



RESEARCH ARTICLE

NDRI: ONE OF STRONG CAUSES OF HOLDING COUNTRY'S HIGHEST MILK PRODUCTION STATUS IN THE WORLD ON A SUSTAINABLE BASIS

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ABSTRACT

National Dairy Research Institute (NDRI) is India's premier institute for dairy research, established in 1955, located in Karnal, Haryana, having been accorded with the status of Deemed University since 1989. NDRI operates under the aegis of Indian Council of Agricultural Research. National Dairy Research Institute (NDRI), Karnal was established in the year 1923 in Bangalore as Imperial Institute of Animal Husbandry and Dairying. In 1947, the institute was renamed as National Dairy Research Institute. Later in 1955, the college was shifted to Karnal. NDRI offers various courses such as diploma programme in DT & Animal Husbandry & Dairying, undergraduate programme (B.Tech in Dairy Technology), postgraduate programme in Dairying, and diploma of philosophy. Situated on the sprawling 560 hectare campus at Karnal, NDRI has over 1800 dairy animals with modern milking parlour system and shelter management system catering to breed improvement projects and other research activities, number of labs equipped with the state-of-the-art analytical instrument to conduct research in most advanced areas of biotechnology, molecular biology, cell structure, fermentation technology, protein chemistry, nutritional studies, food technology and micro element analysis. Nearly 160 highly qualified and experienced scientists and 185 technical staff, in addition to administrative and supporting staff, work at NDRI to run its research and academic programmes having total annual budget of over Rs 215 crores.

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INTRODUCTION

As pioneering Institute, ICAR-NDRI has developed considerable expertise during the last nine decades in different areas of Dairy Production, Processing, Management and Human Resource Development. Continuous effort of the institute in generation and dissemination of technologies on milk production enhancement and value addition has resulted in social, economic and environmental benefits to the nation. The contribution of the institute in manpower development for dairy research, education and farming is immense and recognized as back bone for Indian dairying. In the recent years, the Institute has achieved landmark success in the area of cloning by producing the world's first buffalo cloned calves using 'hand guided cloning' through somatic cells derived from new born calf, seminal plasma, embryonic stem cell as well as adult animal cell. In the area of Dairy Processing research, the Institute has developed technologies for preparation of a variety of indigenous dairy products, formulated foods and health foods. New functional dairy products such as probiotic cheese and dahi, sports drinks, low cholesterol ghee, herbal ghee, ice-cream and burfi for diabetics, and a formulation for cardio-vascular health have

also been developed. Inclusion of ingredients from other food groups such as cereals, fruits and vegetables to formulate breakfast smoothies, iron-fortified biscuits based on pearl millet, probiotic beverage based on barley as well as pearl millet, millet-based weaning and extruded foods is an example of the Institute's foray into the realm of composite foods. Equipments have been designed for both small scale dairy operations and mechanized production. NDRI has developed research methodologies for economic evaluation of dairy production and processing systems, which have been recognized as empirical tool by researchers and development specialists. As a result of proactive steps taken by the institute towards transfer of the technologies, industry has picked up some of the prominent innovations and technologies of the institute such as; low cholesterol Ghee, a new test for the detection of detergent in milk, a kit for antibiotic residues, area specific mineral mixture for animals, technology for iron fortified biscuits, recombinant chymosin, and bacterial rennet. Information generated at the Institute and services offered have contributed to the growth of Dairy Industry on the whole and well being of millions of milk producers and consumers of milk and milk products. Realizing the challenging need of globalized dairy trade, the Institute has been continuously



working to develop its R&D and HRD programmes to better serve the nation in terms of food security, employment generation and poverty alleviation.

GENESIS AND GLORIOUS PAST

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 six 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 its erstwhile form of Imperial Institute in Bangalore, Father of the Nation' Mahatma Gandhi and 'Bharat Ratna' Pandit Madan Mohan Malviya, were imparted training at the Institute in 1927. They wanted to get acquainted with modern methods of cattle management and spent two weeks discussing and learning technicalities and complexities of problems pertaining to cows and buffalos in India. Gandhiji was highly appreciative of the most productive crossbred cow 'Jill' of the institute. He held several discussions on the problems of Pinjrapoles, which housed low producing, mostly sterile cows and other dairy stock mainly on humanitarian grounds. Mahatma Gandhi evinced great interest in the work of the Institute and wrote several articles in 'Young India' and Harijan' on the importance of dairying and scientific cattle management. Gandhiji's thinking and views had significant influence on the political leadership particularly towards taking key policy decisions during early post Independence era, resulting in the formulation of Key Village Scheme, Gosamvardhana Council and intensive Cattle Development Programmes. In 1936 it was renamed as Imperial Dairy Institute and it was shifted to its present site in Karnal in 1955 and renamed again 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. The Institute has the distinction of being a Deemed University for implementing its academic programmes since 1989. The Institute provides high quality education in the field of dairying, which has no parallel in Asia. It is noteworthy that 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.

Organisational set-up: The NDRI is headed by a Director, who is the Chairman of the Board of Management. The Board has 11 members (including members of the Governing Body as nominated by the President of the ICAR Society and Joint Directors/Project Directors/Head of Divisions of Institute) and is the highest policy making body. The activities of the

Institute are managed through Research Advisory Committee (RAC), Staff Research Council (SRC), Executive Council, Academic Council and Extension Council. Organisational set up of the Institute is given below.

CAMPUSES

Southern Campus, Bengaluru (Karnataka): 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 Regional Station 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.

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

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

Model Dairy Centre, Lalukheri – Muzzafarnagar (Uttar Pradesh): The centre was initiated at Lalukheri in Muzzafarnagar, Uttar Pradesh under the project approved by ICAR, New Delhi vide letter No. 2-2/02-ASR-III dated 25.09.2002. The basic facilities have been created for empowering youth and women involved in dairy sector.

MISSION: A leading research institution in India, it is committed to promoting the dairy industry via cutting-edge study and technology. Since its founding in 1923, NDRI has played a significant role in the expansion and development of India's dairy sector and is regarded as a pioneering organization in the field of dairy research and technology. The mission of the Institute is to carry out basic and practical research that advances the growth and competitiveness of India's dairy industry.

Purpose of this writing: The main purpose of this present writing to provide information about this renowned institution (NDRI) in a capsule form or in a nutshell as far as possible to gain preliminary comprehension about this institution.

MANDATE

- To carry out extension research on the basis of clientele needs
- To enable the end-users to adopt the innovations in dairy farming



TIMELINE OF KEY MILESTONES IN NDRI'S HISTORY

Table 1. 1980 to 2000 year

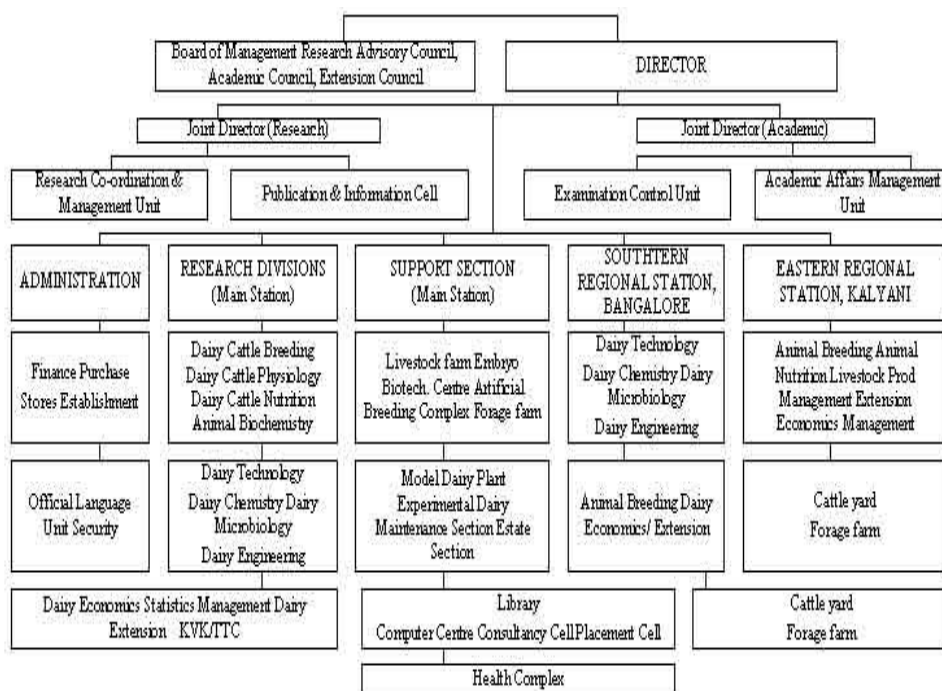
Years	Milestone	Description
1980	National Diabetes Research Interchange	With a grant from the Pew Memorial Trust, Lee Ducat launches the National Diabetes Research Interchange prototype as a program of the Juvenile Diabetes Research Foundation International to provide human pancreas tissue for research.
1981	First Tissue Retrieval	NDRI retrieves its first human tissue — a placenta and umbilical cord from a diabetic mother — and delivers the tissue to scientists at the Connective Tissue Research Institute at the University of Pennsylvania
1984	NDRI Receives First Grant	NDRI receives its first grant award from the National Institute of Arthritis, Diabetes and Digestive and Kidney Diseases to serve as a research resource to the National Institutes of Health, and also opens two satellite centers to aid pancreatic islet cell research.
1985	Islet Cell Transplantation Trials	NDRI provides human pancreas tissues for clinical trials on islet cell transplantation at Washington University in St. Louis.
1986	NDRI Expands Mission	The National Diabetes Research Interchange becomes the National Disease Research Interchange, serving over 80 different diseases and putting the skills, expertise and unique business systems it had developed to work for the broader biomedical research community.
1987	Human Tissue Collection Center	The National Cancer Institute support establishes a Human Tissue Collection Center at NDRI, and NDRI receives its first Human Tissues and Organs for Research Resources (HTORR) grant from the National Institutes of Health, which continues to support us today.
1988	Human Biological Data Interchange	NDRI launches the Human Biological Data Interchange (HBDI) with a grant from the Pennsylvania Department of Health and begins to recruit "special case families" for research into the etiology and pathogenesis of diabetes and other diseases.
1995	NDRI Corporate Partners Program	NDRI launches the Corporate Partners Program, which provides highly customized biospecimen procurement services to pharmaceutical and biotechnology partners.
1996	First International Partnership	NDRI launches its first international corporate partnership with HAB Research Organization in Japan.

Table 2. 2001 to 2017 year

Years	Milestone	Description
2004	Cystic Fibrosis Funding	NDRI receives funding to support the Cystic Fibrosis (CF) Foundation's effort to provide a reliable source of explanted CF lungs for research and drug development, ultimately leading to development of Vertex Pharmaceuticals' FDA-approved Kalydeco.
2005	25th Anniversary Celebration	NDRI marks its 25th anniversary with a celebration honoring Paul Lacy, MD, PhD, founding chairman of NDRI from Washington University.
2006	National Rare Disease Partnership	NDRI launches the National Rare Disease Partnership, partnering with 25 voluntary health organizations to create donor and investigator registries to procure and provide biospecimens for research on rare diseases.
2007	The LAM Foundation Partnership	NDRI begins tissue collection for The LAM Foundation, a patient advocacy organization that supports lymphangiomyomatosis a rare lung disease.
2008	NIH Funding Supplement	NDRI receives a funding supplement to its Human Tissues and Organs for Research Resource Grant from the National Institutes of Health's Office of Rare Disease Research.
2010	Genotype Research Pilot	NDRI receives funding to serve as the tissue procurement partner for the pilot National Institutes of Health Common Fund's Genotype-Tissue Expression (GTEx) Project.
2012	Leinweber Named President & CEO	In September 2012, the NDRI Board of Directors appointed William (Bill) Leinweber as President and CEO. Leinweber is a recognized leader in advocacy for medical and health research and critical public health issues.
2013	ALS Collaborations	NDRI begins to collaborate with the Veterans Administration Biorepository Brain Bank and the Agency for Toxic Substance and Disease Registry/McKing Consulting Corporation to recover specimens from donors with amyotrophic lateral sclerosis (ALS).
2014	TBI and Tumor Partnerships	NDRI partners with the Henry Jackson Foundation for the Advancement of Military Science to provide biospecimens for research on traumatic brain injury in veterans and with the Children's Tumor Foundation for post-mortem tissue recovery services from registered donors for research on neurofibromatosis.
2015	Donation to Discovery" Symposium	NDRI celebrates 35 years with a scientific symposium, "From Donation to Discovery: The Critical Role of Human Tissue in Research" and presents the inaugural D. Walter Cohen, DDS, Service to Science Award to Dr. Cohen, a chair emeritus of the NDRI Board of Directors.
2016	CAP Accreditation	NDRI undergoes the College of American Pathologists' Biorepository Accreditation process and receives a three-year accreditation — testament that we manage biospecimens to the highest scientific standards.
2016	Service to Science Award to Dr. Bennet Omalu	Featuring the real-life doctor portrayed by Will Smith in the 2015 film Concussion, who took on the NFL with his discovery of Chronic Traumatic Encephalopathy (CTE) and its effect on professional athletes. Dr. Omalu was awarded with NDRI's D. Walter Cohen, DDS Service to Science Award for his advocacy on the importance of access to quality human biospecimens to advance scientific research on CTE, brain injury and other neurological diseases
2017	NDRI partners with the Bay Area Lyme Foundation	NDRI partners with the Bay Area Lyme Foundation and its Lyme Disease BioBank to build a system for collecting and banking a diverse group of biospecimens for use by the Lyme disease research community.

Table 3. 2018 to 2023 year

Years	Milestone	Description
2018	Service to Science Award to Dr. Collins, Director, National Institutes of Health	NDRI was thrilled to honor Dr. Francis Collins, Director, National Institutes of Health (NIH) with the D. Walter Cohen Service to Science Award in 2018. Dr. Francis Collins, a physician-geneticist, is noted for landmark discoveries of disease causing mutations for cystic fibrosis, and his leadership role in the 2003 completion of a finished sequence of the human DNA instruction book. In his role as Director of the NIH, Dr. Collins oversees the work of the largest supporter of biomedical research in the world, spanning the spectrum from basic to clinical research.
2018	HTORR Grant Renewal as well as HIV, Autism, and Alzheimer's Supplements	In August 2018, the NIH awarded NDRI with a five-year \$6.5 million grant for the recovery of human tissues and organs for research. The HTORR award was followed by an additional \$800,000, a series of supplemental grants providing support for NDRI to serve as a human biospecimen resource for research focused specifically on Alzheimer's disease, Autism Spectrum Disorder (ASD) and HIV/AIDS.
2020	NDRI Celebrates 40 Years of Empowering Research and Discovery	NDRI celebrated its 40th anniversary of continuously serving the scientific community since 1980. From its beginnings with a focus on diabetes research, NDRI has grown and adapted to serving all researchers by providing human biospecimens worldwide to advance biomedical/bioscience research & development.
2021	NDRI Launches \$12 Million Developmental Genotype-Tissue Expression Project	NDRI along with partners at Children's Hospital of Philadelphia (CHOP), the University of Maryland's Medicine Department of Pediatrics, and Johns Hopkins All Children's Hospital received a research grant of \$12.5M over five years to collaborate on the developmental Genotype-Tissue Expression (dGTEX) project. The dGTEX project will establish the first comprehensive public resource correlating gene expression and genetic variation in pediatric tissues from all major organ systems in the human body.
2022	Service to Science Awards	NDRI announced the awardees at our <u>Service to Science event</u> held at The Union League in Philadelphia. Dr. Katalin Karikó and Dr. Drew Weissman, the scientists who led the research and technology development for the therapeutic use of mRNA, received NDRI's 2022 Empowering Research and Discovery Award. This award honors individuals whose contributions and leadership have helped advance critically needed research. Dr. Karikó and Dr. Weissman were awarded the Nobel Prize for Physiology and Medicine in 2023 for the same research.
2023	SMAHT Initiative Launches	NDRI, in collaboration with the University of Maryland School of Medicine and Johns Hopkins All Children's Hospital, are awarded a research grant of \$14.4M over five years to collaborate on the Somatic Mosaicism across Human Tissues (SMAHT) Network. The initiative will provide the first comprehensive public resource for analyzing genetic variation due to somatic mosaicism in human tissues from all developmental layers in the human body.



- To carry out technology assessment and refinement of dairy innovations evolved by NDRI
- To undertake HRD programmes in dairy extension
- To promote convergence and collaboration for sustainable dairy farming
- To undertake basic and applied research in the area of dairying covering production, processing, economics and management,
- To develop dairy farming systems for different agro-climatic conditions and demonstrate models for transfer of technology,
- To organise and conduct programmes at under-graduate and post-graduate levels in various branches of dairy science,
- To organise short-term specialised training programmes and vocational courses,
- To collaborate with National and International agencies for dairy research and development,
- To provide consultancy to dairy industry, dairy farmers and other dairy development agencies, and
- To act as a referral centre on dairy research.

LINKAGES AND COLLABORATION

The NDRI collaborates with a range of organizations and institutions, both within India and internationally, to advance its research activities and promote the growth and development of the dairy industry. Some of the key collaborations of NDRI include:

- **Government Agencies:** NDRI works closely with various government agencies, such as the Ministry of Agriculture and Farmers' Welfare, the National Dairy Development Board, and the Indian Council of Agricultural Research, to support the development of policies and programs aimed at the dairy sector.
- **Private Sector:** It helps the dairy industry expand and remain competitive, NDRI works with businesses in the private sector such as feed producers, dairy processors, and veterinary pharmaceutical firms.
- **Academic Institutions:** To promote its research initiatives and to offer training and extension services to the dairy sector, NDRI collaborates with a variety of academic institutions, including universities and research institutes.
- **International Organizations:** The World Bank, the World Health Organization, and the Food and Agriculture Organization of the United Nations are just a few of the international organizations that NDRI works with to promote best practices in dairy research and development worldwide and to assist in the development of the Indian dairy industry.

In a nutshell it is presented in such way

- World Bank
- IAEA
- UNDP
- IDF
- DAAD
- Volkswagen Foundation
- AVH Foundation
- Institutions in the UK, USA, Canada, Germany, Netherlands, and Australia
- ICAR/CSIR Institutes
- Department of Biotechnology
- Department of Science and Technology
- NDDDB
- Ministry of Food Processing & Industry
- SAUs
- MANAGE, Hyderabad
- Directorate of Extension, Ministry of Agriculture, New Delhi
- Animal Husbandry and Dairy Development Depts. of various States and ATMA
- State Dairy Co-operative Federations
- NGOs
- NABARD & other financial institutions
- Academic linkages with SAUs, ICAR institutes and foreign universities

Programs and Achievements: National Dairy Research Institute (NDRI) has implemented a range of programs aimed at advancing dairy research and promoting the growth and development of the dairy industry in India. Some of the most

famous and important programs implemented by NDRI include:

- **Livestock Improvement Program:** Several high-yielding breeds that are extensively employed by dairy farmers in India have been produced as a result of this effort, which aims to boost the genetic potential of dairy cows and buffalo.
- **Dairy Product Development Program:** This program has made significant contributions to the development of new dairy products, including dairy-based functional foods and nutraceuticals, and has developed and commercialized several dairy-based products that have improved the health and nutrition of consumers in India.
- **Livestock Nutrition Research Program:** Through the development and commercialization of a variety of animal feeds and feed additives, this initiative has boosted our understanding of livestock nutrition and increased the productivity and efficiency of India's dairy farming.
- **Milk Quality Improvement Program:** In addition to developing and implementing a number of quality control and quality assurance methods and procedures that have served to increase the safety and dependability of dairy products in the nation, this initiative has been crucial in increasing the quality of milk produced in India.
- **Training and Extension Service Program:** This program provides extensive training and extension services to dairy farmers and industry stakeholders, promotes best practices in dairy management and promotes the growth and competitiveness of the dairy sector in India.

AGRICULTURAL TECHNOLOGY INFORMATION

CENTRE: About 70% of the population in India is engaged in agriculture directly or indirectly. Livestock sector alone contributes 27% to GDP from Agricultural and employs 8% of the labour force. Agricultural & Animal Husbandry is the backbone of India's economy in terms of income, employment, equity, sustainability and foreign exchange earnings. There is no doubt that research has generated vast knowledge on different technological interventions for synthesis of appropriate technologies for the end uses. The end users are not able to use these technological interventions due to lack of access to the information about these technologies. To plug this gap of information Agricultural Technology Information Centers (ATICs) have been established in the country. The establishment of Agricultural Technology Information Centers (ACTIs) is intended to provide mechanism beyond individual units of research institutions in contributing towards the dissemination of information. This will serve as a single window system with an objective to help the farmers and other stakeholders to provide solutions to their location specific problems and make available all the technological information along with technology inputs and products for testing and use by them. The ATIC of NDRI, Karnal was inaugurated on 23rd November 2004 by Secretary DARE & DG, ICAR, New Delhi.

TECHNOLOGIES DEVELOPED

- Hamster egg penetration bioassay for fertility assessment of bulls.
- Enhancement of buffalo sperm motility and fermentation of invitro natured oocytes by pentoxifylline and heparine treatment.

- Calibration of lactometer
- Palada Payasam Mix , Gasa Gase payasam mix & Avalakki Payasam technologies
- Process manufacture of Kalan with extended shelf life Standardized
- Gulab Jamoon Mix technology
- Cheese Puri Mix technology
- Curd Rice technology
- Kunda Process manufacture standardized
- Khadi Powder technology
- Channa Podo technology
- Instant Palada Payasam Mix
- Basundi Process manufacture standardized
- Palada Payasam Mix technology transferred to MILMA, Kerala for commercial production.
- Gulab Jamoon Mix technology transferred to KMF, Bangalore for commercial production.
- Development of buttermilk with added health benefits and extended shelf-life.

RESEARCH AREAS

Advanced dairy science and technology research is carried out by NDRI in a number of important areas, such as:

- **Animal Genetics and Breeding:** In order to increase the genetic potential of dairy animals, NDRI carries out research. This includes efforts to create new and improved cow and buffalo breeds as well as to improve breeding methods in order to increase dairy output and productivity.
- **Livestock Nutrition:** The activity of NDRI is focused on establishing new and better feeding methods and comprehending the nutritional needs of dairy animals at various life stages in order to enhance the nutritional status of dairy animals.
- **Microbiology:** By studying the biology and behavior of microorganisms in the dairy food chain, NDRI works to enhance the quality and safety of dairy products as well as provide innovative solutions for eradicating dairy pathogens.
- **Dairy Engineering:** The work of NDRI's researchers includes work on creating fresh and inventive dairy processing systems and improving the energy efficiency of dairy operations. These technologies are intended to be used in the processing, packaging, and storage of dairy products.
- **Chemistry:** NDRI conducts research aimed at understanding the chemical composition and properties of dairy products, including work on developing new and improved dairy ingredients, and improving the nutritional profile of dairy products.
- **Economics:** By examining market trends and customer preferences as well as creating innovative business models for the dairy sector, NDRI undertakes research to increase the economic competitiveness and sustainability of the dairy industry.

RESEARCH PRIORITIES

- Participatory Technology Development and Dissemination of dairy innovations

- Demand-driven, System-oriented Extension Approaches for enhanced productivity as well as in view of changing climatic conditions
- Low-External-Input- Dairying for Resource-Poor dairy farmers
- Gender perspectives in Technology-Transfer
- Entrepreneurship Development Focused on Dairy Innovations
- Organizational Management and Communication Networks in Dairy sector
- Dairy Innovation System Researches
- ICT-mediated Dairy Extension

EXTENSION ACTIVITIES

- The NDRI restricted its application of extension activities only to Karnal district and did not publish the booklet on technologies developed after 1988 for dissemination of technology.
- Extension activities were restricted only to Karnal district
- Extension deals with the dissemination of technical know-how to clientele/dairy farming community through different activities. It involves education of farming/dairying community. A scrutiny of six completed in-house research projects of Extension Division for the period 1996-1999 revealed that four research projects, which were confined only to Karnal district remained inconclusive. Further, technologies in the field of breeding, feeding, fodder demonstration, animal health care and animal management were transferred to eight villages in 1996, 13 villages in 1997, three villages each in 1998 and 1999 in Karnal district. In view of this, one of the important requirements of the system to have widespread linkages with dairy farming community was missing. Hence extension activities of the Institute at national level were required to be reviewed and a concrete action programme needs to be formulated for application across the country.
- The SRC in the meeting held in December 1999 observed that there was a need to develop subject matter specialisation for dissemination of technologies developed at the NDRI for infusion in the rural and industry sectors. No concrete action was taken by the NDRI in this regard.
- The Council stated (June 2001) that the extension activities were being done by Krishi Vigyan Kendra (KVK), Trainers Trainee Centre (TTC) and two centres of advanced studies - Eastern Regional Station, Kalyani, Southern Regional Station, Bangalore and that the research findings/technologies were effectively disseminated through Dairy Samachar/News bulletins circulated to state dairy departments, State Agricultural Universities. The Council was silent about the details of technologies handed over to Extension Division in the absence of which it is not clear how the extension activities were being carried out. Lack of adequate extension activity was reflected in RAC meeting held in October 2000 in which it was observed that extension mechanism had not been established effectively and therefore, proper linkages with end users must be developed.

FUTURE THRUST ON RESEARCH AND EXTENSION ACTIVITIES

- Productivity enhancement and quality milk production from Indigenous cattle, buffaloes and crossbred cattle in the region through genetic, biotechnological, nutritional and managerial interventions
- Development of dairy foods with synbiotics, micronutrients & bioactive compounds.
- Adoption of emerging technologies, modeling & innovative packaging.
- Modernization of dairy education & capacity building
- Analysis of milk production systems, value chains, constraint analysis and Geo-Spatial data base on dairying.
- Development of model village for technology transfer activities and utilization of ICT.

CONCLUSION

In milk production, India is first in the world since 1997, but in the year 2014, for the first time. It beats the entire EU. In this respect, NDRI is playing a pivotal role. The Institution's extension activity is limited only to Karnal district of Haryana, hence it should be extended to whole country, so the milk producers or milkmen will get appropriate technology at appropriate time. Hence, milk production in our country will enhance further and meet the gap in milk production. Milk is a nutrient rich balanced food and base of nutritional security. Food security alone is not sufficient to provide health security of our countrymen, but, food security along with nutritional security will be able to do that. India has largest number of malnourished children in the world, according to ASSOCHAM report-2015, 40 percent of Indian children are undernourished. Only development of agriculture, dairy, animal husbandry etc. will not make India developed country. Along with these other aspects of development must be given importance. Ancient time India was a civilised country, Indus Valley Civilization (IVC), Aryan civilization etc., were the examples. The country had lot of resources especially gold, by the attraction of that many rulers (Invaders) attacked our country to loot golds and other resources. Seventeen times attack of Sultan Mamud is best example. In this way Shak, Hun, Dal, Pathan, Mogal etc. came in India. At last Britishers came and looted all resources (money value 5595 lakh crores) and exhausted our country and it was the starting point of poverty in India. Britishers not only looted resources, they also destroyed several set pattern of economy i.e. destroyed waiver community, forced farmers to cultivate Indigo plant, cotton plant etc. As a result, our country's economy degraded to a great extent and created poor people in India. Before British rule, there was no poor people in India, because village economy was strong based on mainly crop cultivation. Britishers were the key ruler to make India a poor country. When Britishers left India, India became a poor and destitute country. After Independence, whatever India we got, it was not in real sense India, it was practically skeleton of India. After Independence, Indian government has taken lot of measures to develop our country, but still, the condition is same with quite improvemet. Hence, few stern steps must be follow at government level as well as individual level to make our country developed country or accelerate the speed of development of our country. (1) According to 2023 estimation, population of India is 142.86 crores surpassing population of China. Hence, population control is the need of the our. In this respect two child policy must be implemented with strict rules. Who will not follow cancel citizenship. Overpopulation is depriving citizens from basic facilities of life. (2) India has the largest population of illiterate adults in the world. Hence, a rule

must be introduce that education upto class ten (X) is compulsory without any option. (3) Uniform Civil Code (UCC) is the need of the hour. It will accelerate the speed of development.(4) Now-a-days anti-India sentiment become a fashion. It gives wrong message to countrymen and citizens to other countries and a hurdle of development. Anti-India attitude holders must be encountered or allow them to go other countries.(5) Serial or consecutive law breakers' citizenship must be snatched.(6) Finish maovadis as soon as possible.(7) Finish terrorist problem instant. No judge of terrorists, direct encounter.(8) Seal the border of country giving importance no. 1. Without fencing border, it is not possible to give countrymen good governance. (9) Human resource development is needed continuously. Train the youths for different work and encourage for self-employment. Need skill India like more programmes. (10) Develop Indian Employment Exchange. Register all unemployed educated citizens, train them for various activities according to their field and place them in various countries.(11) Make India world business hub. :- India is the apicentre of world knowledge and Nalanda, Taxshila & Vikramshila universities were the visible examples. Similarly, need to make India a world business hub day by day. As a result, country's economy will be good and country's speed of development will be faster. (12) Ammunition (Weapon):- Weapon production and sell to other countries is a uptodate business and high profit providing enterprise whatever the other developed countries i.e. USA, UK, France, Russua, Italy, Germany, China and others do. It has a great role in boost up of national economy. India must catch the ball. (13) Indians who keeping money to other country's bank secreatly, cancell their citizenship. (14)For every political post, graduation degree is must. It will bring revolution in Indian politics. (15) Indian who having many criminal cases (more than ten) encounter them. No justice, result on spot. Actually they are the garbage of society. Cleaning is very essential.(16) Intruders who crossed border of our country and entered our country, identify them and allow to return to their own country. Intruders who are still trying to enter our country by crossing border (below fence, above fence, removing fence or through underground tunnel), no need justice for them, direct encounter them. (17) Consider corruption/scam as number one criminal case and provide corrupt persons highest punishment or capital punishment. A murderer kills one or two people, but a person who corrupts crore (s) of rupees, murders many people by exploiting them financially. (18) Most of the dairymen reported that, cow rearing, it is not problematic et al., if provision of feed is there. Price of cattle feed in market is very high. Hence, if governemnt take measures to provide cow rationing (who having more than five cow minimum), it will be a permanent solution of a problem of cow rearing. After independence, govt. started Grow more Food Campaign (GMFC), reasons behind were food shortage and more population. Today, more or less same situation, grow more food because ever-increasing population of country. As a result, vital force of agriculture and agriculture education is draining to this activity only. Agriculture does not indicate only to produce more production, but, (1) produce quality production (2) to assure countrymen's their nutritional security by producing diversified crops i.e. vegetables, fruits, pulses etc. (3) Give more emphasis on medicinal crops production and make products for earnings from worldwide (4) producing more spices and condiments having huge potentiality to earn foreign exchange (5) development of professional agriculture (6) give more emphasis on food processing (7) create agri-based industries and open employment opportunities of

unemployed youths (8) irrigation infrastructure development nationwide (9) reservation of groundwater (10) more emphasis on organic farming (11) give more emphasis on excess agri-production management (12) give more emphasis of organic farming research and develop new technologies which will reduce much dependence on chemical fertilizers, pesticides and weedicides which will have ultimate impact on ecological balance (13) to catch the world flower market (14) give more emphasis on production of agro-based raw materials for medicine production etc. Considering above, population stability is the need of the hour of our country. More population needs more production, more dependence on agrochemicals and presence of agro-chemicals residues in food items, creating problem in export, as a result, earning from agriculture from foreign countries is day by reducing. Developed countries are more concern for health of their citizens.

Hence, to catch the global agriculture market, we need to convert totally to organic farming and it is possible gradually, not sudden. Need to give main research focus of agriculture to develop several new organic farming techniques and it is possible, we must hold our trust. In 1950, our country's production was 50.86 million tonnes and today our agriculture production has crossed 300 million tonnes marks, it was unbelievable in 1950. Similarly, one day we will reach to complete organic farming, believe it. As a seventh largest country in the world, we having vast agricultural land and having huge potentiality to make our country's agriculture world class as well as agricultural superpower country surpassing all other countries in the world. To bring that day, these institutions (ICAR, IARI, NDRI, IVRI, CIFRI, MANAGE, NAARM, NABARD etc.) roles are indispensable and these are in real sense carrier of agricultural civilization.

Reference:-www.ndri.com
