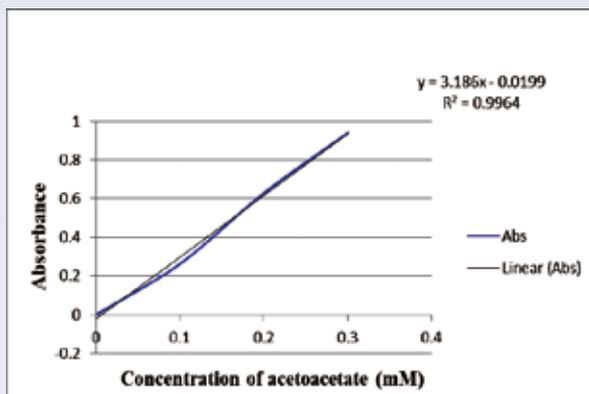
| Proximate analysis of Acacia Meal	
Dry matter	89.48
Crude Protein	13.03
NDF	60.42
ADF	48.12
Ether extract	1.31
Ash	4.82

buffalo without impacting animal productivity. Four rumen fistulated bulls of about one and half year age with body weight of about 200 Kg will be used as rumen liquor donors plus one 500 Kg old fistulated bull. The experimental diet will incorporate condensed tannin-rich tree leaves meal at 1% of DM inclusion rate. Tannin content is 9.15% of the dry weight of the Acacia nilotica foliage meal based on the Folin-Ciocalteu assay.

Evaluation of potential plant-based agent for anti-biofilm and antimicrobial activities against mastitis pathogens of buffaloes

Sarita Yadav, Ashok Boora and Sunesh Balhara

Propolis, a natural resinous substance produced by honeybees, has been used for its therapeutic properties since ancient times, particularly for its antimicrobial effects. The crude MPE exhibited antimicrobial activity against *E. coli*, *Pseudomonas*, and *Streptococcus* spp., with MICs ranging from 15.6 to 7.81 mg/ml. These results suggest that methanol extract of propolis possesses antibacterial potential and could be an alternative antimicrobial agent against mastitis pathogens.
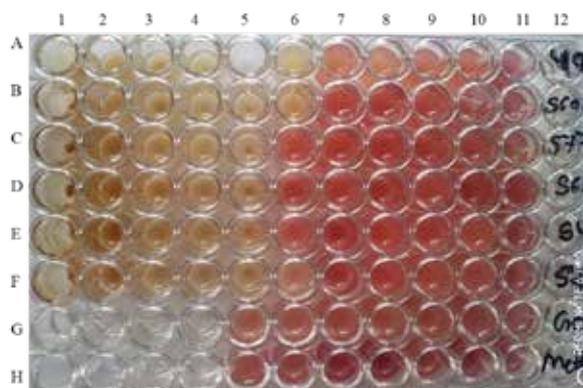
Assay showing detection of MIC for MPE against Pseudomonas isolates in a 96 well plate. A1-10 to F1-10, MPE against different Pseudomonas strains, G1-

G10, Gentamicin, H1-H10, Methanol control, A11-H11, Bacterial cell without MPE, A12-H12, Broth control.

Molecular analysis of methanogenic archaeal diversity in rumen of Murrah buffaloes fed different diet

Sarita Yadav and Ashok Boora

The present study was undertaken to analyze the dominant methanogens present in the rumen of Murrah buffaloes when fed different diets by sequencing and analysis of V3 V4 regions of 16S rRNA, Illumina sequencing. In this study with eight buffalo calves from the CIRB herd, six were given 500g of boiled Guar in addition to a basal concentrate mixture, while two served as controls, one month as adaptation period. Technique to take rumen liquor from live animal through oral stomach tubing (OST) method was standardized. However, execution of OST technique was not without difficulties such as animal resistance, clogging of tube and vacuum generation to take sample out. Total PCR-quality microbial genomic DNA extraction from rumen content was standardized. Several DNA extraction procedures for isolation of microbial genomic DNA extraction from rumen content including Promega stool kit, Qiagen stool kit were examined. DNA yield from these methods was less (Qiagen stool kit: 44.49 ng/µl, 52.82 ng/µl; Promega stool kit: 14.2 ng/µl, 18.3 ng/µl). Hence, we developed a procedure that combines Guanidinium thiocyanate followed by phenol: chloroform extraction with subsequent cleaning of DNA using Qiagen Stool kit to obtain PCR-quality microbial genomic DNA. This method gave a yield of 2246.58 ng/µl, 2056.52 ng/µl, 1428.57 ng/µl, 2510.08 ng/µl, 2784.80 ng/µl microbial genomic DNA. Quantitative PCR (qPCR) assays targeting archaeal 16S ribosomal RNA (rRNA) genes were performed. Archeal microbial population decreased significantly

Standardization of technique to take rumen liquor from live animal through oral stomach tubing (OST) method

by feeding 500 gm Guar as a feed additive in addition to basal concentrate mixture. *Bacteroidetes*, *Firmicutes*, *Proteobacteria* and *Verrucomicrobia* were the most abundant phyla in both control and treatment group, whereas there was significant increase in Firmicutes and Bacteriodetes in control group. The beta-diversity analysis of microbiome composition revealed that Methanobacteriales (Methanosphaera, Methanobravibacter), Methanosarcinales (Methanimicrococcus) decreased in treatment group significantly. Also, there was a significant increase in Prevotella, Proteobacteria in treatment group.

TRANSFER OF TECHNOLOGY

Dairy farmer's perceptions and profitability of rearing superior breeds of buffalo in Punjab

N Saxena, Guuraj M, F C Tuteja, TK Datta, Aiswarya S, Sanjit Maiti, Biswjith Sen and Mukesh Bhakat

The present study was conducted in four districts of Punjab namely Amritsar, Tarn Taran, Firozpur and Gurdaspur, because Nili-Ravi breeding tract falls in these areas. The objective of the study was to understand the farmer's perceptions towards superior buffalo breeds and their profitability in the Punjab and constraints faced by the farmers in keeping their preferred buffalo breed. For the study, a total of 240 farmers from four districts namely Amritsar, Taran Tarn, Firozpur and Gurdaspur were interviewed personally using structured interview schedule during 2023 & 2024. The study revealed that dairy farmer's preferred to keep Nili-Ravi buffalo for milk production in the study area because of longer lactation length & consistent peak milk yield (it means once NR attain the peak milk yield there is no sudden drop in the milk and it maintains consistency), more number of calf in its productive life span (on an average 08-10 calf), docile in nature, easily adaptable and part of their culture in Amritsar, Tarn Taran and Firozpur. However, farmers in Gurdaspur district have less preference for Nili-Ravi buffalo due to high incidence of mastitis and over whiteness of the skin colour of the buffalo. The skin colour and breed characteristic of the Nili-Ravi had direct relationship with breed preference in the study area. The sample farmers highlighted the breed characteristics of the Nili-Ravi buffalo such as front legs are short in comparison with hind legs, pinkish colour tongue, walled eyes, white cut on the forehead, head is bulging at top and depressed between the eyes, loose body skin, white markings on forehead, muzzle, legs, tail and udder. However, dairy farmers are still unable to keep their preferred buffalo breed due to the non-availability of superior quality semen or bulls for breeding. Therefore, government intervention is required to propagate the Nili-Ravi buffalo population in the study area.

Economic impact of Field Progeny Testing (FPT) program on income of Murrah buffalo farmers

Sanjay Kumar and Gururaj M

The present study was conducted to evaluate the cost incurred and benefits accrued from the dissemination of Murrah superior quality germplasm in Hisar unit and to assess the economic impact of Murrah superior quality germplasm on participating buffalo farmer's income. For the study, both primary and secondary data were included. Primary data was collected from 10 FPT and 10 non-FPT villages to assess the impact of CIRB superior germplasm. 200 buffalo farmers (10 respondents from each village) were interviewed personally using structured interview schedule. The expenditure incurred on the project and societal benefit accrued was estimated using Economic Surplus Model (ESM) technique. The results indicated the positive societal benefit of the dissemination of the CIRB superior quality germplasm in the field under Field Progeny Testing (FPT) program in Hisar Unit. The results of the Propensity Score Matching (PSM) technique shown that the production and reproduction parameters of both control & treatment groups were comparable. The parameters such as birth weight of calf, AFC, lactation length, calving interval and lactation milk yield had positive influence on income of farmers in FPT villages compared to non-FPT respondents.

Marketing dynamics of Murrah buffaloes and its impact on livelihood of dairy farmers in Haryana

Gururaj M, N Saxena, Sanjay Kumar, Aiswarya S, ML Sharma and PC Lailer

The objective of the present study is to understand marketing dynamics of superior quality Murrah buffalo in its breeding tract particularly and its impact on income of buffalo farmers in Haryana in general. For the study four districts namely Hisar, Jind, Bhiwani and Rohtak were selected, as the Murrah breeding tract falls within this area. During the period (January to December, 2024), a structured interview schedule was prepared and tested for primary data collection. A total of 90 stakeholders, including farmers, traders, agencies, and middlemen, from Bhiwani, Rohtak, and Jind districts of Haryana were personally interviewed to collect the required data. During the data collection different buffalo marketing channels were identified such as a).Farmers to farmers b).Farmers to middlemen to farmers c).Farmers to agent middlemen to traders to farmers d).Farmers to agent middlemen to traders to agent middlemen to farmers e).Farmers to marketing platform (marketing outlet) to farmers f).Farmers to marketing platform (marketing outlet) to agent middlemen to farmers and g).Farmers to marketing platform (marketing outlet) to traders to farmers. The average price of the buffalo mainly depends on udder size & teat, body shape, horn shape, switch of the tail and lactation order. However, several constraints such as credit based transaction in sale & purchase of the buffalo, online payment fetches 2 per cent of the charges, lack of proper demarcated area for the sale & purchase, waste management affect the marketing of the buffaloes in the study area.

Creating a Comprehensive MOOC: Mastering Scientific Buffalo Management Practices for Sustainable Agriculture

Aiswarya S, TK Datta, N Saxena, P Kumar, Gururaj M and Supriya Chhottaray

The present study is conducted to develop a comprehensive curriculum for the scientific buffalo management practices and to assess the impact of the MOOC on learners' knowledge, and attitudes toward scientific buffalo management practices. The project is in collaboration with ICAR-NAARM, the MOOCs will be designed to provide structured learning for rural youth, buffalo farmers, and entrepreneurs. During the period (March to December, 2024), a course outline was finalized through consultations with experts to ensure its relevance and applicability to the target audience. The course covers various aspects of buffalo farming, including breeding, nutrition, reproduction, economics, processing, entrepreneurship, and biotechnological advancements. It comprises 19 modules, each focusing on a specific topic to provide in-depth knowledge and practical insights. Scripts are being developed in consultation with subject matter experts to ensure high-quality content delivery, covering various aspects in a structured and engaging manner.

Developed MOOC Curriculum on Scientific Buffalo Farming

Major Topics	No. of Modules	No. of Sub-Modules
Buffalo Genetics & Breeding	3	8
Buffalo Physiology	2	6
Buffalo Reproduction	3	9
Buffalo Nutrition	1	6
Buffalo Management	4	12
Economics & Business Aspects	2	6
Extension & ICT in Buffalo Farming	2	6
Total	19	53

Development of Buffalo centric sustainable hub

N Saxena, SK Phulia, Aiswarya S, Gururaj M, RK Sharma, V Mudgal, S Kumar, ML Sharma, FC Tuteja, Ashish Bhaladhare, MH Jan, N Paul, Aishwarya H and SK Kakraliya

This study systematically assesses the livelihood vulnerability of dairy farmers, formulates and validates sustainable livelihood strategies, and evaluates their impact on buffalo-rearing communities. Implemented in 2024 in Nangla village (Fatehabad, Haryana) and Kheri Gujjran village (Patiala, Punjab), the project

targets Scheduled Caste (SC) communities, constituting over 80% of the population in these villages.

A multi-dimensional extension approach employing Farmers' Participatory Research and Extension, integrating school-based extension, entrepreneurship development, cyber extension, and gender empowerment, was adopted to enhance the adoption of scientific buffalo husbandry practices. Key activities included stakeholder engagement through participatory methodologies such as village visits, semi-structured interviews, and Focus Group Discussions (FGDs) with the Sarpanch, Veterinary Officers, school officials, Anganwadi, and ASHA workers. A baseline survey assessed socio-economic conditions, training needs, and Livelihood Vulnerability Index (LVI) parameters to quantify exposure, sensitivity, and adaptive capacity.

The study identified challenges such as repeat breeding, high feed costs, infertility, low productivity, and inefficient animal management. Based on findings and consultations with stakeholders, targeted scientific interventions were implemented, including:

- Health & Nutrition: Area-Specific Mineral Mixtures (ASMM), anthelmintics, ectoparasitic control agents, hormonal therapies.

- Animal Comfort & Hygiene: Rubber mats, milk cans, instructional materials.

- Capacity Building: Farmer-centric training, field demonstrations, and interactive knowledge-sharing sessions.

- Outreach Activities: Kisan Gosthis, Kisan Sammelans, frontline demonstrations, and key event celebrations (Milk Day, Women's Day, Farmers' Day).

- Entrepreneurship Development: Training programs in collaboration with Punjab National Bank Farmers' Training Centre (PNB FTC) and Northern Region Farm Machinery and Tractor Training Institute (NRFMTTI) to promote buffalo-based enterprises.

Scaling Up & Future Prospects

To strengthen participatory learning, a Farmer Field School (FFS) in Buffalo Rearing was initiated in 2025, employing a cluster-based expansion strategy to scale activities across five villages. This initiative will serve as a dynamic platform for experiential learning, capacity-building, and adaptive extension, enhancing resilience, productivity, and sustainability in buffalo-based livelihoods.

A PLS-SEM approach to assessing buffalo farmers' perceptions of scientific husbandry practices using the Extended UTAUT framework

Gururaj M, Aiswarya S, N Saxena and ML Sharma

For the first time, a conceptual model based on the Unified Theory of Acceptance and Use of Technology (UTAUT) was developed and validated using Partial Least Squares Structural Equation Modeling (PLS-SEM) to measure buffalo farmers' perceptions of scientific husbandry practices. A structured interview schedule was designed and the data was collected from 338 respondents and the model was assessed using SmartPLS. To enhance its contextual relevance, two additional constructs—Perceived Risk (PR) and Knowledge Expectancy (KE)—were incorporated alongside core UTAUT variables, including Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI), Facilitating Conditions (FC), Behavioral Intention (BI), and Use Behavior (UB). Data were analyzed using SmartPLS, and model fitness was evaluated through Goodness-of-Fit (GoF) Index, Standardized Root Mean Square Residual (SRMR), Normed Fit Index (NFI), and R-squared (R^2) values. Reliability and validity were ensured through Composite Reliability (CR), Average Variance Extracted (AVE), and Heterotrait-Monotrait (HTMT) Ratio. The structural model's path coefficients and significance levels were assessed via bootstrapping, revealing key relationships that influence buffalo farmers' behavioral intentions and adoption patterns. These findings provide empirical evidence for designing targeted extension strategies and policy interventions to promote sustainable buffalo rearing practices.

Assessing knowledge, attitude, and practice gaps in buffalo husbandry

Gururaj M, Aiswarya S, N Saxena and ML Sharma

KAP analysis was conducted among 521 respondents to assess knowledge, attitude, and practice gaps in

buffalo husbandry, followed by the development of a knowledge test to evaluate their understanding of scientific practices. To measure attitude and practices, structured statements were formulated, capturing perceptions of key management areas. The impact of training was assessed through cognitive gain analysis, revealing significant improvements in knowledge levels. Training Need Assessment (TNA) identified critical areas such as heat detection, artificial insemination, breed selection, newborn care, and reproductive management as high-priority training needs, while economic analysis and social media usage were considered less immediate concerns. Balanced feeding and mineral supplementation were widely recognized as essential for productivity, whereas vaccination, colostrum feeding, and value addition to milk were perceived with lower importance. Thumb milking and cooperative milk marketing were also rated lower, indicating gaps in awareness of best practices. Major skill deficiencies in heat detection, artificial insemination, and balanced feeding formulation highlighted the need for targeted interventions.

DEVELOPMENT OF TECHNOLOGIES AND THEIR TRANSFER TO END USERS

The institute has developed several technologies since its inception that were transferred to the farmers to increase the production and reproductive efficiency of their buffaloes. Many of the farmers trained in this institute are achieving ~60 % conception rates with the frozen semen from this institute. The developed technologies are also transferred through field visits, kisan melas, radio and TV talks and web portal-based extension activities. Books, bulletins and popular articles are regularly written by scientists for dissemination of knowledge of scientific buffalo husbandry to the farmers. Some of the technologies which found acceptance with users are presented below:

Impact of quality semen produced by institute

Institute maintains a high pedigreed herd of Murrah and Nili-Ravi buffaloes. The institute has been undertaking breed improvement programme through selective breeding since its inception. The genetic potential of bulls is evaluated through progeny testing. More than four lakh doses of frozen semen from test bulls and over sixty thousand doses from progeny tested bulls are available for Murrah breed improvement. High genetic merit Murrah and Nili Ravi bulls of have been supplied to various developmental agencies and village panchayats in 12 States for increasing milk production through genetic improvement. Under field progeny testing program in adopted villages, more than one lakh AIs were done so far with
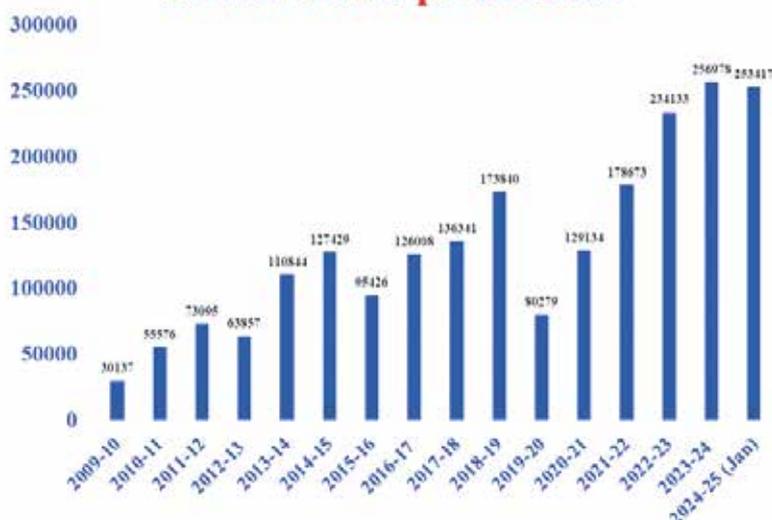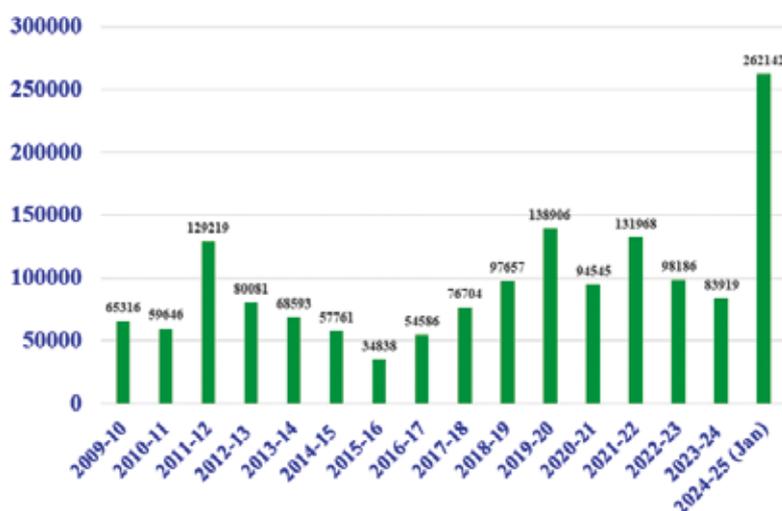
frozen semen of test bulls with conception rate of 48%. Year wise frozen semen production from Murrah bulls are indicated in the figure.

Number of frozen semen doses produced (2009-2024)

Number of frozen semen doses sold (2009-2024)

Dissemination of quality germplasm (semen) for breed improvement

The quality semen cryopreserved from test bulls and progeny tested bulls having >50% post-thawed motility is used at our farm, Network centres and adopted villages for genetic improvement of the buffalo herd. The surplus quality frozen semen doses are being sold to farmers/stakeholders/researchers to disseminate quality buffalo germplasm for improvement in the production of country buffaloes. Detail of the semen sold year wise depicted in the figure given below:

Revenue generated through sale of semen

The frozen semen collected and cryopreserved at CIRB having huge demand and acceptability among the buffalo farmers due to good quality and farmers friendly environment in the institute. The CIRB Revenue generated through sale of semen details are presented in the figure.

Revenue generation (Rs., lakhs) from sale of semen (2009-2024)

Improved protocol for buffalo semen cryopreservation

A simple, reliable and economical method for freezing of buffalo semen has been developed and found to be effective to freeze the static ejaculates successfully, a phenomenon specific to buffaloes which greatly reduces the efficiency of utilization of buffalo semen for artificial insemination. A large proportion of buffalo semen ejaculates collected during summer months are rejected due to the high incidence of post-thaw backward motility of sperm cells. Through thorough investigations about the phenomenon, stage of glycerolization was identified to be the most critical step responsible for backward sperm motility. Glycerolization at room temperature during initial stage of semen dilution reduced/eliminated the backward motility due to which 20 percent more ejaculates could be preserved annually, thereby enhancing the frozen semen production. Overall semen freezing protocols improved resulting in almost 15% improvement in post-thaw motility and improved frozen semen quality and fertility on artificial insemination.

Further, novel cryopreservation protocol for buffalo sperm was developed by altering the freezing rates in 3-step cryopreservation protocol. Using this protocol, significant improvement in post-thaw sperm motility and kinetics parameters (average path velocity, straightline velocity, sperm elongation, total, progressive & rapid motility), sperm live percent, plasma membrane and acrosome integrity was obtained. Patent has been granted for this technology.

Sericin for improved semen freezing

Sericin is a water-soluble globular protein (a protein hydrolysate) derived from silkworm Bombyx mori. Supplementation of 0.25-0.5% sericin in semen extender improved frozen-thawed semen quality through protecting sperm from oxidative stress.

Ready to use buffalo semen extender

Egg yolk is most commonly used semen extender for semen cryopreservation. There are some limitations of egg yolk-based semen extender like wide variability of egg yolk composition, risk of microbial contamination, presence of high-density lipoproteins, calcium and steroids hormones. To solve the above stated problems, active ingredient of egg yolk was extracted and unwanted substances were removed from the egg yolk. Important additives were added and compared with raw egg yolk-based extender and found

that customized extender showed better performance in terms of sperm motility and freezability compared to egg yolk-based extender. This technology is available at Agrinnovate (www.agrinnovateindia.co.in) for commercialization.

Reduced Buffalo Sperm Dosage for Artificial Insemination

This technology involved use of dilution (@12, 16 & 20 million sperm/straw) for field artificial insemination. In this technology the dilution buffalo on buffalo sperm showed no detrimental effect on sperm structural and functional parameters. Moreover, there was no difference in the field conception rate for the 3 doses. Reduction of sperm dosage per insemination pave way for efficient utilization of resources by increase cost benefit ratio with enhanced production of semen doses for wider dissemination of superior buffalo germplasm to the stakeholders to increase productivity.

Improved protocol for oocyte vitrification

Supplementation of BSA in place of FCS in maturation media ensures successful vitrification of in vitro matured oocytes. It has positive influence on post-thaw survival and maintenance of developmental competence of in vitro matured buffalo oocytes vis-à-vis FCS.

Area-specific mineral mixture

Surveys of feeding practices carried out in Haryana revealed deficiencies of essential minerals like calcium, phosphorus, zinc and manganese in 70 percent of buffaloes. On the basis of analysis of mineral intake vs requirement an area specific mineral mixture was developed. Seventy per cent of the buffaloes suffering from anaestrus conceived within a period of 2-4 weeks of feeding the area specific mineral mixture. The mineral mixture improves feed intake, milk production and reproductive efficiency. Institute has been preparing and selling mineral mixture to the farmers at no profit no loss basis.

Feeding standards for different categories of buffaloes

Feeding standards have been developed for different categories of buffaloes, viz. growing males, growing heifers, lactating buffaloes and pregnant buffaloes. Nutrient requirement for heat and humidity stress was also estimated and published.

Ultrasonographic fetal sex determination in buffaloes

Ultrasonography guided fetal age and sex determination technology has been standardized. The accurate diagnosis can be made at 55 day of gestation in buffaloes in contrast to 50 days reported in cows.

Method for estimation of gestational age

By ultrasonography fetal age can be accurately assessed that is useful in better management of pregnant buffalo at the time of calving. The length of gestation in buffalo can be estimated by following standard chart that is developed for crown-rump length of buffalo fetus on different days postinsemination. When this plot was used for determining the age of fetus in pregnant buffaloes the exact date of mating/gestation could be predicted.

Ultrasonography for monitoring ovarian activity

The non-invasive technique of ultrasonographic scanning has been standardized for diagnosis of ovarian activity. This technique is very useful for follicular dynamics studies. With the use of this technique, time of ovulation can be predicted very precisely to allow fixed time insemination.

Early pregnancy diagnosis in buffaloes

A protocol has been standardized for establishment of early pregnancy diagnosis in buffaloes. With ultrasonic scanning, pregnancy could be diagnosed as early as 26 days post insemination. The technique can be used to assess date of service in case of unobserved mating.

Identification of molecular markers for MAS

RAPDs, Microsatellites and traits governing specific genes as growth hormone, seminal fluid protein gene specific primers based buffalo genome characterization done for identification of genetic diversity and markers for higher milk production and bull performance. A twenty nucleotide base pair length having di-nucleotide repeats have been identified showing polymorphic expression of milk production in low and high milk producing buffaloes. Study revealed more than 30 percent dissimilarity between high and low yielding buffalo genotypes.

OvSynch plus protocol for estrus induction in buffaloes

Anestrus, in pubertal heifers and postpartum buffaloes, is the primary cause for low reproductive and productive performance of buffaloes. The condition is associated with the presence of static ovaries and though follicular development may occur, none of the ovarian follicles becomes mature enough to ovulate. In anestrus animals, doninant follicle (DF) undergoes atresia instead of ovulation. Analysis of ovarian response of anestrus buffaloes to 'Ovsynch' protocol revealed that only the buffaloes with a large DF (>9mm) at the time of first GnRH injection respond well to this treatment. However, such an accurate assessment of follicular size is difficult under field conditions with routine per-rectal palpation. Hence, to ensure consistently similar ovarian follicular picture of all anestrus buffaloes at the time of first GnRH injection, a new protocol was developed and named 'Ovsynch Plus.' In this protocol, an injection of PMSG is administered 72 h prior to the first GnRH injection of Ovsynch treatment, in order to support ovarian follicular development so that at least one large follicle is available after 72 h for responding to the GnRH injection with ovulation/luteinization. Resulting luteal structure in the ovary is then subjected to luteolysis by PGF given 7 days later. Further administration of GnRH ensures synchronous ovulations of preovulatory follicles to allow fixed time insemination of treated animals.

The major advantage of this protocol is that it induces oestrus in cyclic as well as acyclic animals within a close window. Buffaloes not coming into estrus within the defined period following this protocol also become cyclic and get pregnant within one month of treatment, if initiated during breeding season.

Embryo transfer technology

Efforts have been made in developing and improving the embryo transfer technology for buffaloes which has resulted in the production of 20 calves at this Institute. Technology for large scale production of *in-vitro* matured and *in-vitro* fertilized embryos using slaughter house ovaries has also been developed. The embryo cryoprservation technique has been standardized. This technique has been standardized for *in-vitro* maturation of oocytes obtained from abattoir ovaries followed by their *in-vtiro* fertilization and culture of the resulting embryos to transferable stage. The technique of IVF will be of immense use for faster multiplication of elite germplasm and progeny testing of bulls after collecting oocytes from live animals.

Use of OPU-IVEP in production of superior buffalo germplasm

Use of Ovum pick up-invitro embryo production (OPU-IVEP), in recent times has proven to be alternative method for propagate and disseminate superior germplasm, along with established techniques such as superovulation and embryo transfer. OPU-IVEP Technology, is an advanced reproductive technology for multiplication of superior female germplasm at much faster rate.

Scrotal circumference for bull selection

Scrotal circumference of Murrah buffalo males is highly correlated with age and body weight and it can, therefore, be used for pre-selection of breeding bulls at an early age. For mature (>600 Kg BW) Murrah buffalo bulls (n=86), mean SC values were 35.23 cm, with S.D. of 3.00. Therefore Murrah bulls having scrotal circumference <29 cm (Mean -2 S.D.) must be excluded from the breeding programme, while males with SC of over 41 cm (Mean +2 S.D.) should qualify as the best semen donors.

Super ovulation with ablation of dominant follicle

Superovulatory treatment in buffaloes starts from day 9-12 of the estrous cycle (Day 0 = Estrus). At this stage ovary invariably has a large dominant follicle (DF) ranging from 12- 15 mm that suppresses the growth of other subordinate follicles. During superovulatory treatment also this DF suppresses other subordinate follicles to grow in response to FSH treatment. This results in less number of preovulatory follicles at the time of insemination leading to less number of ovulations and embryos. Therefore, DF was ablated using ultrasound guided transvaginal follicle ablation technique prior to start of superovulatory treatment. This technique is minimal invasive and has no ill-effect on animal fertility. Ablation of DF results in better superovulatory response and establishment of pregnancies in recipients.

Sexing of IVF produced embryos

Sexing of *in-vitro* produced embryos was successfully done with PCR technique using bovine primers. Micromanipulation of the embryos was done for obtaining biopsy for sexing.

Cloning of breeding bulls for semen production

Using cloning technology, it is possible to make multiple copies of outstanding bulls in the shortest possible time that could mitigate demand of proven semen. The institute produced Hisar-Gaurav, which is cloned of a superior breeding bull, in 2015. This cloned bull has started donating semen at the age of 22 months and qualifies all semen and fertility parameters. Using his semen, 20 progenies were produced that are healthy and normal. In addition to Murrah bull cloning, institute has cloned Assamese breeding bull, which is growing normal and healthy. The semen of this bull has also been collected and cryopreserved successfully with acceptable post-thawed sperm motility. Institute also produced seven cloned calf of M-29, superior bull and one re-clone of Hisar-Gaurav which is first report of its kind.

Repository of somatic cells

Three hundred somatic cell lines were established and cryopreserved from different buffalo breeds (Murrah, Nili- Ravi, Bhadawari) of both sexes. These primary cell lines were characterized using expression of cytoskeleton markers including vimentin for fibroblast origin type and cytokeratin for epithelial origin type. Cryopreserved cell lines would be a viable biomaterial for long term maintenance of elite germplasm, which have wide range of applications including cloning even after death of animal, induced pluripotent stem cells production and unlimited DNA/RNA/protein source for any research purpose. Frozen somatic cells were shared with ICAR-NBAGR, Karnal and these cell lines are also available for researchers on written consent.

DNA bank

DNA repository of about 205 buffaloes has been established at the institute for genome analysis. Phenotypic data on all the animal is being collected which shall be used for establishing linkages with performance traits and identification of molecular markers.

Induction of lactation

Farmers rear the dairy animals for milk production and livelihood but they are commonly facing the problems of conception failure, long calving interval, anestrous, cystic ovaries, specific abortions and repeat breeding. They can benefit by inducing such animals into lactation by induced lactation therapy. The buffalo is weighed and appropriate dose of hormones, Estradiol- 17b and progesterone @ 0.1 mg/kg body weight/day each, is calculated for seven days therapy, dissolved in absolute ethanol and stored. On the day of treatment, 1 ml of each hormone solution is administered subcutaneously in the morning and evening at an interval of 12 hours, for seven consecutive days. Thereafter, on day 17,19 and 21 of treatment, 10 ml Largectil injection and on day 16, 18 and 20, injection of 20 mg of Dexamethasone are also given intramuscularly. Between 15th and 21st day of treatment, udder massage is given for fifteen minutes each in the morning and evening daily till the udder is turgid with milk, which is usually around 21st day when milking is started. The milk becomes normal in physical and chemical properties within 10 -15 days of start of milking and the amount of milk yield increases with time. Almost 60-75 percent of the buffalo's milk yield potential can be achieved following induced lactation.

Colostrum feeding for higher growth and calf survival

Higher levels of immunoglobulins absorbed within 16 h of birth, reduce the mortality in calves and result in faster growth rate by 20-22 percent. High titre of circulating immunoglobulins in calves at an early age of 24 h showed the association with weight gain upto the age of 2 years. Status of immunoglobulin levels at such an early age could also predict the health status of calves. A critical level of these blood proteins required for the survival of calves has been assessed.

Antioxidants in survival and growth of neonates

Advanced pregnant (270 to 280 days' gestation), buffaloes are administered two doses of antioxidant micronutrients, consisting of vit A (Palmitate), vit D and vit E (dl- alpha 3 Tocopherol acetate, within 30 days before calving, at 15 days intervals. These buffaloes secreted 25-80% more Ig protein in colostrum than control buffaloes. Calves born to treated buffaloes were also supplemented with mineral mixture @ 5 g/calf/day, colostrum feeding @ 10% of birth weight, concentrate mixture started 10 to 15 days after birth and green folder offered after 3 weeks, in order to achieve high growth rate and survival. Calves born to vitamins administered buffaloes and further supplemented with mineral mixture gained 10 percent higher body weight and 30% better immunity status. Calves bearing higher body weight and better immunity are economically more rewarding for meat and milk industry.

Uromol preparation

Uromol is a compound prepared by heating urea and molasses in the ratio of 1 : 3 and then mixing it with equal amount of wheat bran/deoiled rice bran. Four kg urea along with 12 kg molasses is slowly heated in a container for 30 minutes. Then equal amount (16 kg) of wheat bran or deoiled rice bran is mixed in it and the mixture is cooled to room temperature. This material contains 36 percent DCP and 72 percent TDN and can replace conventional compound feeds in the ration of buffaloes yielding 8-10 litres milk/day.

Urea molasses mineral blocks (UMMB)

Urea molasses mineral blocks are prepared in the same way as Uromol, except with the addition of mineral mixture, salt and binder. By *ad-lib* feeding these blocks along with other feed ingredients, about 20 percent of the conventional concentrate mixture can be saved. UMMB prepared by the 'cold process' technology has yielded even better results.

Superior isolates of anaerobic fungus

Superior isolates of anaerobic fungus were isolated and evaluated for ability to increase *in vitro* digestibility of straw by buffalo rumen microflora. Such isolates have the potential to be used as feed additives.

Enzyme supplementation

Fibrolytic enzyme supplementation can be used as feed ingredient in the concentrate mixture of calves to increase the growth rate. Further, the cost of enzyme can be reduced by using feed grade enzyme or enzymes used in textile industry (cellulase) and paper industry (Xylanase).

Thermal stress management

Microclimate modifications with supplementation of niacin @ 6 gms/day/animal, yeast @10 gms/day/animal and mustard oil @150 gms/day/animal; enhance milk production of lactating buffaloes by reducing thermal stress.

Marker based early detection of post-partum anestrus (PPA) in buffaloes

This technology has been granted patent 'An in vitro method for detection of postpartum anestrus condition in buffaloes' vide application No. 2940/DEL/2013CBR No. 10352 Docket No. 16369, patent granted on 05/02/2019. SNPs at position 251 of 5' untranscribed region of HSP70 gene has been used for assessing genetic predisposition to postpartum anestrus (PPA) condition in buffaloes. This tool can be used for selection of animals for breeding programs.

Mobile based App

The mobile based app on buffalo reproduction, nutrition and health has been developed and put in

public to impart knowledge for buffalo owners and also a guide for VLDA and graduating veterinarians. The App provides basic information on different areas of buffalo reproduction, nutrition and health for better management of animals by farmers. . The App additionally provides answers on frequently asked questions under each section of buffalo reproduction. The three Apps is presently available in Hindi and English languages. Complete App content has audio backup with download facility.

The app is now placed on Google Play store on following link.

For buffalo reproduction app link : https://play.google.com/store/apps/details?id=com.cirb

For buffalo nutrition app link:

https://play.google.com/store/apps/details?id=com.cirb.buffaloposhahar

For buffalo health app link: https://play.google.com/store/apps/details?id=com.cirb.buffhealth

e-Bhains Vigyan Kendra (ई-भैंस विज्ञान केन्द्र)

This portal is hosted at www.ebhainsgyan.cirb.res.in for two ways interaction between scientists and farmers. This interface has designed to substantiate CIRB's efforts towards use of ICT for popularizing buffalo farming and bridging gaps between end users and scientists. Under this project 'CIRB-Central Institute for Research on Buffaloes' YouTube channel was launched in July 2014. The channel has received overwhelming response from internet users with more than thirty thousand subscribers and more than 80 lakh views. The amateur 'e-lessons' by the Institute scientists themselves explains the processes in very simple and easy to understand language. 91% of the views have been accessed through mobile phones indicating huge penetration of these devices among the buffalo owners. The channel has more than seventy thousand subscribers.

Buffalopedia

(http://www.buffalopedia.cirb.res.in)

It is an internet accessible interactive instructional resource available free at the official website of the ICAR-Central Institute for Research on Buffaloes, Hisar (http://www.cirb.res.in). It is aimed at providing concise information on various aspects of buffalo statistics, breeds, health, reproduction, nutrition and management aspects. This web portal allows different stake holders in buffalo farming to use resources in an integrated and interactive learning manner on the internet. It presents facts, figures, demonstrations, examples, graphics and more regarding the concepts, practices and vocabulary used in buffalo husbandry in user-friendly formats. 'Buffalo e-library' is the main repository of information on various facets of buffalo husbandry, covering the broad areas of buffalo breeds, health, reproduction, nutrition, meat production and extension activities. Buffalopedia is CIRB's contribution towards the broader goal of rural upliftment through popularization of buffalo farming in the most scientific manner. It is an effort to address the need of providing comprehensive information on different aspects of buffalo rearing through ICT tools for wider access. Additionally, it will also give a platform for contributions by different stakeholders to the buffalo farming community. This computer application software is a ready to use technology which can be used by all stake holders through internet. The Buffalopedia has already got lakhs of hits since it was made online and has recorded more than 7.3 lakh visits.

Mobile based App 'ODK collect'

This is an android based smart recording tool for capturing animal related data from field and its transfer to CIRB based central bio-repository database. This collection of data will strengthen ongoing FPT Programme. The data can be immediately accessed by ICAR scientists in different locations through linking of all field units. The program has been customized at ILRI with help of CIRB scientists. Twenty netbooks loaded with complete application forms were distributed under CIRB- CGIAR collaborative project 'Genomic selection in Murrah buffaloes' (2016-18) among the FPT field workers in three Field Units under Network Project on Buffalo Improvement during October 2018.

Modified Artificial Vagina for semen collection from bulls

At the time of semen collection, some bulls take more time to donate the semen meanwhile the temperature of artificial vagina (AV) goes down from the required

temperature. In that condition, the semen collector can change the AV to get better quality of semen. Routinely semen is collected in early morning and in winter season if the environmental temperature is very low in the situation AV temperature also fall down rapidly in that condition, it helps to collector in change the AV to get better semen quality. Generally young bulls require low temperature of AV while mature bull requires high temperature of AV to donate good quality of semen. In that condition, semen collector can identify the bulls which one requires high or low temperature of AV. The temperature sensor is fixed in the AV in such a way that it does not hinder the semen collector at the time of semen collection. Further it does not hinder the washing and sterilization process of AV. This technology is available at Agrinnovate (www.agrinnovateindia. co.in) for commercialization. Intitute sold this technology to Chemtron Analytical Instruments Pvt Ltd, New Delhi on non-exclusive licence for production and sale to the users.

Field Microscope (Spermoscope)

High motile sperm in cryopreserved semen is essential for better conception rate in field condition through artificial insemination (AI). But there is no facility available to check the sperm motility of a semen dose that would be used to inseminate particular animals at the time of AI. Hence, keeping these difficulties in mind institute scientists designed a handy and portable microscope namely 'Field Microscope' of 'Spermoscope' especially for the evaluation of sperm motility in field condition. This technology is available at Agrinnovate (www.agrinnovateindia.co.in) for commercialization. Intitute sold this technology to Novel Industries, Ambala Cantt, Haryana on non-exclusive licence for production and sale to the users.

Preg-D: Buffalo Pregnancy Diagnosis Kit (Urine based)

The kit is a urine based novel technique for pregnancy diagnosis in dairy animals. The kit utilizes a simple thermophilic biochemical colour reaction in urine to diagnose pregnancy. It does not require any instrumentation and results can be interpreted by naked eye. The kit is a very effective alternate method for identifying non-pregnant animals in the herd. The kit can be used by the farmer himself, so very useful in rural areas where it is very difficult to have a veterinarian for pregnancy diagnosis.

RESEARCH PROJECTS AT CIRB

List of Research Projects (Jan 2024 – Dec 2024)

S. No	Title	PI	Co-PIs	Duration
Animal Nutrition & Feed Technology Division				
1	Effect of Feeding Sugar Beet Pulp, and Guar Korma on Rumen Functions, Methanogenesis, Nutrient Utilization and Milk Production in Buffaloes.	Avijit Dey	PC Lailer, A Bharadwaj, TK Datta	March 22 - April 2024 (Extension for 6 months)
2	Genetic enhancement of energy sorghums for renewable fuels and fodders	AV Umakanth (ICAR-IIMR)	Avijit Dey; ICAR-IIMR : Amasiddha Bellundagi, PG Padmaja, I K Das, R Venkateswarlu, S Srividhya, CV Ratnavathi, Jinu Jacob, V M Malathi	Aug 2021-July 2026
3	Evaluation of Feeding Value of Promising Milet Fodder Cultivars in Buffaloes: Effects on Body weight gain, milk Production and Enteric methane Emission (Global CoE on Millets)	Avijit Dey	Sanjay Kumar, Aiswarya S, ICAR-IIMR : A V Umakanth	Apr 2024 to Mar 2026
Animal Genetics & Breeding Division / Production Diseases/ Management/ Extension activities				
4	Genetic improvement of Murrah buffaloes (Network project CIRB, Hisar Centre)	Sanjay Kumar	P Kumar, RK Sharma, SK Phulia, A Dey, Supriya Chhotaray, Rajesh Kuamr, Rupali Rautela, Madhu Singh,	Jul 1993 - Contd
5	Genetic improvement of Nili Ravi buffaloes (Network project, CIRB Sub-Campus Nabha Centre)	FC Tuteja	MH Jan, R Mehta, N Paul, Aishwarya, S H, SK Karkraliya, Ashish Baladhare	Jul 2002 - Contd
6	Performance evaluation of Bhadawari Buffaloes (Network Project, IGFRI centre)	BP Kushwaha	Sultan Singh, Deepak Upadhyay, Pooja Tamboli	Apr 2001 - Contd.
7	Progeny testing of bulls under field conditions (FPT) (CIRB Hisar)	Sanjay Kumar	Supriya Chhotaray	Apr 2001 - Contd
8	Development of web tool for real-time field data collection and analysis for improved buffalo productivity and breeding management	Sunesh Balhara	Sanjay Kumar, A Bharadwaj (upto Dec 2023), Vikash Vohra (NDRI), Puneet Malhotra (GADVASU), TK Datta, UB Angadi (IASRI), Mir Asif Iquebal (IASRI), Sarika (IASRI), Dinesh Kumar (IASRI)	Nov. 2021 - Mar 2023(Extension upto Dec 2024
9	Development of Soft computing tool for dairy buffalo selection	Sunesh Balhara	A K Balhara, S K Phulia and N K Dahiya	April 2021- Dec 2023
10	Diversified farming through livestock and agriculture –Farmer First Programme	A Boora	Sarita Yadav, RK Chaudhary; CCS HAU: Bharat Singh; ICAR-IARI: Manjeet Singh; ICAR-IASRI: Anil Kumar, Sukanta Dash; ICAR-CIAH: Jagan Singh Gora, Mukesh Kumar, Hanuman Ram, Ramesh Kumar, SR Meena	April 2020- May 2024
11	Evaluation of potential plant-based agents for anti-biofilm and antimicrobial activities against major mastitis pathogens of buffaloes	Sarita Yadav	Ashok Boora, Sandip Kumar Khurana (upto Jan 2024), Sunesh Balhara	Oct 2022-Oct 2024
12	Characterization of the ruminal microbiota and fermentation pattern in Murrah buffalo fed condensed tannin enriched diet	Sarita Yadav	A Dey, Ashok Kumar, Sunesh Balhara	May 2024 – May 2026
13	Economic Impact of Field Progeny Testing (FPT) Program on the Income of Murrah Buffalo Farmers	Sanjay Kumar	Gururaj Makarabbi, Anurag Bharadwaj (till 31 Dec. 2023)	May 2022 - April 2024 (Extension of 6 months)
14	Implications of nutrition for the ability of buffaloes to withstand gastrointestinal parasite infections	Sanjay Kumar	A Dey, Supriya Chhotaray	Apr 2024 to Mar 2026
15	Dairy farmer's perception towards buffalo breeds and its impact on selection and profitability in Punjab	Navneet Saxena	Gururaj M, FC Tuteja, TK Datta, Aiswarya S. ICAR-NDRI: Sanjit Maiti, Biswajit Sen, M Bhakat	Sept 2022 - Aug 2024
16	National Agricultural Innovation Fund Inatitute Technology Management Unit (ITMU)	Navneet Saxena	Jerome A	Apr. 2007 – Contd

17	Applications of infrared Thermography as innovative non-invasive technological solution in early mastitis detection (NLM)	Sunesh Balhara	AK Balhara, Sarita Yadav, SK Phulia, Ashok Boora, FC Tuteja, Rajkumar, IIT Roorkee : SK Ambatipudi, Pranita P. Sarangi, PM Madan	April 2023- April 2026
18	Marketing dynamics of Murrah Buffaloes and its impact on livelihood of dairy farmers in Haryana	Gururaj M	Navneet Saxena, Sanjay Kumar, Aiswarya S, ML Sharma, PC Lailer (till Feb 2024)	Aug 2023- July 2025
19	Immunoreagent design, drug discovery and -omics approaches for buffalo production and reproduction (CABiN)	Supriya Chhotaray	A Bharadwaj (till Dec 2023), SK Phulia, R Kumar, IASRI Centre: MA Iquebal, Ratna Prabha	Jul 2020 to Jun 2025
20	Development of state-of-the art decision support system for selection and evaluation of elite buffaloes under the progeny testing program	Supriya Chhotaray	Umesh Singh (Upto 31.03.2024), Sanjay Kumar, Sunesh Balhara	Feb 2024 to Jan 2027
21	Creating A Comprehensive MOOC: Mastering Scientific Buffalo Management Practices for Sustainable Agriculture	Aiswarya S	TK Datta, N Saxena, Gururaj M, P Kumar, Supriya Chhotaray	Jan 2024 to Dec 2026
22	Development of Buffalo - Centric Sustainable Agricultural Hub (Under SCSP Fund)	Aiswarya S (Hisar) & Ashish Baladhare (Nabha)	Programme Coordinator: N Saxena, Programme Co-Coordinator: SK Phulia (Hisar), FC Tuteja (Nabha), Co-PIs: Hisar RK Sharma, V Mudgal, Sanjay Kumar, Gururaj M, Nabha - MH Jan, N Paul, SK Kakraliya, Aiswarya SH	Apr 2024 to Mar 2029
23	Longitudinal genetic analysis of milk production traits-Nili-Ravi	Ashish Baladhare	FC Tuteja, MH Jan, N Saxena, Supriya Chhotaray, Aiswarya Habbu, N Paul	Jun 2024 – May 2027
Animal Physiology & Reproduction Division				
24	Deciphering the association of Milk Urea Nitrogen (MUN) with reproductive efficiency in lactating Murrah buffaloes	SK Phulia	RK Sharma, AK Balhara, A Dey	Sep 2023 – Aug 2025
25	Buffalo sperm dosage in relation to functional parameters and field fertility outcome	Sajjan Singh	Pradeep Kumar, Jerome A, RK Sharma, Gururaj M	April 2018 – April 2024
26	Production of Double Muscled-Mass Farm animal using CRISPR	Dharmendra Kumar	Meeti Punetha, PS Yadav, R K Shamra, Rajesh Kumar	Jan 2021- Dec 2023
27	PoC for ruminants expressing ligninase to reduce carbon footprints	Dharmendra Kumar	Meeti Punetha, Pradeep Kumar, Supriya Chhotaray	Aug 2024 – July 2027
28	In Vitro production of oocyte- and spermatozoa-like cells from pluripotent stem cells of farm animals	Dharmendra Kumar	Meeti Punetha, Pradeep Kumar	Mar 2024 to Feb 2027
29	Establishment of DNA bank of Murrah and Nili-Ravi buffalo herd	Dharmendra Kumar	Sanjay Kumar, Meeti Punetha, MH Jan, Rajesh Kumar, Madhu Singh	Jan 2021- Dec 2023
30	Nutritional and physiological interventions for enhancing reproductive performance in animals (AICRP)	RK Sharma	SK Phulia, V Mudgal P Kumar, Jerome A	Nov. 2014 - Mar 2025
31	Relationship of percentage of white patches with production and reproduction in Nili-Ravi	MH Jan	Ashish Baladhare, FC Tuteja	Apr 2024 to Mar 2026
32	Fertility of Nili-Ravi buffaloes in relation to lactational, metabolic and environmental stressors	MH Jan	FC Tuteja	Feb 2021- March 2024
33	Consortium Research Platform on Agro-Biodiversity (NBAGR funded)	Meeti Punetha	D Kumar, PS Yadav	Sept. 2021 - Mar 2026
34	Enhancing economy of livestock farmers through AI using cloned buffalo bull semen (DBT Project)	PS Yadav	Sajjan Singh, Navneet Saxena, Hema Tripathi, Dharmendra Kumar, Pradeep Kumar, Jerome A, Gururaj M	Jan 2022 - Jan 2024

35	Evaluation of semen characteristics and fertility parameters of cloned bulls and performance of cloned progenies (Phase-II) (NASF Project)	PS Yadav	D Kumar, RK Sharma, Pradeep Kumar, Meeti Punetha, Rajesh Kumar	May 2022 - April 2025
36	Generation of predetermined sex buffalo embryos using CRISPR mediated gene editing technology	Meeti Punetha	-	Feb 2022 - Jan 2024
37	Sequestrating X- and Y-sperm using receptor-ligand based approach in buffalo	Pradeep Kumar	TK Datta, Sajjan Singh (upto April 2024), RK Sharma, Jerome A, D Kumar, Meethi Punetha	Oct 2022 - Sept 2025
38	Testing and Validation of Pregnancy Diagnosis Kits (Preg D and Preg DM) in Yak	AK Balhara	Vijay Paul, Mokhtar Hussain, Mihir Sarkar (NRC Yak) Co-PI: SK Phulia, Sajjan Singh, TK Datta, Yash Pal	July 2023- June 2025
39	Development of urine-based biosensor for pregnancy diagnosis in ruminants (NLM)	AK Balhara	RK Sharma, SK Phulia, MH Jan, Sunesh Balhara, Sarita Yadav, Rupali Rautela	April 2023- March 2026
40	Establishment of centre of excellence by ICAR-CIRB-DADF	Jerome A	RK Sharma, D kumar, Meeti punetha, Rupali Rautela, Rajesh Kumar	Sept. 2023- March 2026
41	Use of OPU-IVEP in production of superior buffalo germplasm	Jerome A	RK Sharma, PS Yadav, D Kumar, Meeti Punetha, Rajesh Kumar, Rupali Rautela	Jan 2021 - Dec 2023
42	Climate smart buffalo farming using digital support systems (BMGF)	AK Balhara	ICAR-CIRB Hisar: Avijit Dey, S Yadav, RK Sharma, SK Phulia, MH Jan, A Boora, FC Tuteja, Sanjay Kumar, S Balhara Collaborating Centers: IIT-Roorkee: Kiran Ambatipudi; Univ of Adelaide: MS Khatkar	Apr 2024 to Mar 2029

IMPORTANT COMMITTEES

Composition of the QRT members
Chairman

Dr. P. Biswas, Ex-Vice Chancellor WBUAFS, Kolkata

Members

Director, ICAR-CIRB, Hisar

Dr. Kusumakar Sharma, Ex ADG, ICAR, New Delhi

Dr. BK Joshi, Ex Director, NBAGR, Karnal

Dr. HK Verma, Ex Director Extension, GADVASU, Ludhiana

Dr. Mahesh Chander, Joint Director (Extn), IVRI, Izatnagar

Dr. G. Dhinakar Raj, Professor & Head, TANUVAS

Member Secretary

Dr. Navneet Saxena, Principal Scientist, ICAR-CIRB, Hisar

Research Advisory Committee (RAC)
Chairman

Dr. P. Biswas, Ex-Vice Chancellor WBUAFS, Kolkata

Members

Director, ICAR-CIRB, Hisar

Dr. V.K. Saxena, Director Research, BASU, Patna

Dr. S.K. Agrawal, Ex Director, ICAR-CIRG, Makhdoom

Dr. SVN Rao, Ex-Prof., Pondicherry Veterinary College, Puducherry

Dr. S. S. Thakur, Ex Principal scientist, ICAR-NDRI, Karnal

Dr. Gyanendra Kumar Gaur, ADG (AP & B), ICAR, New Delhi

Dr. Om Prakash Chikara, Ex Director General, HLDB, Panchkula

Sh. Satinder Singh, Farmers' Representative

Member Secretary

Dr. Sanjay Kumar, Senior Scientist, ICAR-CIRB, Hisar

Institute Management Committee (IMC)

Director, ICAR-CIRB, Hisar

Members

Senior Administrative Officer, ICAR-CIRB, Hisar

PATENTS/ COPYRIGHTS/ TRADEMARKS

PATENTS/ COPYRIGHTS/ TRADEMARKS

Institute Technology Management Unit (ITMU)

The "Intellectual Property Management and Transfer/ Commercialization of Agricultural Technology Scheme (Up-scaling of existing component i.e. Intellectual Property Rights (IPR) under ICAR Headquarters Scheme on Management and Information Services)" plan scheme, funded by ICAR, led to the establishment of the Institute Technology Management Unit (ITMU) in 2008. The ITMU project was renamed the "National Agricultural Innovation Fund (NAIF)" and is divided into three parts: component 1 (the Innovation Fund) deals with ITMU activities, component 2 (ABI activities), and component 3 (ARYA activities). Through the Institute Technology Management Committee (ITMC), ITMU serves as a coordinating body and facilitator for the development of promising technologies, handles patent filings, and maintains the Institute's intellectual property portfolios. ITMU/ITMC carefully abides by the administrative guidelines, advisory decisions, and policy choices made by the ICAR from time to time and requests advice and assistance from the zonal Zonal Agro-Technology Management Centres (ZTMCs) at the zonal level.

ICAR-CIRB Intellectual Property Portfolio

Patent Granted

Technology Name	Date of Grant	Patent Number
An in vitro method for detection of postpartum anestrus condition in buffaloes	05/02/2019	306848
Bufcol-a complete diet for enhanced survivability and growth of neonate buffalo calves	21/11/2019	325523
Composite feed additive for reducing methane emission and improving fibre utilization in ruminants	08/02/2022	388717
Process for improving buffalo sperm viability	17/11/2022	411766
Kalrumpscale - apparatus for measuring rump portion of an animal body	30/04/2024	536273
Synthetic peptides and antibodies targeted to bovine Mx2 protein	09/05/2024	537505

Trade Mark Granted

Item Name	Application Number	Date of Grant	Under which class
Preg D	4759215	28/07/2024	10

Copyright Granted

Item Name	Registration Number	Date of Grant
Water Buffalo Mastitis Database (WBMSTDb)	SW-16058/2023	23/02/2023
Buffalo Subclinical Mastitis Methylome-Transcriptome Database (BSCM2TDb)	SW-16116/2023	23/03/2023
Whole-Genome-Based Web Genomic Resource for Water Buffalo (BuffGR)	SW-18056/2024	08/01/2024
Design and development of software for trait specific SNPs of buffalo	SW-19788/2024	04/12/2024

Patent Filed

Technology Name	Application Number	Date of Patent filing
Urine based pregnancy detection method for ruminant livestock animals	202011013074	25/03/2020
Artificial Insemination Gun System and Method of Use Thereof	202411033216	26/04/2024
Colorimetric Urine Test for Early Pregnancy Detection in Livestock	202411048890	26/06/2024

List of ICAR Certified Technologies

List of certified technologies
Preg D urine-based pregnancy diagnosis kit for cow and buffaloes
Preg-DM: Urine-based pregnancy diagnosis kit for Mithun
RESMI – A composite Feed Additive for Reducing Enteric Methane Emission and Enhancing Production Performance in Ruminants
Digital Artificial Vagina" for semen Collection from bulls
CIRB Artificial insemination gun for cattle on buffalo to protect post-thaw sperm from cold shock
Spermoscope

Programmes Organised by ITMU unit of ICAR-CIRB

Name of Programme (Training/workshop/ Seminar etc.) Organized	Days of Programme (Date from-to)	Participants (No.)	Experts
Technology assessment and commercialization	01.03.2024	50	Dr. P Malik, CEO, Agrinnovate
Seminar on IPR Management	30.04.2024	50	ICAR-NRCE & ICAR-CIRB
Sensitization to Intellectual Property Rights Issues workshop	13.09.2024	100	Mr. S Pandey, K & S Partners

HUMAN RESOURCE DEVELOPMENT

Human Resource Development

The objectives of human resource development programs are to develop professional, impartial, effective and efficient DARE/ICAR personnel responsive to the needs of the farmers, citizens and other stakeholders and help in realizing organizational mandate and vision. Considering this, HRM Unit of ICAR has been set up for monitoring and implementation of ICAR HRM Policy for training and capacity building of the staff of ICAR from time to time though HRD unit set up in different ICAR institutes. The role of HRD unit at the institute level is to organize, facilitate and implement training programs to all the employees of the institute. During the year 2024, HRD unit of ICAR-CIRB facilitated the training of **5 Scientists**, **5 Technical officers** and **5 Administrative staff of the institute**.

S.No.	Employee Name / Designation	Training Details	Place and duration
Scientific Staff			
1.	Dr. Navneet Saxena	Training Program on Innovation Management	ICAR-NAARM, Hyderabad [8-12 July 2024]
		Online training on Activity Metabolomics and Mass Spectrometry	Centre for Metabolomics at Scripps Research, USA [3-24 September 2024]
		Zonal Workshop of KVK	CCSHAU, Hisar [10-12 September 2024]
2.	Dr. Sunesh Balhara	Online training programme on Advances in Mobile Application Development	ICAR-NAARM, Hyderabad [5-9 August 2024]
3.	Dr. Jerome A	Online IP Awareness/Training program under National Intellectual Property Awareness Mission	ICAR-National Research Centre for Grapes, Pune & Intellectual Property Office, India [09 August 2024]
4.	Dr. Navneet Saxena Dr. Dharmendra Kumar Dr. Jerome A Dr. Gururaj M	AgriIP-2024	IP&TM, New Delhi, ZTM, Agri Business Incubation Centre & ICAR-CIFT, Kochi [15 Jaunary -15 February 2024]
Technical Staff			
1.	Dr. Aishwarya Habbu, STO	Online training program Developing Core Competence for Strengthening the Veterinary Extension Services	ICAR-IVRI, Pune [1-3 May 2024]
2.	Ms. Alpana Kumari, T1	In-house orientation training of Technical Staff	ICAR-CIRB, Hisar [15 May - 10 June 2024]
3.	Mr. Surender Kumar, T1		
4.	Ms. Reetu Sharma, T1	In-house orientation training of Technical Staff	ICAR-CIRB, Hisar 12 - 26 June 2024
5.	Sh. Manish Kumar, T1		
Administrative staff			
1.	Sh. Abdul Mazid, AAO	e-HRMS Regional Workshop	ICAR-CPRI, Shimla [24 June 2024]
2.	Smt. Savita, LDC	Online Pre-examination Training for the Limited Departmental Competitive Examination (LDCE) for the post of Upper Division Clerk (UDC) in the ICAR system	ICAR-NIASM, Pune [21 August - 6 September 2024]
3.	Sh. Radhey, LDC		
4.	Sh. Nakul Sharma, Assistant	Training program on Administrative and Financial Management	ICAR-NAARM, Hyderabad [25 - 29 November 2024]
5.	Sh. Amandeep Boora, Assistant		

PUBLICATIONS

Research Publications

- Ahuja K, Batra V, Kumar R, Datta T K. (2024). Transient suppression of Wnt signaling in poor-quality buffalo oocytes improves their developmental competence. Frontiers in Veterinary Science, 10: 1324647. [NAAS:8.60; IF: 2.6].

- Badrhan S, Karanwal S, Pal A, Chera JS, Chauhan V, Patel A, Bhakat M, Datta TK, Kumar R. (2024). Differential protein repertoires related to sperm function identified in extracellular vesicles (EVs) in seminal plasma of distinct fertility buffalo (Bubalus bubalis) bulls. Frontiers in Cell and Developmental Biology, 12:1400323. [NAAS:11.50; IF:4.6].

- Balhara AK, Jan MH, Hooda E, Kumar K, Ghanghas A, Sangwan S, Balhara S, Phulia SK, Yadav S, Boora A, Kumar S, Singh S, Datta TK. (2024). Prediction of core body temperature using infra-red thermography in buffaloes. Italian Journal of Animal Science, 23:1, 834-841. [NAAS:8.50; IF: 2.2].

- Bardhan S, Karanwal S, Pal A, Chera J S, Chauhan V, Patel A, Bhakat M, Datta T K, Kumar R. (2024). Differential protein repertoires related to sperm function identified in extracellular vesicles (EVs) in seminal plasma of distinct fertility buffalo (Bubalus bubalis) bulls. Frontiers in Cell Development and Biology, 29:12:1400323 [NAAS:10.60; IF: 4.6].

- Chanu YM, Paul SS, Dey A, Jerome A. (2024). Deciphering hyperammonia-producing bacteria (HAB) in the rumen of water buffaloes (Bubalus bubalis) and their inhibition through plant extracts and essential oils. Microorganisms, 12, 2040. [NAAS:10.50; IF:4.1].

- Das R, Vohra V, Chhotaray S. (2024). Delineating marker genotypes for higher reproduction performance to aid in selection of Murrah bulls. The Indian Journal of Animal Genetics and Breeding, 21-23.

- Gahlyan RK, Vohra V, Chhotaray S, Kataria RS. (2024). Diversity assessment of a lesser known buffalo population from Central India and its comparative evaluation reveals presence of sufficient genetic variation and absence of selection. Animal Biotechnology, 35(1), 2305550. [NAAS:9.70; IF: 1.7].

- Gupta KK, Balajee SS, Dey S, Tripathi P, Kumar R, Pal Y, Kumar S, Gupta N, Sudan V. (2024). Assessment of variations in the haematological and hepatorenal biomarkers alongside oxidant-antioxidant imbalance in exotic and indigenous horses infected with Theileria equi. Equine Veterinary Education, 36(10):520-526. [NAAS:6.80; IF: 0.8].

- Gurao A, Vasisth R, Kumari N, Chitkara M, Singh R, Mukesh M, Vohra V, Kumar S, Dige MS and Kataria RS. (2024) Identification of KIT gene transcript variants in white spotted river buffalo (Bubalus bubalis). Animal Genetics, 2024;55:918–920. [NAAS:8.40; IF: 1.8].

- Gururaj M, Tuteja FC, Saxena N, Jan MH, Lailer PC. (2024). Break-even estimation and employment generation from Nili-Ravi buffalo milk production in Punjab. Indian Journal of Economics and Development, 20 (4): 802-808. [NAAS:6.30].

- Jerome A, Phulia SK, Chaudhiry V, R Kumar, Sharma RK. (2024). Relationship of external genitalia measurement with antral follicular population and estrus induction response in pre-pubertal Murrah buffalo heifers. The Indian Journal of Animal Sciences, 94(7):579-582. [NAAS:6.40; IF:0.20].

- Jerome A, RK Sharma, PS Yadav, D Kumar, M Punetha, Rajesh Kumar, Rupali Rautela, S Gorani, SS Layek. (2024). Veer Gaurav: Buffalo Male calf produced using OPU-IVF technology and semen of cloned bull. Current Science, 126 (9): 999. [NAAS:7.00; IF:1.1].

- Jinagal S, Dutt R, Sharma M, Punetha M, Saini S, Thakur S, Chaudhary S, Kumar P, Yadav PS, Datta TK, Kumar D. (2024). LPS-Induced Mitochondrial Dysfunction Reduces Oocyte Maturation and Developmental Competence of Buffalo Embryos via

- ROS Mediated TLR4 Signalling. American Journal of Reproductive Immunology, 92(1):e13902. [NAAS:9.60; IF:2.5]

- Jyani V, Mudgal V, Gupta M, Bharadwaj A. (2024). Supplementation of critical micro-nutrients in peri parturient dairy buffaloes improves lactation performance. Journal of Trace Elements and Minerals, 8: 100136.

- Karanwal S, Pal A, Josan F, Patel A, Chera J S, Yadav S, Gaur V, Verma P, Badrhan S, Chauhan V, Bhakat M, Datta T K, Kumar R. (2024). Higher abundance of DLD protein in buffalo bull spermatozoa causes elevated ROS production leading to early sperm capacitation and reduction in fertilizing ability. Journal of Animal Science and Biotechnology. 15:126. [NAAS:12.30; IF: 6.3].

- Kumar D, Hyder I, Kues WA. (2024). 5-Formylcytosine: a new epigenetic player. Signal Transduction and Targeted Therapy, 23;9(1):295. [IF:40.8].

- Kumar D, Mehta JS, Jerome A, Kumar P, Kumar D, Bhardwaj S, Patil CS, Bala R, Verma N, Satish, Virmani M, Sharma RK, Singh P. (2024). Cryopreservation alters buffalo sperm kinematics and mitochondrial parameters, acrosome and intra-cellular calcium status. Cryoletters, 45(4): 257-268. [NAAS:7.00; IF:1.0].

- Kumar D, Mehta JS, Jerome A, Kumar P, Kumar D, CS Patil, S Bhardwaj, Bala R, N Verma, Sharma RK, P Singh. (2024). Effect of season, age and period on semen quality traits in buffalo bulls. Acta Agriculturae Scandinavica Section A-Animal Science, 73 (3-4): 172-178. [NAAS:6.90; IF:0.8].

- Kumar D, Mehta JS, Jerome A, Kumar P, Kumar D, CS Patil, S Bhardwaj, Bala R, N Verma, Sharma RK, P Singh. (2024). Peripheral and seminal biochemical profile in relation to sperm kinematics across seasons in buffalo bulls. Acta Agriculturae Scandinavica Section A-Animal Science, DOI:

- 10.1080/09064702.2024.2382130. [NAAS:6.90; IF: 0.8].

- Kumar K, Dey A, Rose MK, Lailer PC. (2024). Bioactive leaves extracts from Eucalyptus and poplar in modulating rumen fermentation for reducing enteric methane emission in buffalo (Bubalus bubalis). Indian Journal of Animal Health, 63(2):124-131. [NAAS:5.01].

- Kumari N, Saini S, Thakur S, Sharma S, Punetha M, Kumar P, Sango C, Sharma RK, Datta TK, Yadav PS, Kumar D. (2024). Enhancing the quality of inferior oocytes of buffalo for in vitro embryo production: The impact of melatonin on maturation, SCNT, and epigenetic modifications. Tissue and Cell, 1;89:102480 [NAAS:8.60; IF: 2.7].

- Punetha M, Kumar D, Saini S, Chaudhary S, Bajwa KK, Sharma S, Mangal M, Yadav PS, Green JA, Whitworth K, Datta TK. (2024). Optimising Electroporation Condition for CRISPR/Cas-Mediated Knockout in Zona-Intact Buffalo Zygotes. Animals, 4(1):134. [NAAS:9.00; IF:2.7].

- Punetha M, Saini S, Choudhary S, Sharma S, Bala R, Kumar P, Sharma RK, Yadav PS, Datta TK, Kumar D. (2024). Establishment of CRISPR-Cas9 ribonucleoprotein mediated MSTN gene edited pregnancy in buffalo: Compare cells transfection and zygotes electroporation. Theriogenology, 1;229:158-68. [NAAS:8.80; IF: 2.4].

- Punetha M, Saini S, Sharma S, Thakur S, Dahiya P, Mangal M, Kumar R, Kumar D, Yadav PS. (2024). CRISPR-Mediated SRY Gene Mutation Increases the Expression of Female Lineage-Specific Gene in Pre-Implantation Buffalo Embryo. Reproduction in Domestic Animals, 59 (11):e14739. [NAAS:7.70; IF: 1.6].

- Rautela R, Kumar S. Sharma RK, Phulia SK, Kumar R, Singh M, Katiyar R, Bharadwaj A and Datta TK. (2024). Impact of age at first calving on fertility and production performance in Murrah buffalo.

Reproduction in Domestic Animals, 59:e14691. [NAAS:7.70; IF: 1.6].

- Rohith GV, Gururaj M, Ravi SC. (2024) Factors affecting cattle insurance purchase and its effects on the financial situation of dairy farmers, Indian Journal of Economics and Development, 20 (2): 275-284. [NAAS:6.30].

- Sangwan S, Vikram R, Hooda E, Choudhary R, Jawla J, Somagond YM, Balhara S, Phulia SK, Khan MH, Girish PS, Datta TK, Mitra A, Balhara AK. (2024). Urinary metabolomics reveals potential biomarkers for early detection of pregnancy in Mithun (Bos frontalis) cows. Journal of Proteomics, 306(3):105259. [NAAS:9.30; IF: 2.8].

- Sharma M, Punetha M, Saini S, Chaudhary S, Jinagal S, Thakur S, Kumar P, Kumar R, Sharma RK, Yadav PS, Kumar D. (2024). Mito-Q supplementation of in vitro maturation or in vitro culture medium improves maturation of buffalo oocytes and developmental competence of cloned embryos by reducing ROS production. Animal Reproduction Science, 260:107382. [NAAS:8.20; IF:2.2].

- Singh S, Koli P, Kushwaha BP, Anele UY, Bhattacharya S, Ren Y. (2024). Agroecological Zone-Specific Diet Optimization for Water Buffalo (Bubalus bubalis) through Nutritional and In Vitro Fermentation Studies. Animals, 14:143. [NAAS: 9.00; IF:2.7].

- Thachamvally R, Chander Y, Kumar R, Kumar G, Khandelwal N, Manuja A, Kumar Vaid R, Kumar N, Barua S, Pal Y, Tripathi BN. (2024). First Isolation and Genetic Characterization of Avian Nephritis Virus 4 from Commercial Poultry in India. Avian Diseases, 68(3): 202-208. [NAAS:7.30; IF: 1.779].

- Thakur S, Dey A, Kumar S. (2024). Rumen bypass protein: an effective technology for enhancing performance of ruminants. Indian Journal of Animal Health, 63(2): 43-52. [NAAS:5.01].

- Vipul B, Komal D, Diwakar M P, Kumaresan A, Kumar R and Datta T K. (2024). The proteomic landscape of sperm surface deciphers the maturational and functional aspects of buffalo. Frontiers in Physiology, 15:1413817. [NAAS:9.20; IF: 3.2].

- Yadav H P, Mohanty T K, Dewry R K, Lone S A, Nath S, Bhakat M, Baithalu R K, Tiwari S, Swain D K, Kumar P, Mohanty A K, Datta T K. (2024). Reduced sperm number of Murrah (Bubalus bubalis) bull semen in French mini-straw affect kinetic and functional competence after cryopreservation. CryoLetters, 45(1):36-40 [NAAS:7.00; IF: 1.0].

- Yadav PS, Gururaj M, Sajjan Singh, Navneet Saxena, Hema Tripathi, D Kumar, Pradeep Kumar, Jerome A. (2024). Successful dissemination of cloned buffalo superior germplasm at Nuh, an aspirational district of Haryana, India. Current Science, 127(6):657. [NAAS:7.00; IF: 1.1].

- Yadav PS, Kumar D, Saini M, Sharma RK, Dua S, Selokar NL, Bansal S, Punetha M, Gupta A, Kumar R, Kumar P. (2024). Evaluation of postnatal growth, hematology, telomere length and semen attributes of multiple clones and re-clone of superior buffalo breeding bulls. Theriogenology, 1;213:24-33. [NAAS:8.80; IF:2.4].

- Yadav S, Boora A, Thomas P, Kaliappan A, Verma N, Devi P, Dhaka N, Khurana S, Kumar A, Balhara S, Balhara A, Lailer PC. (2024). Genome sequence of bubaline herpesvirus-1 associated with pustular vulvovaginitis in Indian water buffalo. Microbiology Resource Announcements, 12;13(3):e0088923. [NAAS:6.7].

- Yadav U, Dutt R, Bansal K, Jinagal S, Gupta A, Bala R, Bhardwaj S, Verma N, Bishnoi M, Kumar D, Kumar P. (2024). Effect of kojic acid as an alternative to antibiotics in buffalo semen dilutor. The Haryana Veterinarian, 63(2): 227-230. [NAAS:4.50].

Review

- Priya, Punetha M, Kumar D, Yadav P.S. (2024). Buffalo cell immortalization: Research and

conservation for a sustainable future. Journal of Livestock Biodiversity 13 (1): 54-56.

- Priya, Punetha M, Kumar P, Yadav P S, Kumar D. (2024). Buffaloes are 'Black Gold' not Black Cows. Anim Reprod Update., 4(1); 29-36.

- Thakur S, Dey A. and Kumar S. (2024) Rumen bypass protein: An effective technology for enhancing performance of ruminants. Indian J Anim Health, 63(2)- Special Issue: 43-52.

Presentations in Conference / Symposium / Workshop

Lead paper

- Dey A, Paul SS, Jerome A, Datta TK. (2024). Harmonization of rumen microbiome for enhanced buffalo production and abatement of enteric methane and nitrogen emissions. Indian Veterinary Congress & Annual IAAVR Conference, 7 & 8 Feb 2024. pp.41.

- Punetha M, Kumar D, Saini S, Thakur S, Yadav PS. (2024). CRISPR based gene editing in livestock in IV Annual Convention of Animal Physiologists Association and National Symposium on "Advanced Physiological Strategies for Sustainable Livestock Production and Reproduction" (APACON2024) March 01-02, 2024 at ICAR-CSWRI, Avikanagar.

- Kumari N, Saini S, Thakur S, Punetha M, Kumar P, Kumar D, Yadav PS. (2024). Melatonin supplementation improves the quality of inferior oocytes and embryonic development of cloned embryos by reducing oxidative stress. 11th Asian Buffalo Congress, 25-27 October, 2024, Dhaka, Bangladesh.

- Yadav P S. (2024). Animal cloning in India: Status and scope. In XXXII Annual Conference of SAPI on Advances in Physiological Research in Omics Era for Sustainable Animal Production and Livestock Security under the Changing Climate Scenario. November, 27-29, 2024, ICAR-CIRC, Meerut (UP).

- Yadav P S. (2024). Advances in Animal Reproductive Biotechnology: Harnessing Stem Cells and SCNT for Genetic Improvement. In Second National Genetics Congress 2024 (SNGC2024) organized by the Indian Society of Genetics and Plant Breeding (ISGPB) and the Indian Agricultural Research Institute (IARI), 11-13 December 2024, New Delhi, India.

- Kumar D, Punetha M. (2024). CRISPR-Cas mediated gene editing: From principles to practical application in livestock. International Conference on Current Trends in Toxicology & the 43rd Annual Meeting of the Society of Toxicology (India), October 16-19, 2024, at Lovely Professional University, Phagwara, Punjab, India.

- Pradeep Kumar. (2024). Recent Advances in the Application of Flow Cytometry for Bovine Semen Evaluation" at ICAR-NDRI, Karnal, which organised a one-day national workshop on 'Recent Advances in CASA and Flow Cytometry for Bovine Semen Evaluation' under IDP-NAHEP on 29th July 2024.

- Pradeep Kumar (2024). Lecture on 'Use of technology to increase semen production and conception rate in farm animals' in a short course on "Technological innovation in Assisted Reproductive Technologies for the improvement of Caprine germplasm" from 05 February to 14 February organised by ICAR-CIRG, Mathura.

- Aiswarya S. (2024). Scientific Validation of Traditional Knowledge: Challenges and The Way Forward" for International Conference on "Communication and Dissemination Traditional Knowledge (CDTK-2024) organized by CSIR-NIScPR held at November 13-14, 2024 at Gurugram University, Haryana.

- Datta, T.K, Chhotaray, S. (2024). Buffalo for Safe Food and Sustainable Production (Thematic Paper), 11th Asian Buffalo Congress on Buffalo for Safe Food and Sustainable Production. 24-30.

- Datta, T.K, Chhotaray, S. (2024). Strategies for sustainable use of buffalo genetic resources of India, In Compendium of SOCDAB-2024 held at SVVU, Andhra Pradesh.

- Boora AK (2024). Farmer-Led Research: Leveraging Tacit Knowledge for Sustainable Buffalo Farming at the National Symposium of The Indian Society for Buffalo Development (ISBD 2024) 16th to 18th December 2024 at the College of Veterinary Science and Animal Husbandry, Kamdhenu University, Anand, Gujarat.

- Balhara AK. (2024). Present status of buffaloes in India and future trends in 11th Asian Buffalo Congress 25-27 October 2024, Dhaka Bangladesh.

Abstracts

- Krishna Bansal, Dinesh Jhamb, Usha Yadav, Mamata Meel, Akanksha Gupta, Renu Bala, Meenakshi Virmani, Dharmendra Kumar, Pradeep Kumar (2024). 'Sperm motility pattern in buffalo bulls: a first scientific report' in 39th Annual Convention of ISSAR and National Symposium on "Challenges in Enhancing Reproductive Efficiency of Livestock: An Indian Perspective held on November 29 to December 1, 2024 organised by Department of Veterinary Gynaecology and Obstetrics College of Veterinary Science, Ludhiana Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana page-377

- Mamta Meel, Mitesh Gaur, Meeti Punetha, Priya, Rekha Moun, Renu Bala, Manu, Dharmendra Kumar, Pradeep Kumar (2024). Sperm separation by activating toll-like receptor 7/8 in buffalo in 39th Annual Convention of ISSAR and National Symposium on "Challenges in Enhancing Reproductive Efficiency of Livestock: An Indian Perspective held on November 29 to December 1, 2024 organised by Department of Veterinary Gynaecology and Obstetrics College of Veterinary Science, Ludhiana Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana page-379.

- Aiswarya S, R.N.Padaria (2024). Enhancing Non-Timber Forest Product Management through Inclusive Participatory Research in the Nilgiri Biosphere Reserve. International Conference on "Communication and Dissemination Traditional Knowledge (CDTK-2024). CSIR-NIScPR.

- Chhotaray, S, Kumar, S. (2024) Neural Expected Genetic Merit Index for selection of candidate test bulls in a progeny testing program, In Compendium of ISAGBCON-2024 held at BASU, Patna. 190.

- Diwakar V, Vohra V, Patil A, Misal S, Chhotaray S. (2024) Leveraging AI for Breeding Value Prediction in Murrah Buffaloes: Insights from 42 years of Data using Gradient Boosting and XGBoost, In compendium of ISBD-2024 held at CoVAS, Anand.

- Aishwarya H S, Kumar Rajender, Tuteja FC, Datta T.K (2024). Clinical and therapeutic studies on Trypanosoma evansi infected Nili-Ravi buffaloes. 18th Conference of Indian Association of Women Veterinarians (IAWV) and National Dialogue on Role of Women Veterinarian for Viksit Bharat.

Book / Manual / Compendium / Report compilation

- Balhara AK, Gururaj M, Aiswarya S, P Sharan, N Paul and S Balhara (2024). ICAR-CIRB newsletter July-December, 2023. ICAR-Central Institute for Research on Buffaloes, Hisar, Haryana, India

- Balhara AK, Gururaj M, Aiswarya S, P Sharan, N Paul and S Balhara (2024). ICAR-CIRB newsletter January-June, 2024. ICAR-Central Institute for Research on Buffaloes, Hisar, Haryana, India.

- Avijit Dey, Sanjay Kumar, Jerome A, Meeti Punetha, Aiswarya S. ICAR-CIRB Annual Report 2023. ISBN No. 978-81-966640-1-5.

- Chhotaray S, Kumar S, Sharma RK, Datta T.K. (2024) Sire Directory 2024, Published by Director, ICAR-CIRB, Hisar

- Paul SS, CS Prasad, NM Soren, Avijit Dey. (2024). Nutrient Requirement of Animals - Buffalo. 2024. National Committee on Nutrient Requirement of Animals)- (Chairman: K Pradhan; Mem Sec: Dr. R Bhatta; Buffalo Committee:), ICAR, New Delhi. (ISBN: 978-81-954201-9-3).

- Sihag, S, Shalini A, Rachna, Datta T K, Saxena, N and Gururaj M. (2024). किसानों के लिए उन्नत दूध और दूध उत्पाद प्रसंस्करण, Jointly published by ICAR-Central Institute for Research on Buffaloes and Dairy Science & Technology College, LUVAS, Hisar Haryana. Pages: 1-102.

Book / Manual / Compendium chapter

- Saxena N, Jerome A, Taneja A. (2024). ICAR-CIRB Technology Dossier. ISBN No.: 978-81-966640-2-2.

- Kumar D, Punetha M. (2024). CRISPR-Cas mediated gene editing: Basic principles and potential uses in livestock. Edited by Ranjan R, Gangawar C, Singh MK, Chatli MK (2024), In Technological Innovation in Assisted Reproductive Technologies in Goat, ICAR-CIRG, Makhduoom, Mathura, pp168-175.

- Kumar P, Kumar D. (2024). Use of technology to increase semen Production and conception rate in farm animals. Edited by Ranjan R, Gangawar C, Singh MK, Chatli MK (2024), In Technological Innovation in Assisted Reproductive Technologies in Goat, ICAR-CIRG, Makhduoom, Mathura, pp146-161.

- Wang, M, Isachenko E, Rahimi G, Kumar P, Mallmann P, Isachenko V. (2024). Aseptic Capillary Vitrification of Human Spermatozoa. In: Nagy, Z.P., Varghese, A.C., Agarwal, A. (eds) Cryopreservation in Assisted Reproduction. Springer, Cham. https://doi.org/10.1007/978-3-031-58214-1_59

- Wang M, Isachenko E, Rahimi G, Kumar P, Mallmann P, Isachenko V. (2024). Vitrification of Human Spermatozoa: Effect of Cryoprotectants and Cooling Methods on Sperm Cryopreservation. In: Nagy, Z.P., Varghese, A.C., Agarwal, A. (eds) Cryopreservation in Assisted Reproduction. Springer, Cham. https://doi.org/10.1007/978-3-031-58214-1_9

- Praveen K.V, Aiswarya S. (2024). Institutional Support for Agripreneurship Development in Women in India. Agripreneurship through Farming System: A Viable Techno-Economical Approach for Women Empowerment. ICAR-CIWA 120-129.

- Rakshit S, Aiswarya S, Das B, Sahoo A K. (2024). Methodologies for Socio-Economic Impact Assessment of Research Projects. Recent Developments in Livestock Phenome Data Recording, Analysis and Interpretation in the Era of Genomics.ICAR-NRC on Camel. 225-234.

- Patnaik N M, Aiswarya S, Kademani S B, Gowda C, Sahoo A K, Sontakki B, Rathore S. and Venkatesan P. (2024) Strengthening Extension Research in Agriculture Technology Application and Research Institutes (ATARIs). Research and Technology Advancements in Agriculture. ICAR-NAARM.

- Chhotaray S, Meera K, Saravanan KA, Kumar H, Divya D, Bhaladhare A, Raju T, Ganesh KB, Pankaj PK, Vohra V. (2024) Breeding for Multiple Stress Tolerance in the Animal Sector In Research and Technology advances in agriculture. Published by: Director, ICAR-NAARM, Hyderabad -500 030, 141-164.

- Balhara AK, Datta TK, Singh I (2024) Present status of buffaloes in India and future trends. In: Proceedings of the 11th Asian Buffalo Congress 25-27 October 2024, Dhaka Bangladesh pp 85-93.

Technical/Popular articles

- Boora AK, Sarita Yadav, KP Singh, Sunesh Balhara and Inderjeet Singh. (2024). वैज्ञानिक दृष्टिकोण एवं पारंपरिक ज्ञान से प्रोजेनी टेस्टिंग पहचान। (Vaigyanik Drishtikon evam Paramparik Gyan se Progeny Testing Pehchan), pp 11

- Datta TK, Chhotaray S. (2024) Genetic improvement in buffaloes for enhancing global food security. The Indian Journal of Animal Genetics and Breeding, 43(1,2), 130-136. https://doi.org/10.59317/pcdvdj84

- Jyoti, Sarita Yadav, AK Boora and S Balhara. (2024). Development of a dry strip test for detecting subclinical ketosis (SCK) from buffalo milk, pp.10

- Nisha Verma, Sarita Yadav, AK Boora, S Balhara and AK Balhara (2024). Development of a colorimetric paper-based dry strip test for detection of mastitis, pp.3

- Sarita Yadav, AK Boora, AK Balhara, S Balhara and Aiswarya S. (2024). Polioencephalomalacia (Cerebrocortical Necrosis) in Buffalo Calves: Clinical Presentation and Management, pp.7-8

- Sarita Yadav, AK Boora, Ekta Hooda and S Balhara. (2024). स्वस्थ कटरी प्रबंधन से श्रेष्ठतम दुग्ध उत्पादन, pp 8 (Swasth Katari Prabandhan se Shreshtam Dugdh Utpadan)

AWARDS/RECOGNITIONS/ FELLOWSHIPS

Awards / Recognitions	Name of Scientist/Staff
Associate Fellow, National Academy of Dairy Sciences, India (NADSI)	Jerome A
Joined as Editorial Board Member - Journal of Reproductive Healthcare & Medicine, BMC Veterinary Research	
Acted as Co-Chairman in Andrology, Semenology and Artificial Insemination Session at ISSAR Conference 2024,GADVASU, Ludhiana [29 Nov - 1 Dec 2024].	
Acted as Co-Chairman in Reproductive Biotechnology session at ISSAR Conference 2024,GADVASU [29 Nov - 1 Dec 2024]	Pradeep Kumar
Joined as Member of Editorial Board of Scientific Reports Journal	Dharmendra Kumar
Best Ph.D. thesis Award 2024 by MANAGE, Hyderabad	Aiswarya S
Best Poster Award on International Conference on Communication and Dissemination Traditional Knowledge (CDTK-2024) organized by CSIR-NIScPR held at November 13-14, 2024 at Gurugram University, Haryana	Supriya Chhotaray
Dr. P.N. Bhat Award for Best Paper at ISAGBCON-2024 by Indian Society for Animal Genetics and Breeding	
Second best poster on Clinical and therapeutic studies on Trypanosoma evansi infected Nili-Ravi buffaloes presented at 18th Conference of Indian Association of Women Veterinarians (IAWV) and National Dialogue on Role of Women Veterinarian for Viksit Bharat	Aishwarya H S, Kumar Rajender, Tuteja FC, Datta TK
Dr. SK Ranjhan Best Doctoral Thesis Award" by Dr. Ram Kumar Singh in the "20th Biennial International Conference of ANSI" during Jan 23-25, 2024 for his outstanding PhD research work at ANFT Division of CIRB, Hisar.	Avijit Dey
Fellow of Animal Nutrition Society of India (FANSI) at TANUVAS, Chennai during 20th Biennial ANSI Conference from Jan 23-25, 2024.	
Fellow of Indian Association for the Advancement of Veterinary Research (FIAAVR) at LUVAS, Hisar during 24th Indian Veterinary Congress & 31st Annual Conference of IAAVR from Feb 7-8, 2024.	

Dr. Aiswarya S. awarded Best Ph.D. thesis Award 2024 by MANAGE, Hyderabad

Dr.Aiswarya H.S awarded best poster on the occasion of 18th conference of IAWV

Dr. Supriya Chhotaray awarded Dr.P.N.Bhat Award at ISAGBCON-2024

Dr Avijit Dey recognised as Fellow of IAAVR

EVENTS

Participation in Conferences/ Workshops/Meetings

Event	Date	Venue	Participants
8th Convocation of NADSI and National Dialogue on Bringing Smile to Dairy Farmers	9th April 2024	DUVASU, Mathura	Jerome A
Brainstorming session on IPR Management jointly with the ICAR-NRCE Hisar	18th April 2024	ICAR-CIRB, Hisar	All Scientists
National Workshop on Artificial Intelligence and Sensors for Efficient Livestock Farming	10th June 2024	ICAR-CIRB, Hisar	All Scientists
ISSAR 2024 Annual convention and International Symposium	29th November – 1st December 2024	GADVASU Ludhiana	Jerome A & Pradeep Kumar
Annual Convention of Animal Physiologists Association and National Symposium on Advanced Physiological Strategies for Sustainable Livestock Production and Reproduction (APACON2024)	01st – 02nd March 2024	ICAR-CSWRI, Avikanagar	Meeti Punetha
International Conference on Communication and Dissemination Traditional Knowledge (CDTK-2024)	13th – 14th November, 2024	CSIR-NIScPR New Delhi	Aiswarya S
Consultative Workshop on Foresight Analysis of Livestock Production in India	20th December, 2024	CGIAR-ILRI, New Delhi	AK Balhara, Gururaj M & Aiswarya S
Indian Sociey for Animal Genetics and Breeding Conference (ISAGBCON)-2024	21st -22nd November 2024	BASU, Patna	S. Chhotaray
21st Annual Review Meeting of Network Project on Buffalo Improvement	12th-13th November 2024	ICAR-IGFRI, Jhansi	Sanjay Kumar & S Chhotaray
DLFA International Dairy & Agri Expo	23rd -25th February 2024	Charik Pashu Mandi, Punjab	AK Boora
11th Asian Buffalo Congress; Lead paper 'Present status of buffaloes in India and future trends' presented on 27th October, 2024	25th – 27th October 2024	Dhaka, Bangladesh	AK Balhara
18th Conference of Indian Association of Women Veterinarians (IAWV) and National Dialogue on "Role of Women Veterinarian for Viksit Bharat	13th -14th November 2024	DUVASU, Mathura	Habbu A Sunder
XX Biennial Conference of Animal Nutrition Society of India	23rd – 25th January 2024	TANUVAS, Chennai	Avijit Dey
24th Indian Veterinary Congress of IAAVR,	7th -8th Feb, 2024	LUVAS, Hisar	Avijit Dey
International Conference on Innovative trends in Statistics, optimization and data science	21st -23rd Dec., 2024	Kurukshetra University, Kurukshetra	Sunesh Balhara
National workshop on Artificial Intelligence and Sensors for efficient livestock farming	10th June, 2024	ICAR-CIRB Hisar	All Scientists

National workshop on Artificial Intelligence and Sensors for efficient livestock farming

Workshop on Intellectual Property Rights organised by ITMU unit of ICAR-CIRB

Project document signed between BMGF and ICAR team in presence of DG and DDG (AS), ICAR at New Delhi

Academic and Research Collaboration

Sl. No.	University/Institute/Organization entering in MoU	Scope of Collaboration	Date of MoU with ICAR- CIRB Hisar
1	Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana (Punjab)	Academics and Research	09.01.2012
2	Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar (Haryana)	Academics and Research	09.05.2014
3	Bihar Animal Sciences University, Patna (Bihar)	Academics and Research	05.07.2018
4	Nanaji Deshmukh Veterinary Science University, Jabalpur (M.P.)	PG Research	01.09.2018
5	Hitech Sach Dairy, Sirsa (Haryana)	Biotechnological research - buffalo cloning	02.01.2019
6	Rajasthan University of Veterinary and Animal Sciences, Bikaner (Rajasthan)	Academics and Research (UG teaching and PG research)	18.05.2019
7	Punjab National Bank Farmers Training Centre, Sacha Kheda (Jind, Haryana)	Training Purpose	19.11.2019
8	Lovely Professional University, G.T. Road, Phagwara, Punjab	Academics and Research	24.06.2022
9	Uttarakhand Council for Biotechnology, Haldi, Uttarakhand	Academics and Research	20.03.2023
10	Association for Innovation Development of Entrepreneurship in Agriculture (a-IDEA), NAARM, Hyderabad	Research and Transfer of Technology	23.08.2023
11	Sher-e-Kashmir University of Agricultural Sciences and Technology, Srinagar	Academics and Research	07.02.2024
12	DAU Shri Vasudev Chandrakar Kamdhenu Vishwavidyalaya, Durg	Academics and Research	22.07.2024
13	Indian Institute of Technology Roorkee, Uttarakhand	Academics and Research	08.08.2024

MoU signed between Agrovet and ICAR-CIRB

MoU signed between IIT Roorkee and ICAR-CIRB

Distinguished visitors at ICAR-CIRB

Visit of Dr. Raghavendra Bhatta, DDG (Animal Science), ICAR; Dr. Abhijit Mitra, Animal Husbandry Commissioner, DAHD; Dr. Vinod Kumar Verma, Vice-Chancellor, LUVAS; and Dr. Tarun Kumar Bhattacharya, Director, ICAR-NRCE, on the occasion of the 40th Foundation Day

Visit of Dr. Raghavendra Bhatta, Deputy Director General (Animal Science), ICAR

Visit of Dr. Ashok Kumar, Assistant Director General (Animal Health),ICAR

CIRB Among Stakeholder

CIRB activities for different stakeholders/ farmers

Extension activities by CIRB

ICAR-CIRB organizes various extension activities, including trainings, animal health check-up camps, demonstrations, melas, and Kisan Gosthis for various stakeholders under different schemes such as SCSP, TSP and aspirational district. In addition, the institute actively participates in melas and exhibitions to showcase its technologies and ongoing activities. In order to raise awareness among children, CIRB celebrates important days by organizing competitions such as quizzes, essay writing, storytelling, drawing, painting, collage making, etc. The various events held under different schemes are listed below:

Training programs
Institute funded

S. No.	Title	Venue	Date	Participants	Coordinators
1.	Scientific buffalo husbandry practices	CIRB Hisar	30 Jan to 5 Feb 2024	25	Gururaj M Aiswarya S. M Punetha
2.	Improved buffalo husbandry practices	CIRB Hisar	14 to 20 Feb 2024	32	Aiswarya S ML Sharma
3.	Scientific buffalo husbandry practices and entrepreneurship development	CIRB Hisar	19 to 25 June 2024	50	ML Sharma Aiswarya Gururaj M N Saxena
4.	Scientific buffalo husbandry practices	CIRB Hisar	08 to 14 Aug 2024	22	ML Sharma Aiswarya Gururaj M N Saxena
5.	Improved buffalo husbandry practices	CIRB Hisar	23 to 29 Oct 2024	20	ML Sharma Aiswarya Gururaj M N Saxena
Under SCSP scheme					
1.	Improved Buffalo Husbandry Practices	CIRB Nabha	12 to19 Feb 2024	30	FC Tuteja Ashish
2.	Improved Buffalo Husbandry Practices	CIRB Nabha	12 to 19 Mar 2024	30	FC Tuteja Ashish
3.	Improved Buffalo Husbandry Practices	CIRB, Hisar	26 to 27 Mar 2024	50	Gururaj M, Aiswarya S N Saxena M L Sharma
4.	Scientific Buffalo Husbandry Practices	CIRB, Hisar	25 to 27 Nov, 2024	30	Gururaj M Aiswarya S N Saxena ML Sharma

Kissan Sammelan held at Nangla(V),Fatehbad (D),Haryana

Demonstration on detection of mastitis in buffaloes

Training on Scientific Buffalo Husbandry Practises held at ICAR-CIRB,Hisar

Training on Scientific Buffalo Husbandry Practises held at Nangla (V), Fatehbad (D), Haryana

S. No.	Title	Venue	Date	Participants	Coordinators
5.	Scientific Animal Husbandry Practices	Nangla village, Fatehbad (D), Haryana	17 to 19 Dec, 2024	50	Gururaj M Aiswarya S N Saxena
Under TSP scheme					
1.	Entrepreneurship development in buffalo husbandry	CIRB Hisar	1 to 2 Mar, 2024	35	SK Phulia Gururaj M
Inter-institutional collaborative					
1.	Advanced milk and milk product processing for farmers	CoDST, LUVAS & CIRB, Hisar	4 to 6 Mar, 2024	30	TK Datta S Sihag , N Saxena Gururaj M, Shalini Arora Rachna
2.	Milk Value Addition Product Training	PNB-FTC, Sachha Khera & CIRB at Nangla (V), Fatehbad (D), Haryana	27 to 29 Nov,2024	30	N Saxena Aiswarya S. Raman Sheelwanth
3.	Training on Gender Friendly Farm Machinery	CIRB & NRFMTTI, Hisar at Nangla (V), Fatehbad (D), Haryana	17 to 19 Dec, 2024	53	Aiswarya S. Mandal

Animal health check-up & infertility camp and calf rallies

S. No.	Event	Venue	Date of Event	participants	Coordinators
1.	Calf rally	FPT village	23 Jan, 2024	60	Sanjay Kumar R K Sharma Jerome A
2.	Animal health checkup and infertility treatment camp	Nangla (V), Fatehbad (D), Haryana	21 to 22 Oct, 2024	100 farmers (About 200 Bovines and 400 small Ruminants)	Aiswarya S. R K Sharma SK Phulia

Training on Gender Friendly Farm Machinery held at Nangla (V), Fatehbad(D), Haryana in collaboration with NRFMTTI

Training on Scientific Buffalo Husbandry Practises held at ICAR-CIRB, Sub Campus, Nabha

Animal health checkup and infertility treatment camp held at Nangla(V),Fatehbad(D),Haryana

Calf Rally

Demonstrations, kisan gosthis and kisan sammelan

S. No.	Event	Venue	Date	Participants	Coordinators
1.	Kisan Gosthi (40th foundation day occasion)	CIRB, Hisar	01 Feb, 2024	70	Aiswarya S. Gururaj M N Saxena
2.	Demonstration on detection of mastitis in buffaloes	CIRB, Hisar	01 Mar, 2024	35	SK Phulia Gururaj M
3.	Demonstration on pregnancy diagnosis in buffaloes using Preg-D	CIRB, Hisar	01 Mar, 2024	35	SK Phulia AK Balhara
4.	Demonstration on milk processing and preparation of milk products	LUVAS, Hisar	02 Mar, 2024	35	Shalini Arora Gururaj M
5.	Kisan Gosthi and Frontline Demonstrations	Kewalpura (V), Chittorgarh (D), Rajasthan	12 Mar, 2024	176	SK Phulia AK Balhara Gururaj M
6.	Kisan Gosthi and Frontline Demonstrations	Kherar (V), Udaipur (D), Rajasthan	13 Mar, 2024	32	SK Phulia AK Balhara Gururaj M
7.	Kisan Gosthi and Frontline Demonstrations	Chandela (V), Sirohi (D), Rajasthan	14 Mar, 2024	34	SK Phulia AK Balhara Gururaj M
8.	Kisan Gosthi	Nangla (V), Fatehbad (D), Haryana	22 Oct,2024	300	Aiswarya S. Gururaj M N Saxena
9.	Kisan Sammelan	Nangla (V), Fatehbad (D), Haryana	29 Nov, 2024	517	Aiswarya S. Gururaj M N Saxena
10	Farmers Day	Nangla (V), Fatehbad (D), Haryana	23 Dec. 2024	50	Aiswarya S. Gururaj M

Exposure visits

S. No.	Title/Event	Venue	Date	Participants	Coordinators
1.	Exposure visits of Farmers Badi Sadri (V), Chittorgarh (D), Rajasthan	CIRB, Hisar	28 Feb to 4 Mar 2024	35	SK Phulia Gururaj M

CIRB journal club activities

S. No.	Journal Club	Expert	Date	Coordinated by
1	Styles of Communication	Laxmi Mantha	25 January, 2024	Aiswarya S.
2	Why farmers are slow in adapting technologies	SVN Rao	23 February, 2024	Aiswarya S.
3	Antibiotics: More Doesn't Mean Better	Samiran Bandyopadhyay	26 March, 2024	Aiswarya S.
4	The Behavioural Expectations from a Member of a High-Performance Team	Sanjay Saxena	19 April, 2024	Aiswarya S.
5	Exploiting animal sciences in healthcare research:a case study	Prabodha Swain	21 June, 2024	S Chottoray & Aiswarya S.

Journal Club Lecture by Dr.Sanjay Saxena

Journal Club Lecture by Dr. Prabodha Swain

Kissan Gosthi held at Nangla(V),Fatehbad (D),Haryana

Participation in Exhibition/Kisan Mela/Pashu Mela

S. No.	Mela/Exhibition	Venue	Date	Coordinators
1.	96th ICAR Foundation Day & Technology Day	NAAS Complex, New Delhi	15 to 16 July,2024	Gururaj M Aiswarya S.
2.	Pratigya 2024: A mega Exhibition	Bhiwani	22 to 24 Aug, 2024	Gururaj M Aiswarya S.
3	National goat conclave and Bakri mela	ICAR-CIRG ,Makhdoom	18 to 19 Mar, 2024	ML Sharma

Exposure visits of Farmers of Badi Sadri (V), Chittorgarh (D), Rajasthan

Extension among School Children

S. No.	Title/Event	Venue	Date	Participants	Coordinators
1.	Quiz competition	Government School, Talwandi Rana	30 Jan, 2024	100	S Singh S Balhara S Yadav Aiswarya S.
2.	Swachhta Abhiyaan	Government Middle School (GMS), Nangla, Fatehbad (D), Haryana	24 Sept, 2024	133	Aiswarya S. Gururaj M N Saxena
3.	Vigilance awareness week	Government Middle School (GMS), Nangla, Fatehbad (D), Haryana	24 Sept, 2024	133	Aiswarya S. Gururaj M N Saxena
4.	Milk Day Celebration	Government Primary & Middle School, and Anganwady Nangla, (V), Fatehbad (D), Haryana	25 to 26 Nov, 2024	438	Aiswarya S. Gururaj M N Saxena
5.	Exposure Visit ID DAV public School	CIRB, Hisar	27 Nov 2024	50	Gururaj M. Aiswarya S.

Special events organized at institute
Industry-interface meeting

S. No.	Event	Venue	Date	Participants	Coordinators
1.	Industry-interface meet on occasion of CIRB 40th foundation day	CIRB, Hisar	01 Feb, 2024	50	Avijit Dey

Farmers' Visit to Hon'ble Vice President's Office: Recognition of ICAR-CIRB's Efforts

Farmers from the adopted villages under the Field Progeny Testing (FPT) program of ICAR-CIRB had the esteemed opportunity to visit the office of Hon'ble Vice President of India, Sh. Jagdeep Dhankhar, in January 2024. The Vice President appreciated ICAR-CIRB's dedicated efforts in enhancing buffalo breeding and supporting rural livelihoods. He acknowledged the institute's role in empowering farmers through scientific interventions and progressive farming practices. During the visit, farmers from these villages discussed the specific challenges they face in buffalo rearing, while the Vice President encouraged them to adopt improved technologies and assured support for their development.

Success Story: Extending the Productive Life of High Genetic Merit Buffalo Bulls for Semen Production

Ashok Boora, Sarita Yadav, Sunesh Balhara and Inderjeet Singh

In a landmark move towards conserving superior buffalo germplasm and maximizing resource efficiency, ICAR-CIRB Hisar successfully challenged conventional culling norms by reintroducing high genetic merit buffalo bulls beyond their standard productive age. As per 2015 guidelines, semen collection was restricted to bulls under ten years or within eight years of productive service. However, recognizing the rising demand for quality semen doses and the untapped genetic potential of aged bulls, ICAR-CIRB procured five elite bulls (average age: 11 years) from HLDB's Hisar Semen Station between 2015 and 2018.

Each bull was thoroughly assessed for pedigree, breeding soundness, and health status before inclusion. These bulls, previously deemed surplus, went on to produce a total of ₹ 113,82,500 worth of semen doses during an average stay of just 15.9 months. Their semen was swiftly used in research, distributed to farmers, and even sold to other semen banks. Remarkably, bulls M29 and M51 emerged as top performers in national progeny testing programs (Set XVI and XVII), while their progeny—such as a heifer producing 19.7 kg/day—demonstrated excellent genetic transmission.

Set-XVI										
Sr. No.	Bull No.	Location	Date of birth	Dam No.	Sire No./ Set No.	Dam's best lact. 305 or less yield (kg)	No. of daughter recorded	Sire index	% of superiority over SLM (BLUP)	Rank
1.	M-29	CIRB	16-10-05	4P	P274	4600	60	2578.94	3.82	I
Set XVII										
1.	M-51	CIRB	03-02-06	22P	274P	4668	68	2558.57	6.76	I

These bulls contributed significantly to national programs, including progeny testing under the Network Project on Buffalo Improvement and advanced cloning research.

This initiative underscores that with rigorous screening, bulls beyond ten years can remain productive assets. ICAR-CIRB recommends policy revision to permit semen production from older bulls based on performance, rather than arbitrary age limits—thus preventing premature culling and supporting genetic improvement in buffalo breeding.

M-29 Bull

Prof (Dr) Prem Singh (Veterinary Surgery) saved life of injured M-29

STUDENT RESEARCH
AT CIRB

Completed Research

S. No.	Name of the scholar	Degree	Subject/ Discipline	University	Year	Advisor Major/ Co-Major	Title of the thesis
1.	Subham Thakur	Ph.D.	Animal Nutrition	LUVAS Hisar	2019-24	Dr. A Dey	Effect of dietary malic acid protected protein supplementation on growth performance, nutrient utilization and methane emission in Murrah buffalo calves
2.	Akanksha Gupta	Ph.D.	Animal Physiology	NDRI Karnal	2021-24	Dr. P.S.Yadav	Studies on hair cortisol, testosterone and fertility biomarkers in buffalo bulls
3.	Swati Thakur	Ph.D.	Animal Physiology	LUVAS Hisar	2021-24	Dr. P.S.Yadav	To study the role of major histocompatibility class (MHC) I in buffalo cloned embryos to enhance success rate of pregnancies
4.	Prashant Kumar	Ph.D.	Animal Biochemistry	NDRI Karnal	2020-24	Dr. Varij Nayan	Silver and silica nanoparticles effects on steroidogenic and apoptotic pathway genes expression in cultured buffalo granulosa cells
5.	Kanchan Arya	Ph.D.	Veterinary Medicine	LUVAS Hisar	2022-24	Dr Sarita Yadav	Clinico-epidemiological and therapeutic studies on hepatic lipidosis in dairy buffaloes
6.	Praveena	Ph.D.	Environmental Science	LPU Punjab	2022-24	Dr. Sarita Yadav	Antimicrobial and antibiofilm activity of Indian Propolis against Esherichia coli isolated from buffalo mastitis.

Ongoing Research

S. No.	Name of the scholar	Degree	Subject/ Discipline	University	Year	Advisor Major/ Co-Major	Title of the thesis
1	Komal	Ph.D.	Animal Genetics & Breeding	LUVAS, Hisar	2022 till date	Dr. Sanjay Kumar	Genetic evaluation of Fertility, Production performance and Longevity traits in Murrah buffaloes
2	Amandeep	Ph.D.	Livestock Production & Management	LUVASHisar	2022 till date	Dr. Sarita Yadav	Potential of IRT as a tool of screening of mastitis in dairy animals
3	Dr. Renu Choudhary	Ph.D.	Animal Biochemistry	LUVAS Hisar	2023-25	Dr. Ashok K Balhara	Studies on urinary and blood pregnediol glucoronide and p-parcresol levels in female buffaloes
4	Pankaj Chayal	Ph.D.	Animal Genetics & Breeding	NDRI, Karnal	2024-25	Dr. Supriya Chhotaray	Delineating the causal relationship between lactation persistency and predisposition to mastitis in Murrah buffaloes
5	Mamta Meel	M.V.Sc.	Veterinary Gynaecology & Obstetrics	RAJUVAS Bikaner	2024-25	Dr. Pradeep Kumar	Identification of TLR7/8 receptors on buffalo sperm for separation of X and Y spermatozoa using their ligands
6	Rashmi	M.V.Sc.	Veterinary Gynaecology & Obstetrics	LUVAS Hisar	2022 - till date	Dr. Pradeep Kumar	Studies on X and Y sperm separation using TLR7/8 agonist Resiquimod (R848) in buffalo
7	Hemlata Valmiki	M.V.Sc.	Animal Genetics & Breeding	NDRI, Karnal	2024 till date	Dr. Supriya Chhotaray	Multi-omics analysis for delineating host immune response genes for sub-clinical mastitis in Murrah buffaloes
8	Shashank Singh Shekhawat	M.V.Sc.	Animal Nutrition	NDRI, Karnal	2024 till date	Dr. A Dey	Effect of dietary inclusion of rumen protected malic acid-heat treated proteins on intake, nutrient utilization, methane emission, milk production and quality in early lactating Murrah buffaloes

PERSONNEL

General Administration

S. No.	Name	Designation
1.	Dr. Tirth Kumar Datta	Director
2.	Sh. Raj Kumar	Sr. Administrative Officer
3.	Smt. Shammi Tyagi	Sr. Finance & Account Officer
4.	Sh. Rajesh Kumar	AAO
5.	Sh. Girdhari Lal	AAO
6.	Sh. Viksit Kumar	AAO (till 30.09.2024)
7.	Sh. Abdul Mazid	AAO
8.	Sh. Ashok Kumar	Assistant
9.	Smt. Indira Devi	Assistant
10.	Sh. Satbir Singh	Assistant
11.	Sh. Amandeep Boora	Assistant
12.	Sh. Nakul	Assistant
13.	Sh. Dharam Pal	UDC
14.	Sh. Sunil Kumar	UDC
15.	Sh. Mahabir Singh	UDC
16.	Smt. Savita	UDC
17.	Sh. Rajbir Singh	LDC
18.	Sh. Radhey Krishan	LDC
Sub Campus, Nabha		
1.	Dr. F C Tuteja	Sr. Scientist & Officer In-charge
2.	Dr Mustafa Hasan Jan	Scientist
3.	Dr. Ashish Baladhare	Scientist
4.	Sh. Rajiv Mehta	Chief Tech. Officer (till 31.05.2024)
5.	Sh. RS Pippal	Chief Tech. Officer
6.	Dr. AK Saini	Senior Tech. Officer
7.	Dr. Aishwarya Habbu	Senior Tech. Officer
8.	Dr. Nilendu Paul	Senior Tech. Officer
9.	Dr. Suresh Kumar Kakraliya	Senior Tech. Officer
10.	Sh. Daljit Singh	Tech. Officer (till 31.01.2024)
11.	Sh. Mohan Singh	Tech. Officer
12.	Sh. Tejinder Singh	Assistant (till 01.03.2024)
13.	Sh. Jaspal Singh	LDC
Transfer of Technology (TOT)		
1.	Dr. Navneet Saxena	Principal Scientist & In-charge
2.	Dr. Gururaj M.	Scientist
3.	Dr. Aiswarya S.	Scientist
4.	Dr. ML Sharma	Chief Tech. Officer
Priority Setting, Monitoring and Evaluation (PME) Cell		
1.	Dr. SK Khurana	Principal Scientist (till 31. 01. 2024)
2.	Dr. Navneet Saxena	Pr. Scientist & In-charge (W.e.f 01.02.2024)
3.	Dr. FC Tuteja	Senior Scientist
4.	Dr. Dharmendra Kumar	Senior Scientist
5.	Dr. Jerome A	Senior Scientist
6.	Dr. Gururaj M	Scientist (W.e.f 29.11.2024)
7.	Dr. Supriya Chhotaray	Scientist
8.	Sh. Raj Kumar	Asst.Chief Tech. Officer (till Nov. 2024)
9.	Miss Reetu Sharma	Technician T-1 (w.e.f. 29.11.2024)

AKMU		
1.	Dr. Sunesh Balhara	Scientist & In-charge
2.	Sh. Raj Kumar	Asst. Chief Tech. Officer
HRD Cell		
1.	Dr. Avijit Dey	Principal Scientist, Nodal Officer
2.	Dr. Jerome A	Senior Scientist, Co-Nodal Officer
Public Relations Officer (PRO)		
1.	Dr. Sajjan Singh	Pr. Scientist, Nodal Officer (till 30.04.2024)
2.	Dr. Rajesh Kumar	TO (w.e.f. 01.05.2024)
Academic Coordinator		
1.	Dr. Sanjay Kumar	Senior Scientist
2.	Dr. Ashok Kumar Balhara	Principal Scientist
Estate Section and Electrical Section		
1.	Dr. S.K. Phulia	Principal Scientist
2.	Sh. B.P. Singh	CTO & I/c Estate Section
3.	Sh. Rajesh Prakash	CTO & I/c Estate Section
4.	Sh. Anil Kumar	Technician (till 30.09.2024)
5.	Manish Kumar	Technician T-1
Workshop Section		
1.	Dr. Sanjay Kumar	Senior Scientist
2.	Sh. Bhim Singh	Tech. Officer
3.	Sh. Satpal	Tech. Officer
4.	Sh. Ram Chander	STO & In-charge (w.e.f. 19.02.2024)
Students' Trainee Hostel		
1.	Dr. Meeti Punetha	Scientist & Overall In-charge
2.	Sh. Ram Chander	STO & In-charge
Landscape Section		
1.	Sh. Satbir Kundu	Assistant
Network Project on Buffalo Improvement (NPBI)		
1.	Dr. Tirth Kumar Datta	Director
2.	Dr. Umesh Singh	Head, AGB Division (till 31.03.2024)
3.	Dr. B.P. Kushwaha	Principal Scientist (at IGFRI, Jhansi)
4.	Dr. Rakesh Kumar Sharma	Pr. Scientist & Incharge (w.e.f. 01.04.2024)
5.	Dr. Sanjay Kumar	Senior Scientist & Head
6.	Sh. Ram Chander	Senior Technical Officer
7.	Miss Reetu Sharma	Technician T-1
Animal Nutrition & Feed Technology		
1.	Dr. Avijit Dey	Principal Scientist & Head (w.e.f. 30.10.23)
2.	Dr. P.C. Lailer	Principal Scientist (till 29.02.2024)
3.	Dr. Navneet Saxena	Principal Scientist
4.	Dr. Vishal Mudgal	Principal Scientist
5.	Dr. Sarita Yadav	Senior Scientist
6.	Sh. Krishana Kumar	Chief Tech. Officer
7.	Sh. GD Tiwari	Senior Technician
Animal Physiology & Reproduction		
1.	Dr. Yash Pal	Principal Scientist & Head (w.e.f. 27.10.23)
2.	Dr. Sajjan Singh	Principal Scientist (till 30.04.2024)

3.	Dr. Prem Singh Yadav	Principal Scientist
4.	Dr. Rakesh Kumar Sharma	Principal Scientist
5.	Dr. Sushil Kumar Phulia	Principal Scientist
6.	Dr. Ashok Kumar Balhara	Principal Scientist
7.	Dr. Dharmendra Kumar	Senior Scientist
8.	Dr. Jerome A	Senior Scientist
9.	Dr. Pradeep Kumar	Senior Scientist
10.	Dr. Meeti Punetha	Scientist
11.	Miss Alpana Kumari	Technician T-1
Animal Genetics & Breeding		
1.	Dr. Umesh Singh	Principal Scientist & Head (till 31.03.2024)
2.	Dr. Sandip Kumar Khurana	Principal Scientist (till 31.01.2024)
3.	Dr. B.P. Kushwaha	Principal Scientist
4.	Dr. Sanjay Kumar	Senior Scientist
5.	Dr. Ashok Kumar	Senior Scientist
6.	Dr. Sunesh Balhara	Senior Scientist
7.	Dr. Supriya Chhotaray	Scientist
8.	Sh. Ram Chander	Senior Tech. Officer
9.	Miss Reetu Sharma	Technician T-1
Public Information		
1.	Dr. R.K. Sharma	CPIO, Hisar
2.	Dr. Mustafa Hussan Jan.	CPIO, Nabha
3.	Sh. Rajesh Kumar	Nodal Officer
Vigilance Officer		
1.	Dr. RK Sharma	Principal Scientist
Animal Farm Section		
1.	Dr. Sanjay Kumar	In-charge Animal Health
2.	Dr. Madhu Singh	Senior Technical Officer
3.	Dr. Rupali Rautela	Senior Technical Officer
4.	Dr. Rajesh Kumar	Technical Officer
Agriculture Farm Section		
1.	Dr. PC Lailer	Overall In-charge (till 29.02.2024)
2.	Dr. Sushil Kumar Phulia	Principal Scientist (w.e.f. 01.03.2024)
3.	Sh. Krishna Kumar	Chief Tech. Officer
4.	Sh. Baljeet Singh	Tech. Officer
5.	Sh. Jagdeep	Sr. Technician (29.02.2024)
6.	Sh. Surender Kumar	Technician T-1
Results-Framework Documents (RFD) Cell		
1.	Dr. Jerome A	Senior Scientist
2.	Dr. Gururaj M.	Scientist
Library		
1.	Dr. Vishal Mudgal	Principal Scientist
2.	Sh. Raj Kumar	In-charge & ACTO
Hindi Section		
1.	Dr. Sajjan Singh	Principal Scientist (till 30.04.2024)
2.	Dr. Sushil Kumar Phulia	Principal Scientist (w.e.f. 01.05.2024)
3.	Sh. Krishna Kumar	Chief Tech. Officer

SSS, CIRB Main Campus, Hisar				
Pooran	Ram Kumar	Randhir Singh	Satpal Singh	Ashok Kumar
Jai Prakash	Gopi Ram	Ram Kesh	Smt. Santro	Om Prakash
Yam Bahadur	Siri Ram	Subhash	Balwant Singh	Shri Mange Ram
Chander	Pahlad	Rambir Singh	Surjeet Singh	Baljeet Singh
Raj Kumar	Ashok Kumar	Jagdeep	Dalbara	Ranbir Singh
Rajender	Sarla Rani	Jitender Kumar	Hira Lal	Ram Pal
Hari Kishan	Jai Kumar	Om Prakash	Suraj pal	Raj Mal
Nakchhed	Radhey Shyam	Hawa Singh	Rameshwar	Smt. Anita
Ramesh Chand	Mahabir Singh	Satish Kumar	Jagdish	Satbir Singh
Sadhu Ram	Staywan	Balwant Singh	Jarnail Singh	Dilbag Singh
Prem Singh	Joginder Singh	Om Prakash	Ram Sawroop	Rati Ram
Ramesh	Reshma	Bhadur	Devi Dayal	
Sub-Campus, Nabha				
Shyamdev	Ram Anuj	Rajender	Mohinder Singh	Ved Raj
Raju	Bhim Singh	Balwant Singh	Jaswinder Singh	Ram Singh
Brij Mohan	Hansraj	Gurnaam Singh	Nachater Singh	Ram Preet
Rulda Singh	Ram Kewal	Ram Suraj	Girdhari Lal	Krishan Singh
Jaswant Singh	Shri Nath	Rajesh Kumar	Ashwani Kumar	Nazar Singh
Mukhtaryar Singh	Deshraj	Baljeet Singh	Kulwant Singh	Ram Jeon
Chhotu Ram	Kuldeep Singh	Tara Singh	Vinod Kumar	Karnail Singh
Ram Kumar	Malkiat Singh	Mohinder Singh	Grudeep Singh	Avtar Singh
Bhagwant Rai	Radhey Sham	Mewa Singh	Lakhbir Singh	Smt. Harmeet Kaur
Smt. Gurmeet Kaur	Pritam Singh	Ganga Singh	Ramu	Karnail Singh
Jaswinder Singh	Goli Ram			

Promotions

Dr. Varij Nayan, Sr. Scientist promoted to the post of Principal Scientist w.e.f. 17.11.2022 (Pay level 14).

Dr. Ashok Kumar Balhara, Sr. Scientist promoted to the post of Principal Scientist w.e.f. 08.01.2023 (Pay level 14).

Sh. Rajiv Mehta, CTO grant one advance increment w.e.f. 01.01.2023.

Sh. Ram Chander, TO assessment promotion to Senior Technical Officer (STO) w.e.f. 08.01.2023.

Dr. Madan Lal, CTO grant one advance increment w.e.f. 30.03.2022.

Smt. Savita, LDC promoted to the post of UDC w.e.f. 25.11.2024.

New Joining

Ms. Alpana Kumari, joined as Technician (T-1) on 25.04.2024 at ICAR-CIRB, Hisar

Sh. Harish Kumar, joined as Technician (T-1) on 30.04.2024 at ICAR-Sub-Campus, Nabha

Sh. Roshan Kumar, joined as Technician (T-1) on 30.04.2024 at ICAR-Sub-Campus, Nabha

Sh. Surender Kumar, joined as Technician (T-1) on 06.05.2024 at ICAR-CIRB, Hisar

Ms. Reetu Sharma, joined as Technician (T-1) on 10.06.2024 at ICAR-CIRB, Hisar

Sh. Manish Kumar, joined as Technician (T-1) on 10.06.2024 at ICAR-CIRB, Hisar

Sh. Amandeep Boora, joined as Assistant on 17.09.2024 at ICAR-CIRB, Hisar

Sh. Nakul, joined as Assistant on 24.09.2024 at ICAR-CIRB, Hisar

Retired

Dr. S.K Khurana, Principal Scientist retired on 31.01.2024

Sh. Daljit Singh, T.O retired on 31.01.2024

Sh. Surjit Singh, SSS retired on 31.01.2024

Dr. P.C Lailer, Principal Scientist retired on 29.02.2024

Sh. Jagdeep Singh, Sr. Technician (T-2) retired on 29.02.2024

Sh. Tejinder Singh, Assistant retired voluntarily on 01.03.2024

Sh. Siri Ram, SSS retired on 31.03.2024

Sh. Jaswinder Singh, SSS retired on 31.03.2024

Dr. Sajjan Singh, Principal Scientist retired on 30.04.2024

Sh. Kuldeep Singh, SSS retired on 30.04.2024

Sh. Rajiv Mehta, CTO retired on 31.05.2024

Sh. Nazar Singh, SSS retired on 31.05.2024

Sh. Jagdish Singh , SSS retired on 30.06.2024

Sh. Rulda Singh, SSS retired on 30.06.2024

Sh. Ram Kewal, SSS retired on 31.08.2024

Sh. Ved Raj, SSS retired on 31.08.2024

Sh. Viksit Kumar, AAO, retired on 30.09.2024

Sh. Anil Kumar, T-1 retired on 30.09.2024

Sh. Puran, SSS retired on 30.11.2024

Deputation

Dr. R.S Pippal, CTO deputed on 08.01.2024

Dr. Umesh Singh, Head, AGB deputed on 31.03.2024.

Resignation

Sh. Manish Kumar, T-1 resigned w.e.f. 07.10.2024

Sad Demise

Sh. Jagdeep Singh, SSS expired on 15.01.2024

Sh. Bhagwant Rai, SSS expired on 19.03.2024