



NDRI News

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From the Director's Desk



Dr. Trilochan Mohapatra, Secretary (DARE) & DG, ICAR visited NDRI Karnal on 3rd November, 2016

Diseases in cattle and buffaloes are of significant concern to the dairy industry as well as for public health because of their potential impact on animal and human health, milk production, food safety and economics. Although the country has achieved milestone in eradicating the most dreaded disease Rinderpest, several other emerging and re-emerging diseases are prevailing in the country leading to huge economic loss. Among the several diseases, haemoprotzoan diseases in dairy cattle and buffaloes are economically important because of direct losses associated with milk production. The major haemoprotzoan diseases affecting dairy cattle and buffaloes include Theileriosis, Babesiosis, Anaplasmosis and Trypanosomiasis.

Theileriosis is a tickborne diseases caused by *Theileria* spp and the most important species affecting cattle are *T. parva* and *T. annulata*. The disease is transmitted by several species of ticks of the genus *Hyalomma*. Babesiosis or tick fever is caused by protozoan parasites of the genus *Babesia*. Two species viz *B. bigemina* and *B. bovis* are important in cattle. Anaplasmosis is caused by *Anaplasma marginale*. Both babesiosis and anaplasmosis is transmitted by *Rhipicephalus* (*Boophilus*) *microplus*. Trypanosomiasis is caused by protozoa of the genus *Trypanosoma* and *T. evansi* is the most commonly occurring trypanosome species in India. Tabanidae flies are the vectors responsible for the spreading of the disease.

The overall prevalence of theileriosis in India ranges from 16 to 45%. The Serological screening of cattle, maintained in unorganized cattle farms all over India revealed that 30–60% of the cattle harbour antibodies to *T. annulata* piroplasms. In our country, mainly the cross-bred cattle and buffaloes are at great risk to theileriosis with an estimated annual loss of US\$ 239.5 million. The incidence of babesiosis in indigenous and cross-bred cattle, and in buffaloes has been reported frequently since long. Depending on the sensitivity of the serological tests, different authors reported up to 86% seroprevalence of the babesiosis pathogen in Indian dairy animals. Anaplasmosis is considered as one of the top 10 economically important rickettsial diseases affecting ruminants in India.

The typical symptoms of theileriosis include fever, lymph node swelling, anorexia, dyspnea etc. In severe cases, a sharp decrease in body temperature is reported just before death.



In babesiosis, the typical symptoms include high fever, ataxia and lack of coordination, production of dark red or brown-colored urine (haemoglobinuria), signs of general circulatory shock and sometimes nervous signs. In acute form of anaplasmosis, fever, anaemia, icteric mucous membrane, depression, dehydration and laboured breathing are very common symptoms. Animals surviving with an acute attack often make a slow recovery, resulting in loss of milk production. Acute form of trypanosomiasis is manifested with high fever, lachrymation, corneal opacity, reduced milk yield and nervous signs. Mortality may occur within 24 hours of onset of clinical signs. Chronic form is characterized by emaciation and loss of reproductive performance. *T. annulata* can cause mortality up to 90%, if not attended properly, but strains vary in their pathogenicity. In anaplasmosis, generally, mortality is between 5 and 40% but may reach up to 70% during a severe outbreak.

Anti-parasitic drugs are therapeutically effective in animals with clinical signs, but in most of the cases the animals may continue to remain the carriers of pathogens. Parvaquone is effective against theileriosis at a dose rate of 20 mg/kg body weight. Buparvaquone, a second-generation hydroxynaphthoquinone related to parvaquone, is more effective in the treatment of *T. annulata* infection in cattle and buffalo. *Babesia* infection can be treated with diminazene diaceturate (3-5 mg/kg body weight) and imidocarb (1-3 mg/kg body weight), however, the recovery depends on how early the disease is detected and treated. For the treatment of anaplasmosis, oxytetracycline (20 mg/kg body weight) is the drug of choice. *T. evansi* can be

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controlled by using trypanocidal drugs. Deep intra-muscular administration of diminazene aceturate (7 mg/kg body weight) is the choice for the treatment of trypanosomiasis in ruminants. Live attenuated schizont vaccine is commercially available for prevention of *T. annulata* infection. Live, attenuated strains of *B. bovis* or *B. bigemina* are also used to vaccinate cattle against babesiosis in some countries.

The control of haemoprotezoan diseases in animals can be achieved by tick or fly control and development of a suitable prophylaxis system for protection against the disease. The global loss due to ticks and tickborne diseases was estimated to be between US\$ 13.9 and 18.7 billion annually while in India the cost of controlling ticks and tickborne diseases has been

estimated to be US\$ 498.7 million/annum. This huge loss due to haemoprotezoan diseases can be minimized by controlling the vectors, using chemical control strategy and/or tick vaccines. By adopting large-scale vector control strategies, *R. (B.) microplus* and *R. (B.) annulatus* has been eradicated in USA. However, in India, large scale unorganized livestock rearing poses difficulties in controlling the vectors of haemoprotezoan diseases. The need of the hour is systematic vector control programmes coupled with dairy animal health management and disease preventive measures to reduce the milk production losses associated with haemoprotezoan diseases.

A. K. Srivastava
(A. K. Srivastava)

Up-regulation of Milk Secretion with Modified Microclimate through Manipulating Plasminogen-Plasmin System in Murrah Buffaloes during Hot Dry Season

(Nilofar Haque and Mahendra Singh)

A study was carried out on lactating Murrah buffaloes to determine changes in milk yield and composition alongwith the plasminogen-plasmin system of milk and plasma hormones during hot dry season (air temperature range 39.7 - 44.8° C) under two different management systems. Buffaloes were divided in two groups of six animals each: control and treatment, where animals in treatment group were provided with mist and fan cooling from 9:30 a.m. to 5:00 p.m., while control group animals were devoid of it for a period of 6 weeks. Under mist and fan cooling system, buffaloes experienced better comfort as their physiological responses such as rectal temperature, respiration rate, pulse rate, and forehead and middorsal temperatures were significantly ($p < 0.05$) reduced compared to control, which subsequently resulted in higher milk yield by 4.44% ($p < 0.001$). Analysis of milk samples revealed higher concentration of plasminogen (7.99 vs 6.27 $\mu\text{g/ml}$; $p < 0.01$) and β -casein (1.09 vs 0.92 g/dl; $p < 0.001$) and lower plasmin level (0.178 vs 0.194 $\mu\text{g/ml}$; $p < 0.05$) in treatment group buffaloes. Plasma glucose level was higher ($p < 0.001$) by 21.08%, whereas cortisol, norepinephrine, and NEFA levels were lower ($p < 0.001$) by 19.19, 15.38, and 11.41%, respectively, in treatment animals. However, exposure of buffaloes to cooling system did not alter composition and calcium content of milk, GH, and epinephrine level in plasma. It was inferred from the studies that the provision of cooling system during summer was effective to minimize environmental stress and improve milk production by manipulation of the PG-PL system in buffaloes. The lower plasmin and higher plasminogen level suggests their role in upregulating the milk secretion during summer season buffaloes.

Production of Direct Vat Set (DVS) Greek-Style Yoghurt Culture

(Ravi S. Wankhede and Surajit Mandal)

Greek-style yoghurt, a semisolid fermented dairy product, is characterised by thick creamy texture, heavier mouth-feel and high nutritive value. Concentrated freeze dried (DVS) Greek-style yoghurt culture was formulated and evaluated for its suitability and quality. Two different yoghurt cultures [*Streptococcus thermophilus* NCDC 526 (ST 526); *Lactobacillus delbrueckii subsp. bulgaricus* I15 (LB I15)] and [*S. thermophilus* NCDC 455 (ST 455) and *L. delbrueckii ssp. bulgaricus* I15 (LB I15)] were used for the preparation of Greek-style yoghurt and based on sensory, physicochemical and microbiological attributes, ST 526+LB I15 was selected for DVS formulation. Growth performance of ST 526 and LB I15 in a formulated whey based medium (WBM) was found to be comparable with M17 and MRS broths, respectively. Conditions for biomass production in WBM were optimized under batch fermentation (pH 5.55, temperature 42° C, agitator speed 75 rpm). Cell biomass was harvested by centrifugation (10000 rpm, 10 min, 4° C) at early stationary phase of growth (ST 526 at 6 h; LB I15 at 8 h) and suspended in cryoprotective medium. Mixture was pre-frozen (-20° C for overnight) and subjected to freeze drying. Viable counts of freeze dried cultures were 12.41 and 12.21 log cfu/ g for ST



Greek-style yoghurt

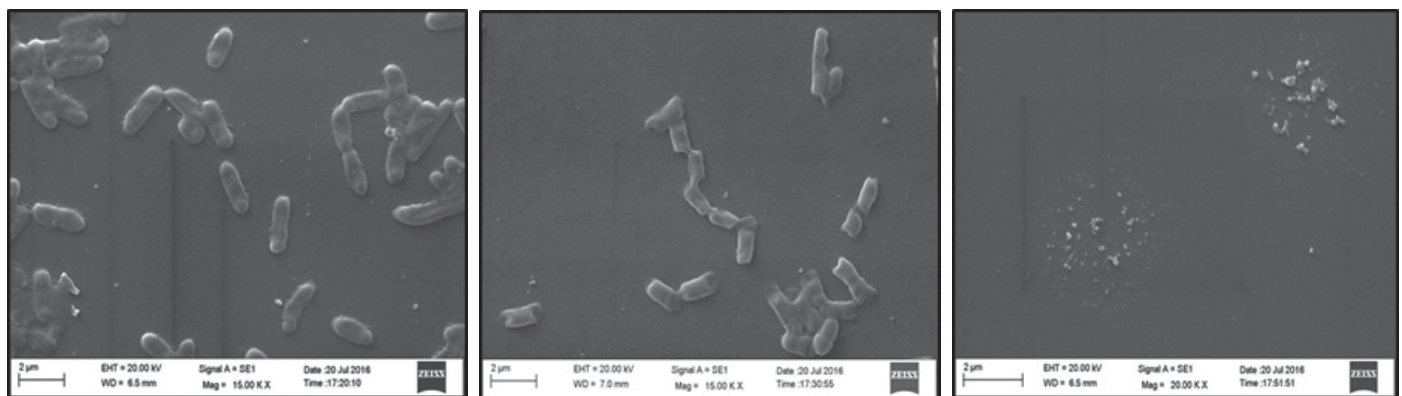
526 and LB 115, respectively. Prepared DVS cultures were packed in cryo-vials and stored at -20°C for 75 days. Viable counts were more than $11.00 \log \text{cfu/g}$ with a curd setting time of 4.5 h after 75 days of storage. Microbiological, physicochemical and sensory qualities of Greek-style yoghurt prepared with DVS cultures were acceptable till 30 days at $7 \pm 1^{\circ}\text{C}$. Freeze dried concentrated cultures can be used as DVS starter for production of good quality Greek-style yoghurt.

Lactobacilli as Protective Culture for Enhanced Safety and Extended Shelf Life of Cottage Cheese

(Rinky Gupta and Sudhir Kumar Tomar)

Three indigenous strains of *Lactobacilli* previously identified and characterized for their antifungal characteristics were assessed for their antibacterial activity against frequently reported pathogens and spoilage micro-organisms in Cottage Cheese using agar well diffusion and microtiter plate assays. *Lactobacillus plantarum* NCDC 769 exhibited the highest inhibition in terms of greater diameter of inhibition zones invariably as 29.25, 30, 21.25 and 31.75 mm against target bacteria namely *Staphylococcus aureus*, *Listeria monocytogenes*, *Bacillus cereus* and *Pseudomonas fluorescens* respectively. *L. plantarum* NCDC 769 emerged as the most potent protectant as compared to other test cultures with the lowest MIC as 16, 14, 14 and 18 mg/ml against *S. aureus*, *L. monocytogenes*, *B.*

cereus and *P. Fluorescens*, respectively. A significant difference in antimicrobial activity was observed in untreated cell free supernatant (CFS) as compared to the supernatant subjected to temperature treatments at 60, 70, 80 and 90°C though, antagonistic effect did not diminish completely. The study also demonstrated that there was no significant effect of pH ($P > 0.05$) on antibacterial activity upto level of 5.0 with respect to *L. plantarum* NCDC 769 unlike other test cultures as determined by well diffusion assay. *In situ* evaluation of protectant for inhibition of target bacteria was conducted by experimental contamination of Cottage Cheese with approximately 5 - 6 log units of respective target bacteria in cheese milk. A significant decline in counts of target bacteria was observed in Cottage Cheese prepared using protectant culture as an adjunct during 30 days of shelf stable storage at refrigeration temperature (4°C). The results indicate that these isolates are endowed with industrial potential for their use in dairy industry as potent adjunct cultures for manufacture of Cottage Cheese with extended shelf life and improved safety by preventing the growth of undesirable pathogenic bacteria. The addition of *Lb. plantarum* NCDC 769 in adjunct with *L. lactis ssp. lactis* NCDC 314 to cottage cheese significantly lowered the counts of technologically harmful microflora inoculated experimentally. Thus, use of protective cultures can prevent major technological issues related to quality and safety of fermented foods in dairy plants.



SEM images of antimicrobial activity of potent protectant against *Ps. fluorescens* (a) Control (b) treated with neutralized supernatant (c) treated with un-neutralized supernatant

Profiling of Milk Fat of Indigenous Milch Species

(Jyotika, Rajan Sharma, Bimlesh Mann and Y. S. Rajput)

Milk fat of indigenous species of bovine (Tharparkar and Sahiwal) and buffalo (Murrah) was characterized and compared with goat (alpine x beetle). The season had an impact on fatty composition of milk with concentration of short chain fatty acids being highest in winter and lowest during summer amongst all the species and breeds studied. Conversely, the milk produced in summer had elevated levels of total poly unsaturated fatty acids, trans fatty acids and conjugated linoleic acid (CLA) contents in comparison to winter milk. The major isomer of CLA in milk fat of all species was found to be C18:2 (c9, t11) and was highest in cow milk fat. All milk fat samples invariably contained odd chain fatty acids up to C25 with chain length varying from C9-C25. Among the trace fatty acids detected, branched chain fatty acids were identified in all the species, with goat milk demonstrating the highest levels. Some distinct branched chain fatty acids were detected in present study. 4-methyloctanoate, 4, 6-dimethyloctanoate, 4-methylnonanoate and 4, 8-dimethylnonanoate branched chain fatty acids were detected only in goat milk. Phytanic acid (tetramethyl 3, 7, 11,

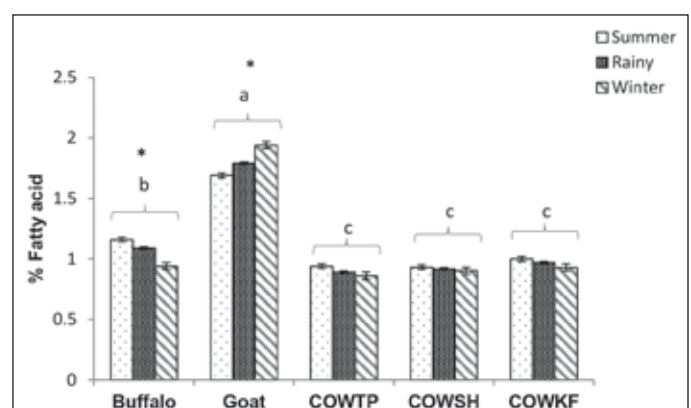


Figure: Total branch chain fatty acids (%) concentration in summer, rainy and winter season for milk fat derived from different milk animals. Bars represents mean of six determinations and error bar indicates standard error. Significance between seasons $*P < 0.05$; a,b,c,d- represents difference between species/breeds. (COWTP: Tharparkar breed of cow; COWSH: Sahiwal breed of cow; COWKF: Karan Fries breed of cow)

15 hexadecanoic acid) was not observed in goat milk. 2-tridecyl propenoic acid was detected in buffalo and cow milk but not in goat milk. Further, 3-methoxypropanoate was found only in cow breeds. Cholesterol concentration was found highest in summer and lowest in winter in all samples. Cholesterol content was found highest in goat milk fat (324 to 340 mg/100 g fat) among all the species studied. The other identified minor sterol fractions viz., desmosterol, lanosterol and lathosterol on the other hand did not

show much variation in content with respect to season. Fat soluble vitamins (retinol, β -carotene and tocopherol) were analyzed using RP-HPLC and were estimated highest in summer and lowest in winter. Retinol and tocopherol contents were found highest in goat milk fat. β -carotene was found highest in indigenous bovine breeds (445 to 616 μ g/100 g fat) and was absent in buffalo as well as in goat milk fat.



EXTENSION

DAIRY EXTENSION DIVISION

Dairy Education at Farmers' Door

- Dairy Extension Division organized an ongoing Extension Education Programme "Dairy Education at Farmers' Door" to strengthen effective dissemination of dairy production and processing technologies among the farming community. Under this programme, a team of NDRI scientists including subject matter specialist from production, processing and management group visited a new cluster of villages viz. Dungro, Subri and Pingli in Karnal district on 2nd Saturday of every Month during the period under report. Extension scientists obtained the feedback from the participating farmers. The key point of interactions were related to ecto parasitic problem, clean milk production, management of advanced pregnant animals and care of new born calves.
- A total number of 9 Kisan sangosthies were organized at village level on various aspects of animal husbandry under field farm technician (FFT) programme.
- Nine women empowerment training and campaigns were organized with the objective to create awareness in the field of dairying and home science and also impart skill in these areas so that farm women could generate more income from dairying and maintain healthy atmosphere in their respective family. By these programmes, 135 farm women were trained in village Bazidpur, Gumto and Dungro including 46 farm women in on-campus programmes.
- A total of 2334 visitors (Students & Faculty) from 71 Colleges/Institutions/Universities visited the Institute and were sensitized about the different research, teaching and extension achievements and facilities available in the Institute.

TRANSFER OF TECHNOLOGY

Institute Technology Management Committee (ITMC)

During the period of October to December 2016, a total of 3 technologies were commercialized to two different industries. The details of the commercialized technologies are listed below:

Technologies Commercialized by NDRI from (1/04/2016 to 30/06/2016)

S No	Name of the Technology	Inventors	Cost of the Technology (INR)	Date of purchase	Firm
1.	Paper Strip Assay for Rapid Detection of Pesticide Residues	Naresh Kumar, N. Tehri, R. Gopaul, P. K. Sharma, Kumar, Morab S. and Raghu H. V.	₹ 5.00 lakhs + 15% ST	17.12.2016	Hatsun Agro Product Ltd. No. 1/20A, Rajiv Gandhi Salai (OMR), Karapakkam, Chennai-97
2.	Spore Based Kit for Detection of Antibiotic Residues in Milk at Dairy Farm	Naresh Kumar, A. Khan, S. Arora, Raghu H. V., M. Balhara, P. K. Sharma and S. Shaikh	₹ 3.00 lakhs + 15 % ST	17.12.2016	
3.	Fast Acidifying Yoghurt Culture for Greek-Style Yoghurt	Surajit Mandal, S.K. Tomar, Pradip V. Behare, Jyoti, Ravi S. Wankhede	₹ 3.00 lakhs + 15 % ST	30.12.2016	GOLIANA. 553, Udyog Vihar, Phase-V, Gurgaon-122016
Total Amount (INR)			₹ 11.00 Lakhs +Rs. 1,65,000 Service Tax = ₹ 12,65,000		

Also received INR 57,500/- from selling 10 freeze dried ampoules of Sugar tolerating lactic culture for preparation of Misti Doi to Namaste India Foods Pvt. Ltd. Kanpur, U.P.



MoU signed between NDRI and M/s Goliana

Patents Granted

S. No	Title of Patent	Inventors	Patent Application No.
1	A Multipurpose Device for Concentration, Dialysis and Buffer Exchange of Protein Solution and a Process for the Same (1703/DEL/2006)	Y. S. Rajput and M. P. Divya	Patent No. 276077 Date of Grant: 07/10/2016

Patents Filed / Examined

S. No.	Title of Patent	Inventors	Patent Application No.
1	Microencapsulated Flaxseed Oil Powder and a Method of Preparation Thereof	Vivek Sharma, Ankit Goyal, Sumit Arora and Darshan Lal	2030/DEL/2014 FER Date: 04/11/2016
2	A Strip Based Test for Detection of Detergent in Milk	Y. S. Rajput, Gulab Singh and Rajan Sharma	750/DEL/2015 FER Date: 22/12/2016
3	Antimicrobial Nanoemulsion of Clove Oil Stabilized with Milk Protein and a Process Thereof	Bimlesh Mann, Minaxi, Rajesh Kumar and Rajan Sharma	913/DEL/2015 FER Date: 22/12/2016

EVENTS

An International Workshop on Milk: Naturally Nanostructured Food

A one day "International Workshop was organised on Milk: Naturally Nanostructured Food" on 30th November, 2016. The workshop was sponsored by Australia-India Council Grant Round 2015 under a collaborative project between NDRI and University of Queensland, Brisbane, Australia. Dr. A. K. Srivastava, Director and Vice Chancellor, NDRI inaugurated the workshop. The presentations were focused on the topics including status of research on nanostructure of milk-characterization of nanoparticles in buffalo milk and effect of fat globule size on rheology, tribology and sensory properties of buffalo milk, cream and butter, role of milk proteins as nanoencapsulant and recent approaches on application of gold nanoparticles for developing

detection methods linked to milk quality. The workshop was attended by 100 delegates from various organizations including NDRI-Karnal, CIRB-Hisar, CIPHET-Ludhiana, NRC Equine-Hisar, CIAE- Bhopal, LUVAS-Hisar, GADVASU-Ludhiana, Punjabi University-Patiala, CIAB-Mohali and DMS-New Delhi.

Training Programme on Probiotics: The Therapeutics of 21st Century

Dairy Microbiology Division of the Institute organised a 21 days CAFT training programme on "Probiotics: The Therapeutics of 21st Century" during 8th – 28th November, 2016 at NDRI, Karnal. The training was provided to 19 participants from ICAR Institutes, State Agricultural Universities and other State Universities on the emerging field of probiotic science, alongwith imparting hands-on training on the basic handling of probiotic organisms and



A view of inaugural session of International Workshop



The participants of the CAFT programme with the Director, NDRI

assessing their functionality. Guest lectures were also delivered on gut microbiota and its role in different diseased conditions such as Autism, Malnutrition and Mental health etc.

Institute Industry Meet

Zonal Agro-Technology Management Centre (ZTMC) organized one day, "Institute Industry Meet" on 17th December, 2016 at the NDRI Karnal. At this meet, technologies developed at NDRI and other Institutes of ZTMC were presented, demonstrated and commercialized to entrepreneurs /Industries. A total number of 130 technologies were presented to Industries. Apart from NDRI, 8 other member Institutes of the ZTMC also participated in this meet (i.e. NBAGR, CIRB, CIRC, CIRG, NRCC, NRCE, NRCM and NRCY).



A View of Institute-Industry Meet

ZTMC Meeting

Zonal Agro-Technology Management Centre (ZTMC) Meeting was held at NDRI, on 17th December, 2016 to discuss the progress of Zone. The meeting was chaired by Dr. A. K. Srivastava, Director NDRI and Chairman of Zonal Institute Technology management Committee (ZITMC). Dr. Inderjeet Singh, Director ICAR-CIRB and Co-Chairman of ZITMC also attended the meeting with members. Member Secretaries of various Institute Technology Management Committees (ITMCs) also attended the meeting.

Patent Workshop

Zonal Agro-Technology Management Centre (ZTMC) of the Institute organized one day "Patent Workshop" on 16th December, 2016 at NDRI, Karnal. The resource persons (Mr. Amit Jain and Dr. Indira Banerjee) for this workshop were from LS Davar Company, New Delhi. They discussed in details the procedure for filing of patents. They also gave tips to speed up the process of grant of patents. The workshop was attended by scientists and students of the Institute. Dr. R. R. B. Singh, Joint Director (Academic) chaired the workshop.

Training on Milk and Milk Products Processing

Dairy Technology Division and Business Planning & Development (BPD) Unit of NDRI successfully organized 10 days Entrepreneurship Development Programme on "Milk and Milk Products Processing" from 15th -24th December, 2016. The training was attended by 20 participants from different states.

Institute Research Council Meeting

IRC Mid-Term Review Meeting of the Institute was held from 20th - 22nd & 24th October, 2016 at NDRI Karnal, 18th October, 2016 at Southern Campus, Bengaluru and 26th October, 2016 at Eastern Campus, Kalyani, respectively. The progress reports of the on-going and completed research projects were critically evaluated in order to address present emerging issues of the dairy sector. IRC meetings were chaired by Dr. A. K. Srivastava, Director and convened by Dr. Bimlesh Mann, Acting Joint Director Research, NDRI, Karnal.

NDRI started Point of Sale (POS) facility at its Milk Parlour

NDRI installed POS machine at its Milk Parlour to promote the digital payment system. While inaugurating the POS machine at NDRI Milk Parlour, Dr. A. K. Srivastava, Director, NDRI, Karnal said that NDRI Milk Parlour has annual turn over of around 6 crore and the installation of POS machine at Milk Parlour will be helpful to the customers and the NDRI administration. About 13 different milk products are available at Milk Parlour, which include Bufri, Kalakand, Flavoured Milk, Paneer, Pizza Cheese, Gulabjamun Mix Powder, Ice-cream, Lassi, Processed Cheese, Ghee, Pizza, Tomato Whey Soup etc and all these products are tested in an Institute Lab prior to their release at Milk Parlour.



Dr. A. K. Srivastava, Director and Vice Chancellor, NDRI inaugurating the POS machine at NDRI Milk Parlour

NDRI Paid Tribute to Mahatma Gandhi Ji

To commemorate the birthday of Mahatma Gandhi, NDRI organised a "Messive Cleaning Campaign" at a large scale on 2nd October 2016 under the leadership of Dr. A. K. Srivastava, Director and Vice Chancellor, NDRI Karnal. All the employees of NDRI took the task to clean every nook and corner of the Institute. More than 800 students also participated in this cleaning drive. Residents of NDRI were sensitized for making their surroundings neat and clean.

Regional Campuses of the Institute also celebrated birthday of Mahatma Gandhi Ji by organising cleaning drive at their respective campuses.

6th Blood Donation Camp

6th Blood Donation Camp was organised by Model Dairy Plant and "Smiling Waves-Initiative by B.Tech (Dairy Technology)". The camp was inaugurated by Director NDRI and CMO, Karnal on 16th September, 2006. A total of 75 donors donated blood. Vishwakarma Day was also celebrated by Model Dairy Plant staff on 17th September, 2016.

राजभाषा एकक

तिमाही हिन्दी बैठक का आयोजन

डा. आर.आर.बी. सिंह, संयुक्त निदेशक (शैक्षणिक) एवं कार्यवाहक अध्यक्ष, संस्थान राजभाषा कार्यान्वयन समिति, भाकृअनुप-राडेअनुसं, करनाल की अध्यक्षता में दिनांक 26.10.2016 को संस्थान में राजभाषा कार्यान्वयन समिति की तिमाही बैठक सम्पन्न हुई। बैठक का कार्यवृत्त सर्वसंबंधितों को सूचना, अनुपालन तथा आवश्यक कार्रवाई के लिए परिचालित किया गया। समिति को गृह मंत्रालय, राजभाषा विभाग द्वारा जारी चालू वित्तीय वर्ष 2016-17 के लिए केन्द्र सरकार के सभी कार्यालयों के लिए मदवार तय किए गए न्यूनतम वार्षिक लक्ष्यों के बारे में विस्तार से जानकारी दी गई। बैठक में सभी प्रभागों/अनुभागों के प्रभारी अधिकारियों से निर्धारित न्यूनतम लक्ष्य को प्राप्त करने की दिशा में सार्थक प्रयास करने की अपेक्षा की गई। बैठक में हिन्दी पत्रों पर हिन्दी में हस्ताक्षर करने के साथ-साथ अंग्रेजी पत्रों पर भी हिन्दी हस्ताक्षर करने एवं हिन्दी डाक को प्राप्त करते समय हिन्दी में हस्ताक्षर करके हिन्दी के प्रयोग को बढ़ाने के संबंध में निर्णय लिया गया।

हिन्दी कार्यशाला का आयोजन

संस्थान के श्री राकेश कुमार, सहायक निदेशक (राजभाषा) द्वारा दिनांक 10.11.2016 को संस्थान में कंप्यूटर पर युनिकोड एवं तकनीकी टूल्स के द्वारा हिंदी प्रयोग को बढ़ावा देने के संबंध में एक कार्यशाला आयोजित की गई। इस कार्यशाला में शामिल हुए अधिकारियों एवं कर्मचारियों को कंप्यूटर/लेपटॉप पर हिन्दी सॉफ्टवेयर एवं प्रोग्राम अपलोड करने तथा बिना हिन्दी टाइपिंग जाने अंग्रेजी टाइपिंग के ज्ञान व युनिकोड की मदद से हिन्दी में टाइप कर सकने के बारे में प्रशिक्षित किया गया।

नराकास करनाल की छमाही बैठक का आयोजन

डा.ए.के.श्रीवास्तव, अध्यक्ष नराकास एवं निदेशक, भाकृअनुप-राष्ट्रीय डेरी अनुसंधान संस्थान, करनाल की अध्यक्षता में नगर राजभाषा कार्यान्वयन समिति (नराकास), करनाल की 64वीं छमाही समीक्षा बैठक दि. 29 नवम्बर 2016 को संस्थान में आयोजित की गई। बैठक में करनाल में स्थित 70 केन्द्र सरकार के कार्यालयों, उपक्रमों, निगमों, अनुसंधान संस्थानों, विश्वविद्यालयों तथा राष्ट्रीयकृत बैंकों आदि के 70 प्रशासनिक अध्यक्षों, वरिष्ठ अधिकारियों, राजभाषा अधिकारियों एवं प्रतिनिधि अधिकारियों ने भाग लिया। बैठक में सदस्यों की राजभाषा के कार्यान्वयन सम्बन्धी समस्याओं के निराकरण के लिए राजभाषा विभाग के प्रतिनिधि के रूप में श्री प्रमोद कुमार शर्मा, उप-निदेशक(कार्यान्वयन), उत्तर क्षेत्रीय कार्यान्वयन कार्यालय-1, नई दिल्ली भी उपस्थित रहे।



नराकास करनाल की छमाही बैठक का एक दृश्य

HONOURS/AWARDS

Dr. A. K. Srivastava, Director and Vice Chancellor, NDRI was conferred “**Dewang Mehta Education Award**” for his outstanding contribution in recognition of leadership, development, innovation and industry interface on 25th November, 2016 at Raj Lands End., Mumbai.

ICAR-National Dairy Research Institute got a certificate of appreciation from Indian Council Agricultural Research, New Delhi for outstanding achievements in digitization of more than 1,600 Ph.D./ Masters theses of the Institute in the digital repository KrishiKosh of the Council during the workshop on “Exploring KrishiKosh Repository to Disseminate Agricultural Knowledge” held from 6th - 7th December, 2016 jointly organized by CCS Haryana Agricultural University, Hisar, Haryana and ICAR, New Delhi. **Mr. B. P. Singh**, Assistant Chief Technical Officer (Library) also received a ‘Certificate

of Appreciation’ for his commendable contribution in “Strengthening and Sustainability of e-Granth (Strengthening Digital Library and Information Management under NARES)” during the workshop.

VISITS ABROAD

Dr. T. K. Datta, Principal Scientist, ABTC visited Bangkok, Thailand from 8th - 9th November, 2016 to participate in the meeting on Genetic Improvement of Livestock in Asian Countries organized by “**Dairy Asia**” under the mentorship of FAO for visioning and building a sustainable dairy sector in Asia and the Pacific region.

Dr. A. K. Tyagi, Head, Animal Nutrition Division visited University of Ghent, Ghent, Belgium from 13th - 20th November, 2016 to deliver lecture in the International Training Programme of Dairy Nutrition.

Dr. A. Kumaresan, Senior Scientist, ARGO underwent International training in the area of “**Flow Cytometry Based Semen Evaluation in Relation to Male Fertility**” for a period from 15th September to 30th November, 2016 at Division of Reproduction, Department of Clinical Sciences, Swedish Agricultural University, Uppsala, Sweden. This training was a part of post award grant under Lal Bahadur Shastri Outstanding Young Scientist Award 2014 received by him in the year 2015.

DINSTINGUISHED VISITORS

- 15.10.2016 Sh. Dushyant Chautala, Hon'ble Member of Parliament.
- 19.10.2016 Professor Mike Vander Haar and team from MSU-Michigan, USA.
- 03.11.2016 Dr. Trilochan Mohapatra, Secretary (DARE) & DG, ICAR New Delhi.
- 18.11.2016 Ms. Alina Gumpert, Director of the German Agribusiness Alliance and Mr. Ulrich Lossie, Director Agriculture and Bioenergy, Federal Association of German Training Centres.
- 03.12.2016 Dr. Marie Hasket, Dr. Fritha Langford and Prof. Cathy Dwyer from University of Edinburgh, UK.

PERSONALIA

Joining/Appointments

- Dr. Bimlesh Mann, Head, Dairy Chemistry Division given the additional charge of Acting Joint Director (Res.), NDRI, Karnal w.e.f. 1.10.2016.
- Ms. Khushhu Kumari joined as Scientist at NDRI, Karnal w.e.f. 17.10.2016.
- Sh. Kunal Kalra joined as Finance & Accounts Officer at NDRI, Karnal w.e.f. 17.11.2016.
- Sh. Agnivesh joined as Administrative Officer at NDRI, Karnal w.e.f. 16.11.2016.
- Ms. Ritu Dalal joined as Administrative Officer at NDRI, Karnal w.e.f. 17.11.2016.

Promotions

- Dr. Mukund A. Katakataware, Sr. Scientist, Southern Campus, Bengaluru promoted to ₹ 9000 Grade Pay w.e.f. 26.02.2016.
- Dr. Sathish Kumar, M. H., Scientist, Southern Campus, Bengaluru promoted to ₹ 7000 Grade Pay, w.e.f. 11.5.2015.
- Dr. K. P. S. Tomar, Chief Technical Officer, Livestock Research Centre awarded an advance increment w.e.f. 1.1.2016.
- Mr. R. K. Mittal, Chief Technical Officer, Vehicle Maintenance Section awarded an advance increment w.e.f. 1.7.2016.
- Mr. R. K. Bansal, Assistant Chief Technical Officer, Maintenance

Section promoted to the post of Chief Technical Officer w.e.f. 1.7.2016.

- Mr. Prabir Shah, Assistant Chief Technical Officer, Eastern Campus, Kalyani promoted to the post of Chief Technical Officer w.e.f. 1.1.2016.
- Mr. Lehri Singh, Assistant Chief Tech. Officer, Experimental Dairy promoted to the post of Chief Technical Officer w.e.f. 10.12.2015.
- Mr. Sunil Kumar, Senior Technical Officer, Dairy Engineering promoted to the post of Assistant Chief Technical Officer w.e.f. 2.8.2015.
- Mr. B. P. Singh, Senior Technical Officer, Library promoted to the post of Assistant Chief Technical Officer w.e.f. 31.10.2015.
- Mr. Naresh Kumar Dahiya, Senior Technical Officer, Computer Centre promoted to the post of Assistant Chief Technical Officer w.e.f. 12.11.2015.
- Mr. Sanjiv Kumar, Senior Technical Officer, Experimental Dairy promoted to the post of Assistant Chief Technical Officer w.e.f. 19.1.2016.
- Mr. Shiv Kumar, Senior Technical Officer, Livestock Production & Management Section promoted to the post of Assistant Chief Technical Officer w.e.f. 27.1.2016.
- Mr. Anil Kumar Dagar, Senior Technical Officer, Farm Section promoted to the post of Assistant Chief Technical Officer w.e.f. 19.2.2016.
- Mr. Pooran Mal Meena, Senior Technical Officer, Estate Section promoted to the post of Assistant Chief Technical Officer w.e.f. 27.4.2016.
- Mr. Jitender Singh Rana, Senior Technical Officer, Livestock Research Centre promoted to the post of Assistant Chief Technical Officer w.e.f. 1.5.2016.
- Mr. Braj Kishor, Senior Technical Officer, PME Unit promoted to the post of Assistant Chief Technical Officer w.e.f. 4.5.2016.
- Mr. Parmod Kumar, Senior Technical Officer, ATIC promoted to the post of Assistant Chief Technical Officer w.e.f. 24.5.2016.
- Ms. Kanchan Choudhary, Senior Technical Officer, Official Language Unit promoted to the post of Assistant Chief Technical Officer w.e.f. 29.06.2016.
- Ms. T. R. Thivijaya Kumari, Senior Technical Officer, Southern Campus, Bengaluru promoted to the post of Assistant Chief Technical Officer w.e.f. 29.6.2016.
- Mr. M.S. Nagarajaiah, Technical Officer, Southern Campus, Bengaluru promoted to the post of Senior Technical Officer w.e.f. 20.5.2016.

- Mr. Narendra Singh, Senior Technical Assistant, Library promoted to the post of Technical Officer w.e.f. 19.9.2015.
- Sh. Ishwar Singh Nagar, Senior Technical Assistant, Maintenance Section promoted to the post of Technical Officer w.e.f. 31.8.2015.
- Mr. Rup Kumar Pal, Senior Technical Assistant, Vehicle Pool promoted to the post of Technical Officer w.e.f. 29.6.2016.
- Mr. Sudesh Kumar, Senior Technical Assistant, Vehicle Pool promoted to the post of Technical Officer w.e.f. 29.6.2016.
- Ms. Anuradha, Senior Technical Assistant, Human Health Complex promoted to the post of Technical Officer w.e.f. 29.6.2016.
- Mr. K. Ramakrishna Prasad, Senior Technical Assistant, Southern Campus, Bengaluru promoted to the post of Technical Officer w.e.f. 10.7.2016.

Retirements/Transfers

- Dr. S. K. Kanawija, Principal Scientist, Dairy Technology Division retired from the Council's services w.e.f. 31.10.2016
- Mr. Karan Singh, Chief Technical Officer, Dairy Cattle Nutrition Division retired from the Council's services w.e.f. 31.12.2016.
- Mr. Ramkishan Singh Dhull, Technical Officer, Hospitality Section retired from the Council's services w.e.f. 31.12.2016.
- Mr. N. K. Verma, Assistant Administrative Officer, Purchase Section retired from the Council's services w.e.f. 31.12.2016.
- Sh. Ishwar Diyal, Assistant Administrative Officer promoted as Administrative Officer and transferred from NDRI, Karnal to join at CSSRI, Karnal w.e.f. 15.10.2016.

SOUTHERN CAMPUS, BENGALURU

EXTENSION ACTIVITIES

- A total number of 486 visitors in seven batches comprising students from various educational institutes, farmers and entrepreneurs of southern region, visited the institute. The visitors were briefed about the on-going research and extension activities.
- An orientation programme was organized for 250 progressive dairy farmers of Karnataka during 25th to 26th October, 2016. The farmers were briefed about the ongoing activities of the campus and given orientation on scientific dairy farming and green fodder production. An interactive session was organized to identify the specific problems in dairying and needed suggestions were provided.
- Good Laboratory Practice Training for Technical Staff of ICAR was conducted at Southern Campus of NDRI Bengaluru from 17th – 22nd October, 2016. Fourteen Technical Officers from 12 ICAR Institutes attended the training programme.
- Model Training Course on "Recent Extension Approaches for Dairy Entrepreneurship Development" was conducted at Southern Campus of NDRI, Bengaluru from 1st – 8th December, 2016. The programme was sponsored by Directorate of Extension, Department of Agriculture & Cooperation, Ministry of Agriculture & Farmers' Welfare, Government of India, New Delhi, exclusively for the Field Extension Officers/ Officers of Development Departments. Seventeen Officers from eight states attended the training.

EVENTS

World Food Day

World Food Day was celebrated on 17th October, 2016 on the theme "Climate is Changing: Food and Agriculture Must Too" at Southern Campus of NDRI, Bengaluru. Dr. K. N. Ganeshaiah, Former Dean (PGS) UAS, Bengaluru was the chief guest of the function and he delivered a lecture on "Impact of climate change on food production". Dr. K. P. Ramesha, Head, Southern Campus presided over the function. The programme was organized by the Alumni Association of Southern Campus of NDRI, Bengaluru.

National Milk Day

National Milk Day was organized on 26th October, 2016 in order to commemorate the birth anniversary of Dr. V. Kurien, popularly known as 'Father of White Revolution' in India, Mr. B. Nataraj, Director (QC), KMF Bengaluru delivered a lecture on "Challenges and Issues of Indian Dairy Cooperatives in Producing Quality Milk". Head, Southern Campus Bengaluru presided over the function. The programme was organized under the aegis of Alumni Association of Southern Campus of NDRI, Bengaluru.

Agricultural Education Day

Agricultural Education Day was observed on 3rd December, 2016 and Elocution Competition was conducted for the Diploma, PG and Ph.D students of the campus on the topic "Agricultural Education – Scope and Opportunities". Prizes were given to the winners.

Workshop on Mastitis Control-Way Forward

In order to understand the present problems of mastitis and its holistic control under field conditions, one day workshop on "Mastitis control- Way forward" was organized jointly by NDDB and Southern Campus of NDRI, on 15th December 2016 at Southern Campus of NDRI Bengaluru. Dr. S. Ayappan, Chair Professor, (NABARD) and Former Secretary, DARE & DG, ICAR gave the opening remarks. The workshop was summarised with the statement that though vaccine may not be immediate solution to control of mastitis due to presence of various types of specific and non specific organisms, detection of subclinical mastitis through threshold SCC and quality milk production, use of alternative medicines without adverse effects under field conditions could be the choice for quick diagnosis and control of mastitis in future. The workshop was attended by about 100 participants from various organizations.

National Consultation on Small Farmer Production Systems: Way Forward

A National Consultation on "Small Farmer Production Systems: Way Forward" was organized during 22nd – 23rd December, 2016 at Southern Campus of NDRI, Bengaluru and NIANP, Bengaluru as a part of the NABARD sponsored Project under Dr. S. Ayyappan, Chair Professor (NABARD). The Consultation was organized under the aegis of NABARD, Southern Campus of NDRI, NIANP, UAS, Bengaluru and NAAS, New Delhi. The Inaugural Session was held at NIANP, Bengaluru on 22nd December, 2016. The Inaugural function was graced by many dignitaries. Dr. R. Bhatta, Director, NIANP, Dr. H. Shivanna, VC, UASB, Dr. M. V. Ashok, CGM, NABARD, Dr. T. N. Prakash, Chairman, Karnataka APC spoke on this occasion. Padmabhushan Dr. M. Mahadevappa, delivered the inaugural address. Dr. A. K. Srivastava, Director & VC, NDRI, Karnal delivered the presidential address. The major recommendations emerging from the consultation included, providing incentives to the small farmers from dry farming regions, propagation of cultivation of small millets, more focus on buffaloes and indigenous cattle for milk production, establishment of seed and fodder banks, empowering the farmers with information & education, popularizing the solar energy, value addition of agricultural products

must be encouraged, development of skill schools for capacity building, etc.

Dairy Cattle and Agricultural Waste Management through Vermicomposting

Southern Campus of NDRI, Bengaluru has recently started utilization of bio-waste (unwanted bushes/weeds/fallen leaves available in the farm area/institute campus, and dung & urine) for vermicomposting, using earthworms viz. *Eisenia foetida* & *Eudrilus eugeniae*, which consumes organic wastes and reduces the volume by 40–60% and converts into high quality organic manure for the plants and crops. At this campus, since September 2016, vermicompost in bulk or in 5 kg & 10 kg bags at the rate of 10 per kg is being sold. Hands on practical trainings on dairy cattle waste management and vermicomposting are provided to farmers/entrepreneurs and interested parties.



Utilization of bio-waste through Vermicomposting

HONOURS/AWARDS

The business venture idea proposed by the team from Southern Campus of NDRI, Bengaluru to "Processing and packaging of whey as a potential liquid replacer for industrial and domestic usage" was placed fourth place after final round in the Alltech Innovation Competition India 2016. The team comprised **Ms. Preeti** (Ph.D., Dairy Engineering), **Ms. Priyanka** (Ph.D., Dairy Engineering) and **Ms. Sonanki Mitra** (M.Tech. Dairy Technology).

RESEARCH

Effect of Forest Tree Leaves as Feed Additives on Rumen Fermentation Kinetics in Cattle *In Vitro*

(M. Lotha, A. Santra, A. Mandal, S. K. Das and T. K. Dutta)

Manipulation of rumen microbial ecosystem for reducing ruminal methane production and ciliate protozoal population and improving TVFA and propionate production for efficient utilization of dietary energy and protein is the useful strategy to improve production

efficiency of ruminant animals. North Eastern part of India is having wide variety of tree leaves, which are yet to be explored for their effect on rumen fermentation. Eight tree leaves e.g., Agar (*Aquilaria agallocha*), Sonal (*Cassia fistula*), Polita mother (*Erythrina variegata*), Glyricidia (*Glyricidia maculata*), Barun (*Crataeva nurvala*), Kamela (*Mallotus philippensis*), Harbarai (*Phyllanthus acidus*) and Nageswar (*Mesua ferrea*) were collected from Tripura for studying their effect

as feed additives on ruminal fermentation *in vitro*. 200 ± 10 mg of substrate comprising of air dried milled (<1.0 mm) paddy straw and concentrate mixture in 60:40 ratio was used as control for *in vitro* gas production test. In experimental syringes, parts of the control substrate were replaced by 50 and 100 mg of different plant materials e.g., each tree leaves. Highest CP content (22.2%) was found in glyricidia followed by sonal (19.9%), politamother (17.4%) and barun (16.5%) tree leaves. TVFA production was highest ($P<0.01$) by kamela followed by glyricidia and politamother tree leaves. Highest ($P<0.01$) nitrogen was observed by glyricidia followed by politamother and kamela tree leaves. Lowest ($P<0.01$) ammonia nitrogen was observed by kamela in the control. The enzyme activity of carboxymethyl cellulase was highest ($P<0.01$) in kamela followed by politamother and glyricidia tree leaves. *In vitro* true dry matter digestibility (IVTDM) was also highest ($P<0.01$) in Kamela tree leaves in the control substrate. IVTDM for control was 43.8%, and 45.2 & 46.5% when 50 and 100 mg substrate was replaced by kamela tree leaves, respectively. IVTDM for politamother and glyricidia tree leaves were similar. It can be concluded from the present study that kamela (*Mallotus philippensis*) tree leaves may be used as feed additives.

Effect of Feeding Rice Distillers Grain with Solubles (RDGS) on Growth Performance of Jersey Crossbred Calves

(A. Chatterjee, Dipak Dey, D. K. Mandal, C. Bhakat, M. K. Ghosh and T. K. Dutta)

Rice Distillers Grain with Solubles (RDGS) is an important agro-industrial by-product of the distillery industries in Asian countries. The nutritive value of RDGS as part of the concentrate for crossbred calves was evaluated. The DM content of RDGS was $89.58 \pm 0.09\%$. The chemical composition (% DM) in terms of OM, CP, EE, CF, NFE, TA, NDF, ADF and AIA were 94.97, 48.43, 5.45, 7.27, 33.86, 5.03, 40.50, 16.82 and 0.95, respectively. The effect of feeding RDGS in crossbred cattle was studied in a growth trial of 120 days on 12 crossbred jersey calves distributed in two groups. The animals in control group were fed on soybean meal based concentrate mixture with paddy straw and green fodder as per NRC recommendation. In the treatment group (T_1) soya bean meal in concentrate mixture was totally replaced by RDGS. There was no statistically significant difference in average TDMI, CP intake and TDN intake and blood biochemical profile between the two groups. The average daily live weight gain(g/d) was significantly ($P<0.01$) higher in the group fed RDGS than in the control group. The feed conversion efficiency also improved by around 17 % in the treatment group. RDGS being a very good source of nutrients, can replace soybean meal fully as major source of protein in concentrate mixture for growing calves without any adverse effect.

Comparative Evaluation of Traditional vis-a-vis Improved Feeder for Early Growing Crossbred Calves

(Saroj Rai, T. K. Dutta, A. Mandal, M. K. Ghosh, R. Behera, M. Karunakaran, D. K. Mandal, C. Bhakat and Debasish Satapathy)

A study was carried out to evaluate the efficiency of improved metallic feeder for calves designed at Eastern Campus of NDRI, Kalyani and compared with traditional aluminium bowls (as feeder).

The study was carried with eight new born calves in each group and offered *ad libitum* supply of calf starter, green fodder and water from early age to weaning age. Colostrum/milk was offered through bottle feeding.

The gain in body weight of calves after 90 days of weaning age feed through improved feeder and aluminium bowls was 31.00 ± 2.47 and 26.00 ± 2.44 kg, respectively. The average DMI (kg/animal/day) of animals fed through improved metallic feeder was significantly higher ($p<0.05$, 1.34 ± 0.13) than that of the aluminium bowls (1.22 ± 0.08). Throughout the period of study, the overall residue in improved feeder was significantly lower ($p<0.05$) with less than 9.91% of wastage on dry matter basis. The results indicated that the improved metallic feeder was more efficient than traditional aluminium bowls in reducing feed wastage and in improving the intake of calves.



Improved Metallic Feeder

EXTENSION ACTIVITIES

Dairy Development Programme in the North Eastern States of India

A team from Eastern Campus of NDRI participated in "Yak Mela" at Lubrang village, West Kameng, Arunachal Pradesh on 13th November, 2016 and distributed 5000 kg concentrate mixture and 596 kg mineral mixture, which benefitted 124 Yak farmers. One Scientist Farmer Interaction session was organized on 24th November, 2016 at Bagma village of Tripura in which 48 dairy/animal husbandry farmers participated and one veterinary health camp was also organized on 25th December, 2016 in the same village where 98 farmers were benefitted and 744 animals (dairy and other animals) were treated.

Hundred farmers from various states of North Eastern India visited the Campus at Kalyani on 29th November, 2016. Farmers were acquainted with various scientific practices for dairy development and interacted with the scientists/officials for enhancement of their knowledge about scientific practices pertaining to dairy farming.

Tribal Development through Dairy Farming

- Two training programmes on "Scientific dairy farming for tribal unemployment youths" were organized during 7th - 9th and 20th - 22nd December, 2016. Twenty participants from West Midinipore and Bankura districts of West Bengal participated in the programme. Faculties of the campus provided the training on different aspects of scientific dairy farming mainly housing and management, feeds and feeding

practices, fodder cultivation practices, disease control measures, oestrus detection and reproductive management etc.

- One Veterinary health and Vaccination camp was organized on 8th November, 2016 at Dholbhangra village of Harda Gram Panchayat in West Medinipur district of West Bengal. In the camp, 78 farmers were benefitted and 1357 animals were treated and vaccinated. Training programmes were also organized under TSP. One Awareness Camp on "Agriculture and Dairy Farming" for tribal school children was organized on 8th – 20th December, 2016 at the campus. A total of 103 tribal students alongwith teaching staff participated in the awareness camp. Students were exposed to various aspects of agriculture and animal husbandry, which aroused curiosity among the participants.

Orientation Visit for School Children of Eastern States

During the Regional Science Congress organized by Jawahar Navodaya Vidyalaya, Kalyani, two lecture sessions on "Animal science and its future prospects" and "Scope and opportunity of agriculture education vis-à-vis research : A national perspective" were delivered by the scientists of the campus on 15th November, 2016. Eastern Campus of NDRI organized one orientation visit for school children (130 students) of Jawahar Navodaya Vidyalayas of West Bengal, Bihar and Jharkhand states in the campus. The theme of the visit was awareness development among school children in respect of Indian agriculture including animal husbandry development for food and livelihood security.

'Mera Gaon, Mera Gourav' and 'Dairy Education at Farmers' Door' Programme

On every second Saturday of every month, scientists and technical officers of the campus regularly visited different villages of Nadia district to educate the farming community about the scientific dairy farming practices. Apart from implementation of 'Mera Gaon, Mera Gourav' programme, scientists of the campus also visited Majhdiya, Umapur and Alaipur villages a number of times to solve the problems of farmers, demonstrated various technologies pertinent to dairy farming and distributed inputs to the needy farmers.

HONOURS/AWARD

Eastern Campus of NDRI, Kalyani bagged "**Second Best Exhibition Stall Award**" on 14th December, 2016 in the "Kisan Mela" organised by ERS of IVRI and Sasya Shyamala Krishi Vigyan Kendra at Arapanch village of South 24 Paraganas district of West Bengal.

Dr. R. R. B. Singh Takes Over as Officiating Director NDRI



Dr. R. R. B. Singh took over as Officiating Director, ICAR - National Dairy Research Institute on January 31, 2017. He has been serving at this Institute as Joint Director (Academic) since January 2016. Dr. Singh was earlier on deputation as Dean of Faculty of Dairy Technology at the Sanjay Gandhi Institute of Dairy Technology, Patna under Bihar Agricultural University, Sabour for close to three years. He obtained Bachelor degree from Sheth M. C. College of Dairy Science under the then Gujarat Agricultural University, Anand, Gujarat majoring in Dairy Technology and post graduate degree in Dairy Technology from National Dairy Research Institute, Karnal, Haryana. He specialized in thermal processing with focus on UHT processing of milk during his post graduate studies. His other areas of research interests have been sorption phenomenon in foods, application of reaction kinetics and artificial neural network in food quality modelling, traditional Indian dairy products, nutraceuticals and functional foods. He has worked in several multidisciplinary research projects, which include eight externally funded, ten institutional and five contract research projects. He has filed nine process patents and authored more than 100 research publications, many of which are in high impact international and national journals. Dr. R. R. B. Singh is recipient of more than a dozen awards including Dr. J. R. Patel Memorial Award for Education and Research and ICAR Outstanding Team Research Award. Dr. Singh has visited Dairy and Food Science institutions in countries like Germany, USA, Ireland, Belgium, Portugal, Sweden, Netherland and Srilanka to pursue his professional interests. He has served as Member of Expert Committee- Food Processing of the Department of Science and Technology and Scientific Panel on labelling and claims/Advertisements, Food Safety and Standards Authority of India, Government of India. He is actively involved in many professional activities and currently serves as Secretary of Dairy Technology Society of India and also National Academy of Dairy Science (India).

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