One Institute- Three Locations
हार्दिक अभिनन्दन!

सामाजिक भारत की सामाजिक, आर्थिक एवं जनसाधारणी कारकों की संगठन भारतीय उर्ध्व परिवर्तन में मूलभूत परिवर्तन लाने के लिए तत्पर हैं। इसी तरह राजस्व परिवर्तन द्वारा परिवर्तन में निरंतर अग्रसर हैं। नवीन गतिविधियों में नितम्ब नवीन प्रौद्योगिकियों का उपयोग गुणवत्ता एवं सुरक्षा का आवासन देने की रिश्ता में निरंतर अग्रसर हैं। ख़ुद के परिप्रेक्ष्य में यदि देखें तो दूसरे की मांग में विकिरण रूपों में कई गुण वृद्धि आयी जा सकती है। दृष्टि मूल्य शुरू करता है वहुआयामी सामाजिक एवं सामाजिक अधिकार प्राप्त करने के लिए अनुसंधान एवं अध्ययन के साथ साथ सम्बन्धित। इस दिशा में हमारा संस्थान जेसो भारतीय उर्ध्व परिवर्तन एवं अनुसंधान के क्षेत्र में वर्तमान स्थिति का मापन करने, अनुसंधान एवं अध्ययन के क्षेत्र में वर्तमान स्थिति का मापन करने के लिए अनुकूलित है। अनुसंधान के लिए अनुकूल दिशा में हमारा संस्थान जेसो भारतीय उर्ध्व परिवर्तन एवं अनुसंधान के क्षेत्र में समक्ष लाए गए हैं।

जीवित, वैदिक, विज्ञानवर्धक एवं सुविधाजनक दुर्घटना पदार्थों का निरस्त बड़ी मांग को पूरा करने हेतु मूल्य संरचना, उत्पाद की विकासमंदी एवं गुणवत्ता एवं सुरक्षा के आवासन के लिए नवीन प्रौद्योगिकी के उपयोग का प्रयोग करने की आवश्यकता होती है। संविधान विश्व समाज की विश्वस्थित संरचना एवं गुणवत्ता एवं सुरक्षा के आवासन के लिए नवीन प्रौद्योगिकी के उपयोग के लिए एवं उत्पाद की विकास के लिए संविधान विश्व समाज की विश्वस्थित संरचना एवं गुणवत्ता एवं सुरक्षा के आवासन के लिए नवीन प्रौद्योगिकी के उपयोग के लिए संविधान विश्व समाज की विश्वस्थित संरचना एवं गुणवत्ता एवं सुरक्षा के आवासन के लिए नवीन प्रौद्योगिकी के उपयोग का निरंतर अग्रसर है।

इस पुस्तिका के माध्यम से अपने परिवार राष्ट्रीय उर्ध्व परिवर्तन संस्थान से विश्वके सुरक्षा रखने से कराने के लिए आपको है।

(अनिल कुमार श्रीवास्तव)
निदेशक एवं कुलपति
Hearty Welcome!

The present socio-economic and demographic dynamics are poised to radically transform the Indian dairy situation. The growth of technology-aided dairy-farm operations promoting quality and safety assurance of milk is in the offing. From the consumption perspective, a several fold increase in demand for milk in progressively more and more, subtly diverse forms can be visualized. The country requires technology, policy and extension support for meeting the multi-pronged challenge of ensuring adequacy, quality, profitability and affordability along the milk value chain. In this direction, the Institute is focusing its research endeavors to develop and disseminate new technologies and techniques, through establishment of linkages with other research, policy and extension organizations. The process of technology development is being aided by creation of supporting database and enabling infrastructure. Integration of newer areas of molecular genetics, genomics, nutri-genomics, proteomics, metabolomics and state-of-the-art management systems supported by appropriate bioinformatics tools are going to lead to genetic improvement of dairy animals in the coming years.

The growing demand for safe, nutritious and health-promoting as well as convenience milk products is being addressed via process development aimed at value addition, product diversification and complete quality and safety assurance. The Institute is taking lead in establishing strong database covering vital aspects of dairying in India viz., milk production, marketed surplus, procurement, processing and distribution across different agro-climatic regions. Research on understanding the market and preparing itself to respond to emerging market trends will be the prime instrument for enhancing the domestic livelihood opportunities in the dairy sector. NDRI is playing a crucial role in developing quality human resource for the dairy sector of the country by developing need based educational programmes and introducing innovations in learning styles and pedagogy. In order to implement the proposed research actions and interventions, infrastructure inputs are a continuous process.

I would like to warmly welcome you to ICAR-National Dairy Research Institute and I am delighted to be able to introduce you to the Institute in more detail.

(Prof A K Srivastava)
Director & Vice Chancellor
ICAR-National Dairy Research Institute (NDRI) at Karnal, Haryana is one of the premier institutes in dairy sector which has contributed a lot in the growth of dairy industry and played a crucial role in India’s development in milk production with its continuous research. Over ninety year old NDRI’s lineage goes back to the Imperial Institute for Animal Husbandry & Dairying which was set up in Bangalore in 1923 as a center for dairy education. In 1955, it was shifted to its present site in Karnal and renamed as National Dairy Research Institute. The infrastructure of Imperial institute was retained as southern regional station of NDRI and later in 1964 Eastern regional station was set up at Kalyani in West Bengal. In 1970, NDRI was brought under Indian Council of Agricultural Research. Since, 1989, the Institute has the distinction of being a Deemed University for implementing its academic programmes.

**One Institute - Three Locations**

- ICAR-National Dairy Research Institute (NDRI) at Karnal, Haryana is one of the premier institutes in dairy sector which has contributed a lot in the growth of dairy industry and played a crucial role in India’s development in milk production with its continuous research. Over ninety year old NDRI’s lineage goes back to the Imperial Institute for Animal Husbandry & Dairying which was set up in Bangalore in 1923 as a center for dairy education. In 1955, it was shifted to its present site in Karnal and renamed as National Dairy Research Institute. The infrastructure of Imperial institute was retained as southern regional station of NDRI and later in 1964 Eastern regional station was set up at Kalyani in West Bengal. In 1970, NDRI was brought under Indian Council of Agricultural Research. Since, 1989, the Institute has the distinction of being a Deemed University for implementing its academic programmes.

The primary goal of the Institute is to provide R&D support towards generation and dissemination of knowledge for development of national milch herd, milk production enhancement, greater productivity of dairy industry and upliftment of dairy profession leading to socio-economic and environmental benefits to the nation as well as contribute towards manpower development programme.

**Main Campus of NDRI, Karnal**

This is a unique campus which alongside Deemed University and residential buildings also has various well equipped research laboratories as well as green spaces with perennial plants and gardens. It is a place of study in the heart of a charming landscape with lots of greenery. Modern laboratories are available for education and research. Well equipped sports facilities and attractive leisure time opportunities are offered to the students and employees of the Institute.
Southern Campus of NDRI, Bengaluru

The foundation stone of the edifice of NDRI was laid at Bengaluru on July 1, 1923. It was the forerunner institution in starting dairy education programmes to meet the manpower requirements of the Nation’s dairy industry. Upon shifting of the institute Head Quarters to Karnal in 1955, the establishment at Bengaluru continued as the Southern Campus of NDRI. The station has been catering to the research, training and extension needs of the dairy farmers and dairy industry of the Southern Region of the Nation. This centre was the first to initiate training in artificial insemination in cattle in the country and also research in different fields of dairy production and processing in India.

Eastern Campus of NDRI, Kalyani

The eastern campus of the Institute was established at the Central Dairy in Kolkata in 1964 and was shifted to Kalyani, Nadia district, during 1966, about 50 km north of Kolkata. The main objective of establishing the Eastern Campus is to identify the major constraints of dairy production in eastern and north eastern India and to offer solutions through research and extension activities to these problems. It serves as a vital link between the NDRI, Karnal and the far-flung areas of the eastern and north eastern regions of the country for transfer of technology developed at the Institute and provides appropriate feedback after trials for perfection.

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Research at NDRI

Study and Research

NDRI places great importance on applied, transfer-oriented research besides conducting basic and strategic research. This is one of the reasons why the NDRI has become an important scientific centre to address the new emerging issues of dairy sector in India. The research areas are wide-ranging and correspond to the Institute’s mandate. The research and teaching work is being carried by various research divisions of the Institute to serve the cause of dairying by developing quality human resource and suitable technologies related to the production, processing and marketing of milk and milk products, and their dissemination for the benefit of dairy industry, farming community and the nation.

Research Programmes

» Genetic Improvement of Milch Animals through Identification and Dissemination of Superior Germplasm by Application of Emerging Reproductive and Molecular Technologies.


» Raising Productivity of Dairy Animals through Improved Feeding Strategies, Efficient Nutrient Utilization and Use of Non-conventional Feed Resources.

» Research on Nutraceuticals from Milk, Functional Foods with Prebiotics, Probiotics, Micronutrients, and Other Bioactive Compounds for Improved Human Health.


» Clean Milk Production with a Focus on Emerging Health Concerns and Development of New Generation Tools for Ensuring Quality Control through Application of Newer Chemical and Biotechnological Concepts.

Genome map of *Lactobacillus plantarum* Lp91
Length: 3,308,257 bp; Genes: 3,219

Genome map of *Lactobacillus fermentum* Lf1
Length: 2,098,631 bp; Genes: 2,066
Academics at NDRI Deemed University

The Institute was conferred “Deemed to be University” status in 1989 for further strengthening the academic programmes for human resource development. The Institute provides high quality education in the field of dairying, which has no parallel in Asia. NDRI is not only an important contributor of manpower in dairying required in State Agricultural Universities (SAUs) but also plays an important role in enhancing the teaching capabilities of the faculty from SAUs. This is evidenced by recognition of the Institute by the ICAR, as “Centre for Advanced Faculty Training (CAFT)” in Animal Genetics & Breeding and Dairy Processing disciplines.

A wide range of academic courses are being offered by the Institute. The courses have been so beautifully designed as to provide broad base as well as specialized training on different aspects of dairying. Interdisciplinary courses ensure the acquisition of important basic and methodical knowledge at a high level. The large selection of optional subjects makes it possible for our students to create their own education profile. Bachelor of Technology (Dairy Technology), a 4 year degree programme offers intensive training in processing and quality control of milk and milk products; and engineering aspects of milk processing plants.


The Diploma programme in Dairy Technology at Southern Campus, Bangalore offers intensive training in dairy processing and quality assurance while the Diploma in Animal Husbandry at Eastern Campus, Kalyani imparts education in Livestock Production and Management.
The Institute develops required trained manpower for the growing demands from dairy sector. The majority of the courses are accredited and conform to the International standards.

The Placement Cell provides career guidance, training and placement services for the passing out students in various disciplines of the Deemed University. B.Tech. (Dairy Technology) and Masters in Dairying students are provided employment in reputed organizations through campus interviews. Passed out students of NDRI are getting employment in Dairy/ Food Industry (Govt./Cooperative/ Multinationals). In addition to employment, a number of students also opt for higher studies in India and abroad.

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How to Make the Most of My Studies?... With Excellent Conditions for Studying

NDRI offers the best possible conditions for study at each location. Well-equipped modern workshops, specialized research laboratories, excellent national computerized library having all required study material, numerous lecture halls seminar rooms, students’ sports complex, beautiful cafeteria, comfortable hostel facilities, wireless network connections make it possible to study outside and beyond the lecture halls. Modern PC pools ensure that students have the most up-to-date and efficient tools. In addition, there is a Farmers Farm School in an adopted village of the Institute.

Competent mentors and well qualified professors are available to provide advice and guidance at all times. There are opportunities for discussions too and, with our kind of study organization, nobody is left on their own—advice and support is available for everyone. There is a family feel at our university, people know and respect each other and together strive to achieve common aims.

NDRI students’ community presents a cosmopolitan ambience at the campus and despite heavy load of curriculum; our students allocate some of their time to give expression to their creative talents through cultural and sports events. Their valued participation in inter-institutional competitions has brought laurels to the Institute.

Inter-University Youth Festival ‘Reverie’ is the regular feature of the Institute. The Institute has a play ground having all the outdoor & indoor sports facilities for the students and employees of the Institute. We provide a healthy atmosphere at our campus for the overall personality development of the students’ community. Students are also encouraged to participate in seminars, conferences, workshops and various types of competitions such as oral presentations, poster presentations, dairy products judging contests besides participating in Inter-University Youth Festivals organized by various agricultural universities.
NDRI imparts education in various disciplines of dairy science to the International students from Nepal, Bangladesh, Afganistan, Iran, Iraq, Myanmar, Mauritius, Sri Lanka, Vietnam, Ethiopia, Ghana, Rawanda, Zimbabwe, Holland, Egypt and many other countries for training and education in Dairying. NDRI has a separate International hostel having all the facilities essentially required for them. Thus, NDRI is developing skilled man power required for expanding the dairy education not only in Asia but also across the world.
The scientists of the Institute maintain close liaison with various organizations to exchange information and acquire current and advanced knowledge in basic and applied fields of Dairy Science. The scientific competence and excellence in conducting various research programmes has attracted funds from various National and International funding agencies and research and development departments.

Funding through External Sources and Collaborations
At present, research support through external funding from 71 extramural research projects has touched Rs. 110 crores. Presently, NDRI has SIX International research collaboration projects, one - DST-JSPS (India-Japan) Joint Research Project on Screening of herbs for their nutraceutical potential in animals using the nutriomic approach to elucidate their mechanistic mode of action.; second - Indo-New Zealand on Development of resilient probiotic foods designed for the Indian market conditions; third - Indo – UK on Development and application of lactic acid bacteria on designer Probiotics; fourth – Indo-South Africa-Brazil on validating procedures for the measurement of heat resistant spoilage and pathogen bacteria in milk to provide scientific and technical basis for future developments in the management of food safety in South Africa, India and Brazil; fifth – Indo- US project on Upgradation of low-quality residue to high quality feed with Michigan Biotechnology Institute (MBI); sixth Indo- Ireland on use of Butyrivibrio fibrisolvens as a potent feed additive to increase CLA in ruminant derived food products. One more project has been approved on nanotechnology research on buffalo by Australia-India Council (AIC) with The University of Queensland, Brisbane, Australia.

NDRI has been successful in getting external funding from almost all leading national funding agencies i.e. Dept. of Biotechnology (DBT), Department of Science and Technology (DST), National Dairy Development Board (NDDB), National Fund for Basic and Strategic Research on Agriculture (NFBSRA), Ministry of Food Processing Industries (MFPI), Department of Atomic Energy (DAE), Indian Council of Medical Research (ICMR), Department of Animal Husbandry and Dairying (DAHD) and National Bureau of Agriculturally Important Microorganisms (NBAIM). NFBSFARA, AMAAS, NASF, Govt. of Chhattisgarh, ESBA, NABARD, Min. of Environ. And Forest, ICRISAT, Consortia of Research platform on Nanotechnology, CRIDA (ICAR), ICSSR, ILRI. The external financial support has encouraged scientists to work on stem cell, buffalo cloning, transcriptone, proteomes, embryogenesis, biosensor, nanotechnology, abiotic stress in farm animals, nutraceuticals and functional foods. National Referral Centre for Milk Quality and Safety through NAIP project is in place. The grants from extramural projects have helped students to opt modern tools and techniques in their dissertation.
Dairy Cattle Breeding Division

The Division has been actively involved in conducting research in the areas of animal genetics and breeding including cytogenetics, molecular genetics and biotechnology related to dairy animals. The main thrust areas of research are genetic improvement of HF Crossbred & Sahiwal cattle and Murrah buffaloes by progeny testing of breeding bulls and genomic selection of male and female animals for reproduction and reproduction performance, faster multiplication of superior germplasm, development of selection criteria and optimum breeding plans, identification of genetic markers and its association with production/ reproduction traits, disease resistance and screening of young males for genetic disorders. The Center of Advanced Faculty Training (CAFT) in Animal Genetics and Breeding has further strengthened its HRD activities. It is ensured that the valuable expertise gained in tropical dairying is shared with scientific community through specially designed International training courses.

The Division is engaged in the development of skilled human resources in the field of Animal Genetics and Breeding. The Division also contributes in training programs of Kisan Vigyan Kendra, consultancy services to farmers and various organizations, supply of superior cattle and buffalo germplasm in the form of frozen semen and surplus breeding bulls to farmers, livestock developmental agencies, state governments and other dairy stake holders in the country. The focal point of research and teaching of the Division is “Genetic improvement of milch animals through identification and dissemination of superior germplasm by application of emerging reproductive and molecular technologies”. 

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Livestock Production Management

The mission is to identify and sustain good indigenous breeds of dairy animals which may survive in hot environmental conditions without affecting its milk production to meet out the rising demands of livestock products. Beside research, the faculty of LPM is engaged in teaching at both UG and PG levels and in research in the frontline areas of all applied aspects of dairy animal production and has been successful in evolving many transferable technologies and development of package of practice on the routine care and management of dairy animals. The LPM faculty is also shouldering the responsibility of the routine management of the livestock research centre and breeding bulls maintained at the Animal Breeding Research Center of the Institute, besides supporting the training and extension activities of the institute.

Expertise is needed alongwith the strong combination of balanced methodological skills, practice-oriented management abilities, marketing management and production related know-how in livestock production. Modern progressive dairy farmers have to be able to maintain a balance between scientific, economic and environmental requirements to apply this comprehensive knowledge on their livestock farms. The academic programmes are well designed for dealing with all the different fields related to dairy farming and learning how to sustain high yielding milch animals from the impact of global environment change. The focal point of research of this centre is “Development of State-of-the-art Dairy Production Systems Using Better Housing and Fertility Management Practices”.

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Animal Biotechnology Centre

- Biotechnology was initiated at NDRI, Karnal during mid eighties under a UNDP ‘Centre of Excellence on Biotechnology’ programme. A state-of-the-art biotechnology research facility has been created to consolidate the biotechnology research at NDRI. It has well equipped specialized laboratories on Embryo Biotechnology, Regenerative Biotechnology, Animal Genomics, Proteomics Research, Structural Biology along with highly trained staff. All this creates very good preconditions for collaborations with other research organizations and dairy industry in order to establish new pathways of research road map specifically in the field of hand guided cloning technique. The centre is working on embryo biotechnology (Embryonic stem cell technology, animal cloning, Transgenesis and sperm sexing); Animal genomics (Oocyte, embryo

genomics, genes polymorphism, genomics of male fertility, genomics of Immunity) and Proteomics & structural biology (Early pregnancy biomarker, proteomics of milk production and lactation, probiotics surface proteins, sperm proteomics, bioinformatics). Besides research on areas relevant to biotechnology in dairy production and processing, the Centre also offers M.Sc./M.V.Sc./M.Tech and Ph.D. (Animal Biotechnology) programmes.

Breakthroughs in Buffalo Cloning

- Buffalo cloned for the first time in the world by Hand-guided cloning
- Birth of cloned calf produced using fetal fibroblast as donor cell
- Cloned calf produced using embryonic stem cells as donor cell
- Calf produced from a frozen-thawed cloned embryo
- Cloned calf produced from somatic cells isolated from fresh seminal plasma
- Clone of an elite buffalo produced
- Clone of a high-ranking progeny-tested buffalo Bull
- Clone of wild-buffalo (endangered species) produced
- Cloned calf produced from somatic cell isolated from urine
- Cloned calf produced from somatic cell isolated from pride of NDRI

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Dairy Cattle Physiology Division

The Division is conducting basic and applied research besides imparting training in various aspects of Animal Physiology development and application of field level technologies and Post Graduate teaching and research programmes in Animal Physiology at Master’s and Doctoral levels. Presently the thrust areas of research include growth & reproductive physiology, lactation physiology and environmental physiology. A number of research projects have been funded by the BARC, Department of Biotechnology, and DST-DAAD. Basic and strategic research under National Initiative on Climate Resilient Agriculture (NICRA) is being conducted for identifying unique traits in cattle and buffaloes for resilient livestock production system. A Network Project on impact, adaptation and vulnerability of Indian agriculture to climate change with emphasis on livestock was also taken up. Linkages have also been established for collaborative research ventures with other ICAR Institutes viz. IVRI, Izatnagar and CIRB, Hisar and SAU’s for strengthening research on climate resilient livestock.

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Dairy Cattle Nutrition Division

- The Division undertakes basic and applied research, post-graduate programmes of education and participates in the process of extension education through various training programmes and field level technology development and refinement in the discipline of animal nutrition and forage production. The Division has developed excellent laboratory facilities, which are central facilities for research and education and include laboratory for anaerobic rumen microbial lab.; environment related studies lab; quality control laboratory; feed processing unit; nutritional biotechnology laboratory besides state-of-the-art fine instrument lab. For the last few years precision nutrition and nutrient gene interaction studies are full swing in the division to observe the study of a particular gene/ loci on nutrient utilization and vice versa. The main objective of the Division is “Raising Productivity of Dairy Animals through Improved Feeding Strategies, Efficient Nutrient Utilization and Use of Non-conventional Feed Resources”.

Butyribrio Administration Increases CLA content in Goat Milk
Forage Research and Management Centre

- This centre is involved in research and teaching in the discipline of agronomy (Forage Production). Improved varieties of fodder crops and their cultivation methods have been developed at the Institute. Wheat as a dual-purpose crop has been successfully tested. The centre is also engaging in teaching of post graduate doctoral degree programmes in the field of Agronomy (Forage Production) of the NDRI Deemed University.

Institute has scientifically managed fodder production farm for producing adequate quantity of good quality green fodder to meet out the nutritional requirements of the Institute herd.

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Animal Biochemistry Division

- Animal Biochemistry Division plays a crucial role in research and teaching activities in the areas of Dairy production and processing at NDRI. The focus of research projects in the Division pertains to basic and applied Biochemistry related to the health benefits of milk/fermented milks and other dairy products, mechanistic aspects related to the functionality of probiotics, prebiotic fibers and milk derived nutraceuticals in relation to lifestyle diseases like obesity, diabetes, ageing, allergy and hypercholesterolemia; Luteinizing hormone based sensor for estrus detection in buffaloes, livestock methane reduction through immunization based approaches, controlled release dispensers for delivery of semiochemicals and the development of mammalian cell based biosensor prototypes for toxins in commercial milk. Recently, the department took new research initiatives pertaining to the lactation stress associated postpartum anestrus SNP array in buffaloes, biosafety of nanomaterials, buffalo milk exosomes as a model for developing new cell delivery system and to explore the role of probiotic lactobacilli in modulation.
Dairy Chemistry Division

Food testing is an essential and vital part for the growth of food processing industry to meet out the challenges of food safety and consumer demands. As food industry is growing with fast pace in India, this department is playing an important role for developing skilled manpower who are trained in the latest instrument-based methods for testing of food products particularly in the area of food contaminants and validation of health claims to meet out the increasing demand of experts/technical persons required in food industry. The mandate of Division is to conduct fundamental and applied research for understanding chemistry of milk and milk products, to impart educational programmes for undergraduate and postgraduate courses and to provide R&D support towards chemical-quality control related problems of the dairy industry. The research activities of the Division are being carried out under the identified priority area “Clean Milk Production with a Focus on Emerging Health Concerns and Development of New Generation Tools for Ensuring Quality Control through Application of Newer Chemical and Biotechnological Concepts”.

The Division has state-of-the-Instrument room, Research labs (lipids, proteins and bioactive peptides, minerals, functional foods/neutraceuticals and quality assurance). A well-equipped chemical quality control lab developed under National Referral Centre is a pride possession of the Division.

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Dairy Technology Division

The Dairy Technology Division is one of the first Divisions set up at National Dairy Research Institute, Karnal. It is involved in teaching, basic and applied research, training and consultancy activities in the area of dairy processing and dairy product manufacture. The Division currently has ten well-equipped laboratories viz., Sensory Evaluation Laboratory, Packaging Laboratory, Indigenous Milk Products Laboratory, Cheese and Fermented Milks Laboratory, Functional Ingredients and Applications Laboratory, Food Technology Laboratory, Formulated Dairy Products Laboratory, Dairy By-Products Laboratory, Rheology Laboratory and e-Learning Laboratory. A unique feature of infrastructure available to the Division for undertaking R&D work for scaling up of the laboratory concepts to the pilot/semi-commercial scale is a well equipped Experimental Dairy capable of processing 10,000 liters of milk into a diverse range of dairy products.

The research activities of the Division are being carried out under the identified research programme “Value Addition to Dairy Products through Application of Emerging Technologies, Modelling Approaches, Process upgradation, Biotechnological Interventions, Nutraceutical Enrichment, Mechanized Manufacturing & Novel Packaging Systems” for addressing its thrust areas of research. The academic courses of the Division are fine tuned and designed in such a way that the quality job oriented education could be provided to the students of dairy technology to serve the dairy sector according to the changing trends and demands of the consumers and dairy industry.
Dairy Engineering Division

Dairy Engineering Division was established as one of the major research divisions from the inception of the Institute. It is contributing in teaching, research, training and industrial consultancy. The Division has research laboratory facilities to cater to the needs of specific areas and programmes such as Process Engineering, Process Equipment Design, Unit Operations and Instrumentation. In addition to this, there are post-graduate teaching laboratories, Research & Development Workshop and Equipment testing hall to support both research and teaching activities. During the past three decades, the Division has achieved breakthrough in developing a number of process equipment for manufacturing indigenous milk products. Many of these equipments have been patented. Current research areas are machine vision technology for quality evaluation of dairy product and development of weight based filling system for viscous dairy products. The Division also conducts specialized training to the graduate engineers during summer.

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Dairy Microbiology Division

Dairy Microbiology Division is engaged in research, teaching, consultancy, training and technology transfer in specialized field of Dairy Microbiology. Broadly, the research work of the Division covers the areas related to starter cultures and fermented milk products; direct vat starters (DVS); indigenous probiotics, their functional efficacy and gut microbiota, prebiotics and synbiotics; bioactive peptides, microbial metabolites and biopreservatives; biosensors, quality assurance and food safety as well as rumen microorganisms. The Division has played a leading role in establishing National Collection of Dairy Cultures (NCDC) with current repository of more than 600 cultures and National Referral Centre for milk quality and safety. The Division regularly organizes need based specialized short term symposia/conferences/seminars covering basic and applied areas of Dairy Microbiology including quality assurance, food safety, starter cultures and fermented health foods for HRD development in the country.

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Statistics &
Management Division

The research programmes of the Division has enveloped more intricate and broader aspects of dairy enterprise encompassing backward and forward linkage factors for facilitating technology evaluation and transfer. The Division, over the years, has developed good infrastructure in terms of scientific manpower, teaching and training aids, divisional library and computer unit. In response to the research demands of the clientele systems, the Division has been orienting its research priorities and conducting the research accordingly. From simple economic analysis of milk production, the Division works on advanced aspects of value chain management, implication of economic reforms on dairy sector, climate change and economic impact assessment through the research projects and post-graduate research programmes of the scholars.

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Computation of Water Footprint of Crops and Dairy

- **Computations done for both**
  - Irrigated production system
  - Rainfed production system

- **In irrigated system, the highest water productivity found**
  - wheat-milk -paddy crop

- **Physical water productivity of milk output**
  - Crossbred -local cows –buffalo

- **In rainfed system, water footprint was highest in case of red gram and black gram**
  - Due to low crop productivity

- 60 litre of water is consumed for every rupee generated from milk production
Dairy Extension Division

- Dairy Extension Division undertakes extension activities, besides teaching and research in Extension Education. Research endeavors of the Division are in the areas of information and communication technologies, organizational behavior, information management, participatory technology development and impact studies of dairy innovations. The faculty has also been engaged in human resource development through post graduate and doctoral programs at NDRI. Research-Extension-Industry-Farmer Interface is organized by the Division to provide an opportunity for the convergence of all stakeholders working together for dairy development. A new Extension Education Program “Dairy Education at Farmers’ Door” was initiated in February, 2009, to strengthen the effective dissemination of dairy production and processing technologies among farming community. Another new Extension Approach “Farmers’ Farm School” in village Gorgarh was initiated 2014, for updating farmers’ knowledge in the field of dairy farming in particular and agriculture in general.
Artificial Breeding Research Center

The Artificial Breeding Research Centre (ABRC) is engaged in progeny testing programme for Sahiwal, Murrah and Crossbred Karan Fries Bulls, as well as doing active research on bull management, semen cryobiology, spermatogenesis; bull fertility assessment and dissemination of quality germplasm to the farmers and developmental agencies. Bull semen under progeny testing programme are supplied to different centres in the country for test mating, collection of data on conception rate and progeny testing parameters etc. The centre is well equipped with modern critical equipments and software required for management of information of bulls as well as semen. The centre has screened sexually transmitted bacterial, viral and protozoan diseases viz., TB, JD, Brucellosis, IBR, Campilobacteriosis and Trichomoniasis of all breeding bulls as well as semen straws for IBR. The centre conducts training programmes for the Veterinary Officers, Quarantine Officers and other technical staff of different semen stations of the country. The centre has developed training modules on various aspects of artificial insemination, frozen semen technology and infertility management for various national and international participants.

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Food Safety & Quality Assurance

Adulteration in dairy products and consumers concern on milk safety; recent food poisoning outbreaks associated with *E. coli* O157:H7, *L. monocytogenes*, *Salmonella typhi* etc. ; public health risk/ safety concerns on pollutants and environmental contaminants levels in milk & milk products; emergence of new pathogenic strains with heat resistance (Surviving HTST pasteurization) and drug resistance; poor general awareness towards hazards associated with unsafe milk hygiene practices & poor shelf-life are some of the emerging milk safety concerns. Currently there is also a shift in global market from production to knowledge based system and quality concepts based on science and risk based approach have been adopted globally for ensuring food safety. Therefore, dairy industry in India needs to gear up to meet the new challenges in the increasing competitive global market. In order to meet above mentioned challenges, capacity building program has been initiated at this Institute through Post Graduate program in specialized field of Food Safety and Quality Assurance (FSQA).

Contact

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National Library in Dairying

The Institute Library has an impressive collection of literature on Dairy Science and related subjects. More than 100 periodicals are subscribed to keep track of the current scientific and technical developments. There are 91,509 volumes which includes 51,780 books, 33,457 bound journals, 4,504 thesis, 268 microfiches, 1,500 CDs. Library has an excellent computer section having fifty workstations for students and staff of the institute. Students use this facility to get current information related to advanced research areas and for communication.

The Library provides Internet, Email, Documentation, Reference, Current Awareness Services, CD-ROM Literature scanning through CD-ROM of CAB Abstract, Food Science Technology Abstract, AGRIS, Derwent Biotechnology Abstract, Indian Standards and ISO Standards on food products including milk and dairy products on CD-ROM.

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Krishi Vigyan Kendra

Krishi Vigyan Kendra (KVK) at NDRI, Karnal became operational in July 1976. Subsequently, this Kendra has developed infrastructure to run the need based skill oriented training programmes through “Learning by Doing”. Three fundamental principles viz., (i) agricultural production – the prime goal, (ii) work experience – the main method of imparting training and (iii) weaker section of the society – the main target group, are always kept in mind. The main aim of KVK is to accelerate agricultural production and allied activities for improving economic status of farmers and create job opportunities for the poorest amongst the poor in the rural areas.

At KVK, need based training courses were designed for different types of clientele. After training, follow up extension programme was undertaken. While designing the courses, the entire concept of farming system was taken into consideration to make the enterprises economically viable for the farmers. The trainings started with field units, different farms, live demonstration units, workshops and terminated in discussion assembly. For making training programmes more effective, the KVK developed close linkages with different government, non-government and voluntary agencies and line departments. KVK prepares an annual action plan for conducting need based training programmes for dairy stake holders to uplift their socio-economic status.
Skill Development: Entrepreneurship Development and Partnership with Stakeholders

- Business Planning and Development (BPD) Unit of the Institute promotes dairy & food agribusiness enterprise through consultancy, commercialization of dairy & food technologies and capacity building programmes. This unit not only provides services on marketing assistance, quality evaluation, research and development (R&D) for business development, it also helps small entrepreneurs for setting up dairy farms, food and dairy processing units and organizes training programmes required for young budding entrepreneurs.

The Institute continues to share its innovative technologies with Indian dairy industry through consultancy cell. Each year NDRI organizes Institute Industry Interaction meet to present the technologies and processes developed by the Institute for transferring them to the dairy industry. This unit provides contract services related to dairy food testing facility, karyotyping of animals, supply of semen, testing of semen straw, milk adulteration kits and microbial cultures. Besides this, consultancy services are also provided for establishment of commercial dairy farms, milk processing units, breeding farm, auditing processing unit for HACCP/ISO certification and advisory services on product quality improvement, quality feed/fodder production, maintenance of elite herd and custom hiring of processing equipments for pilot/industrial scale trials.

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Vision - Looking Ahead

NDRI is a prestigious institute catering the research and Human Resource needs of the dairy sector of the country. The demand for milk is increasing and it is expected that by 2050 the milk production will have to be increased to the tune of 400 million tonnes/year. The population pressure and emerging global opportunities further necessitate that the efforts for enhancing animal productivity are accelerated. This calls for continuance of well-proven technologies such as crossbreeding with superior germplasm coupled with improvement in the productivity of vast population of generally low producing indigenous cattle and buffaloes at faster rate using emerging reproductive and molecular technologies. There is a need for application of biotechnological tools for faster multiplication of superior germplasm of elite animals as well as identifying the unique genes specific to indigenous dairy animal genetic resources using the molecular techniques. With respect to the global warming, investigations are needed in respect of shelter design, mechanized handling of feed and fodder and automatic dung collection and cleaning. Due to shortage of feeds, there is a need to explore new feed and feed additive resources and evaluate them for livestock feeding and find out how much these can be useful in bridging the gap between supply and demand of the nutrients.

Probiotic dairy foods containing health-promoting bacteria and incorporation of valuable fibres of the plant origin as also fortification with micronutrients is the other important areas are an important segment of the functional food market. There is a need for developing standard processes and equipments for batch and large-scale processes for the production and packaging of indigenous milk products. Development of integrated systems for industrial production and packaging of indigenous milk products would be the key factor in resolving quality assurance and safety issues involved in export of dairy commodities under WTO agreement. There is a need to conduct research on the development of rapid methods for detection/determination of newer adulterants in milk and milk products.

Development of entrepreneurship based on technologies developed by the institute is very necessary through Business Planing Development Unit and Technology Business Incubator to nurture the prospective entrepreneurs so as to commercialize the technologies developed by the institute. With the advent of information technology era and availability of computer networks and advanced software packages for storage, retrieval and dissemination of data in a systematic manner, it is now necessary to develop databases on a uniform platform which can be shared by the potential users including planners, administrators, policy makers, economists and the scientific community at large.

“Many hands, many hearts and many minds generally contribute to anyone’s notable achievement; never doubt that a small group of thoughtful people can change the world.”
ISO Certification
ICAR-NDRI has earned ISO:9001 Status on December 11th 2014.

Leadership Role

NDRI received “Sardar Patel Outstanding ICAR Institute Award”
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