

वार्षिक प्रतिवेदन ANNUAL REPORT 2019



भारत
ICAR

भारतअनुप-केंद्रीय गोवंश अनुसंधान संस्थान
ग्रास फार्म रोड, मेरठ छावनी-250 001 (उ.प्र.), भारत
ICAR-Central Institute for Research on Cattle
Grass Farm Road, Meerut Cantt - 250 001 (U.P.), India

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(Indian Council of Agricultural Research)

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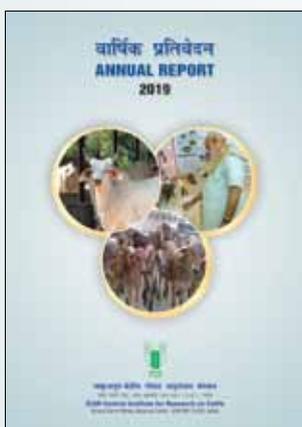
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PREFACE

“सचन्त धेनवः” The statement written in the chapter 1: 5/5” of the Rigved describes that “the cows create always

happiness”. Cattle have been one of the important species among livestock wealth of our country since its domestication. India has a vast resource of indigenous and crossbred cattle, which plays a vital role in food security of a large human population as well as improving the socio-economic status especially of the small and marginal farmers.

Our country possesses vast diversity of cattle genetic resources spread in various agro-climatic regions. According to 20th livestock census, India possessed 193.46 million cattle comprising of 142.11 million indigenous/non-descript and 51.63 million crossbred /exotic heads. Though per capita milk yield is low, our indigenous livestock resource has inherent capacity of resistance to various tropical diseases, tolerance to the climatic changes and thrive on poor quality of roughages to yield sustainable production. On the other hand, crossbreds have added value as higher milk volume in our country. Therefore, ICAR-CIRC is working with mission of germplasm improvement in both important indigenous and crossbred “Frieswal” cattle and technology development for realizing enhanced cattle productivity and profitability of farmers.

I am very much delighted to inform that the institute released “Frieswal” a crossbred milch cattle breed in 2019 after a 30-year long journey in the field of systematic genetic improvement of Indian cattle maintained at Military Farms, Ministry of Defence. Actually, this is the outcome of the Frieswal project, one of the three projects undertaken by this institute under All India Coordinated Research Project (AICRP) on cattle started in 1985. On mature equivalent lactation basis, the Frieswal cows yielded average 3628 kg milk based on 55462 lactation records spread over more than 25 years. Consequent upon closure of Military Farms, 208 Frieswal animals were selected from available elite animals at Military Farm, Meerut and established as bull mother farm

at ICAR-NDRI, Karnal for production of young male calves for testing in Field Progeny Testing Programme. So far 525 bulls have been utilized for germplasm production to the tune of 4.768 million semen doses at semen station of the institute.

Indigenous Breeds (IB) Project is another programme under AICRP on cattle implemented by this institute on Gir, Kankrej and Sahiwal breeds at the farmers’ herds in their respective native tracts. The elite animals are being maintained at germplasm (GP) units and associated herds of different agencies including farmer herds in the field area. The Junagadh Agricultural University, Junagadh is identified as the GP unit for Gir, Sardar Krushi Nagar Dantiwada Agricultural University, S. K. Nagar for Kankrej and National Dairy Research Institute, Karnal for Sahiwal breed of cattle. The institute is in the phase of including Tharparkar cattle in IB project. The genetic evaluation of bulls is being done on the basis of breeding values calculated from the first lactation 305-days milk yield of their daughters. Frozen semen doses of proven bulls are used to breed large cattle population for improving the milk production potential. The institute has planned application of Assisted Reproductive Technologies and other biotechnological tools at respective GP units of these breeds for dissemination of superior male and female germplasm.

During the period under report, a grand National Conference on Livelihood Improvement through Sustainable Livestock Production was successfully organized during 3-4 November, 2019 in collaboration with the Pashu Poshan Kalyan Samittee. The conference was inaugurated by Dr. Trilochan Mohapatra, Secretary (DARE) and Director General (ICAR). On this occasion, two kits viz., ICAR-CIRC - CATTLE BLAD Diagnostic Assay Kit for detection of carrier bulls of Bovine Leukocyte Adhesion Deficiency (BLAD) and ICAR-CIRC - COWCAM Assay Kit to detect the adulteration of cow milk with camel milk or vice-versa were also released. Furthermore, 113 outreach visits were conducted covering 2263 animals belonging to 925 farmers through mobile ambulatory clinic services, animal health camps in Farmer FIRST Project and

MGMG adopted villages. The present report also highlights salient research achievements, new technologies/ methodologies developed, extension activities performed and human resource development activities of the institute. I sincerely hope this document would serve as a valuable source of information to the scientists, extension workers, farmers and other stakeholders who are actively involved in cattle production.

The valuable support and guidance provided by the Secretary, DARE and Director General, ICAR, the DDG (Animal Science) and team at the ICAR HQ is greatly acknowledged. I am greatly thankful for kind cooperation and timely support extended by the Director, Frieswal Project and the principal

investigators of all cooperating centres of AICRP. Here, I feel privileged to acknowledge and place on record the contributions made by the Head of divisions, scientists, administrative and technical staff of the institute towards fulfilling the mandate of the Institute. I would like to appreciate editorial committee members for their sincere efforts in the compilation and preparation of this Annual Report 2019.



Shrikant Tyagi
Director

ICAR-CIRC: An Introduction

ICAR-Central Institute for Research on Cattle is a premier institute of Indian Council of Agricultural Research an autonomous organization under Department of Agricultural Research and Education, Ministry of Agriculture and Farmers Welfare, Government of India. The institute formerly known as Project Directorate on Cattle (PDC) was established on 3rd November 1987 at Military Farms School and Research Centre, Meerut by upgrading the status of All-India Coordinated Research Project (AICRP) on Cattle. The Directorate was actively collaborating with the Military Farms, Ministry of Defence to evolve a national milch crossbred cattle "Frieswal" by crossing Holstein Friesian (5/8) with Sahiwal (3/8) cattle. Considering importance of the Indigenous cattle breeds for their adaptability, feed conversion efficiency, disease resistance etc. the Indigenous Breeds Project was started in collaboration with State Agricultural Universities and State Government, Non-Government Organizations and sister ICAR Institutes for conservation and genetic improvement of some of the important indigenous cattle breeds of our country viz., Gir, Sahiwal, Kankrej, Hariana and Ongole. During the 8th Five Year Plan, Field Progeny Testing programme (FPT) was also started to undertake progeny testing of crossbred bulls under field conditions. Considering its sincere research and extension efforts and achievements made in cattle improvement, the PD on Cattle was upgraded as Central Institute for Research on Cattle (CIRC) in 2014. Thereafter, CIRC is acting as a nodal institution to monitor, coordinate and support all research and development projects for cattle improvement. The Institute is also providing good quality male germplasm to stakeholders. The Institute also obtained ISO 9001:2015 certification and has well equipped semen freezing and molecular genetics laboratories besides feed testing facilities in animal nutrition laboratory. Besides institutional research programme on cattle genetics, nutrition, reproduction and management, sponsored research projects from DST, Government of India are also regularly handled by the institute scientists.

VISION

The vision of ICAR-CIRC is "Improvement of cattle for high productivity and profitability."

MISSION

Germplasm improvement and technology development for realizing enhanced productivity and profitability.

MANDATE

1. Basic and strategic research on productivity and production enhancement of cattle including indigenous cattle.
2. Dissemination of scientific information and technology for cattle production management.

OBJECTIVES

AICRP on Cattle

1. To develop a national milch breed of cattle 'Frieswal' using Holstein Friesian X Sahiwal base.
2. Conservation and genetic improvement of important indigenous cattle breeds.
3. Production of progeny tested crossbred bulls and genetic improvement of cattle under field conditions.

ICAR-CIRC Main Scheme

1. To undertake research in the field of cattle breeding, feeding, management and reproduction to enhance productivity and profitability.
2. To plan, coordinate and monitor the research projects on cattle.
3. To serve as national data repository and provide consultancy for cattle production and reproduction.

FUTURE THRUST AREAS

1. Genetic improvement of other important indigenous breeds of cattle viz. Tharparkar, Rathi, Red Sindhi, etc. using conventional and modern breeding techniques and studies on draught animal power of important indigenous draught breeds.
2. Large scale production of quality cattle germplasm.
3. Development of optimum feeding and management practices including designing of shelter to suit the local environment for enhancing cattle productivity.
4. Sexing of male germplasm for production of calves of desired sex.
5. Validation of therapeutic importance of cow produces like milk, Panchgavaya, urine, dung etc.

6. Genomic selection of bulls and use of embryo transfer technology for elite bull production.
7. Biotechnological strategies including biotic and abiotic stress for understanding and improving cattle production and reproduction.
8. Comparative economics of productivity of Indian cattle breeds vis-à-vis crossbred cattle.

RESEARCH PROGRAMMES

AICRP on Cattle

1. Studies on genetic aspects of Holstein x Sahiwal crossbreds- **"Frieswal Project"**.
2. Field recording of performance data for undertaking large scale progeny testing - **"Field Progeny Testing of Frieswal Bulls"**.
3. Genetic studies on performance of important indigenous breeds (Gir, Kankrej and Sahiwal) of cattle and their improvement through selection - **"Indigenous Breeds Project"**.

ICAR-CIRC Main Scheme

1. Increasing cattle productivity using latest breeding tools
2. Enhancement of cattle productivity through reproductive techniques.
3. Use of nutritional and management interventions for optimization of cattle productivity.
4. HRD and technology dissemination.

INFRASTRUCTURE

Germplasm Resources

The Institute has undertaken research programmes related to genetic improvement of indigenous and crossbred cattle by identifying germplasm (GP) and data recording (DR) units in various government and non-government organizations. Frieswal cattle resource is presently available at ICAR NDRI, Karnal as bull mother farm of institute and bull rearing unit is located at Meerut under the administrative control of Directorate of Frieswal. Similarly, indigenous cattle genetic resources are available at GP and DR units of respective breeds. The germplasm unit of Sahiwal is located at NDRI, Karnal (Haryana) while that of Gir, and Kankrej are located at Junagadh Agricultural University, Junagadh (Gujarat) and Sardarkrushinagar University, Dantiwada (Gujarat), respectively.

Research Laboratories

The Institute has well-equipped laboratories to undertake basic and applied research works in the fields of Animal Genetics and Breeding, Animal Nutrition, Animal Physiology, Animal Reproduction and Molecular Genetics. Semen Freezing Laboratory of the Institute has state of the art facilities for cryopreservation of bovine semen with a capacity to store 25 lakh doses of frozen semen.

Computer Centre/ ARIS cell

This institute is having 100 mbps internet connectivity from NKN, NIC, New Delhi. Internet connectivity was provided to all staff for smooth functioning of research works, FMS/ MIS and other office works. The website of Institute (www.circ.icar.gov.in) is updated regularly. ARIS Cell helped in repairing and maintenance of Computers, Printers, Scanners and UPS etc. Practical classes were conducted for students/participants during the training programs at the institute.

Library

Four foreign Journals namely Andrology, Theriogenology, Animal (An International Journal of Animal Bioscience) and Reproduction in Domestic Animals were subscribed in the institute's library. During the reported period, library procured 71 books in Hindi and English on different subjects making a total of 2364 on its roll. Three hindi newspapers namely Dainik Jagran, Amar Ujala and Danik Hindustan and one english daily namely Times of India along with 17 literary magazines viz. इण्डिया टुडे (हिन्दी), इण्डिया टुडे (अंग्रेजी), योजना (हिन्दी), योजना (अंग्रेजी), गृहशोभा, मेरी सहेली, कुरुक्षेत्र, सरिता, निरोगधाम, साइंस रिपोर्टर (अंग्रेजी), विज्ञान प्रगति, रीडर डाइजैस्ट (अंग्रेजी), सखी, प्रतियोगिता दर्पण, वनिता (हिन्दी), इम्प्लोयेमेंट न्यूज़ पेपर (अंग्रेजी व हिन्दी) Library facilities are also made available to the employees of sister organizations, students of MIET and Sardar Vallabh Bhai Patel University of Agriculture & Technology, Meerut and participants of different trainings organized by this institute.

Semen Distribution Centre

A semen distribution-cum-sale counter is working at main gate of the institute. During the period, the centre has sold 21829, 264, 2032 and 1300 doses of Frieswal, Kankrej, Gir and Sahiwal, respectively to farmers and stakeholders from which a revenue of Rs 3,92,100 was generated.

Executive Summary

कार्यकारी सारांश

I. AICRP ON CATTLE

गाय की अखिल भारतीय समन्वित अनुसंधान परियोजना

गोवंश की संकर नस्ल “फ्रीजवाल” का विकास फ्रीजवाल परियोजना Frieswal Project

The Frieswal project evolved a national milch breed “Frieswal”, a Holstein X Sahiwal, having 62.5% exotic inheritance level and yielding 3628 kg of milk with 3.9% butter fat in a mature lactation of 300 days by ICAR-CIRC in collaboration with Military Dairy Farms, Ministry of Defence.

Established a bull mother farm of Frieswal cattle at ICAR-NDRI, Karnal by selecting 208 Frieswal cows /heifers from Military Farms for production of young male calves for testing in Field Progeny Testing Programme. The herd strength of Frieswal animals at ICAR-NDRI, Karnal was 234 including 115 adult cows, 92 young stock and 27 calves. At NDRI herd, 21 calves were born (12 females and 9 males) through nominated mating of elite cows with ranked bulls. At present herd strength of Bull Rearing Unit at Meerut is 175 including 158 adult, 17 young stocks. Since inception, based on breed characteristics and physical conformity, 1655 male calves born out of nominated mating were received/ available at BRU Meerut for selection of young male calves for future breeding. A total of 36 bull calves were received/ due to receive at Bull Rearing Unit during April to December 2019.

This year, 63147 doses of Frieswal bull semen were produced cumulating to 4695266 doses since inception of the project. As on 31.12.2019, a total of 2055322 semen doses were available in the stock. During the year, 7319 semen doses have been distributed to Military Farms, 22829 doses have been sold to para-vets, state Animal Husbandry Departments, livestock Development Boards, State Agriculture Universities and a revenue of Rs. 3,28,180/- was generated. Beside this, total revenue of Rs. 36,72,788/- has been generated through sale

of milk from the NDRI herd. Frieswal has been declared and released as a breed by Hon'ble DG on 3rd November, 2019 and subsequently a trademark was filed with reference number No. 4361504.

एक राष्ट्रीय दुधारू नस्ल फ्रीजवाल का विकास होलस्टीन एवं साहीवाल के संकर से 62.5% विदेशी नस्ल का स्तर बनाये रखते हुए केंद्रीय गोवंश अनुसंधान संस्थान एवं सैन्य फार्म, रक्षा मंत्रालय, भारत सरकार के सहयोग से किया गया है जो 300 दिनों के परिपक्व दुग्धकाल में 3.9% वसा सहित 3628 किलोग्राम दूध देती है।

क्षेत्र संतति परीक्षण परियोजना में परीक्षण हेतु युवा बछड़ों के उत्पादन के लिए सैन्य फार्मों से 208 फ्रीजवाल गायों / बछड़ियों का चयन करके भाकृअनुप-राष्ट्रीय डेयरी अनुसंधान संस्थान, करनाल में फ्रीजवाल गोवंश के बुल मदर फार्म की स्थापना की गयी। भाकृअनुप-राष्ट्रीय डेयरी अनुसंधान संस्थान, करनाल में फ्रीजवाल गोवंश की कुल संख्या 234 थी जिसमें 115 गाय, 92 युवा साँड एवं 27 बछड़े शामिल थे। एनडीआरआई में स्थित गोवंश पालन इकाई में, कुल 21 बछड़ों/बछड़ियों (12 मादा और 9 नर) को उच्च श्रेणी की गायों के गर्भाधान से प्राप्त किया गया। वर्तमान में मेरठ में साँड पालन इकाई में कुल 158 वयस्क व 17 युवा साँड शामिल हैं। स्थापना के बाद से, नस्ल की विशेषताओं एवं शारीरिक अनुरूपता के आधार पर 1655 बछड़ों को जन्म दिया गया था, जो भविष्य में प्रजनन के लिए युवा बछड़ों के चयन के लिए साँड पालन इकाई, मेरठ में उपलब्ध थे। अप्रैल से दिसम्बर, 2019 के दौरान साँड पालन इकाई में कुल 36 बछड़े प्राप्त हुए।

इस वर्ष, परियोजना के शुरू होने से फ्रीजवाल साँड के वीर्य की 63147 मात्रा तथा अब तक वीर्य की कुल 4695266 मात्रा तैयार की गई थी। दिसम्बर, 2019 तक, स्टॉक में कुल 2055322 वीर्य खुराक उपलब्ध थी। वर्ष के दौरान, कुल 7319 वीर्य खुराक सैन्य फार्मों को वितरित की गई, 22829 वीर्य खुराक पैरा-वैट, राज्य पशुपालन विभाग, पशुधन विकास बोर्ड एवं राज्य कृषि विश्वविद्यालयों

को विक्रय की गई। जिससे कुल रुपये 3,28,180/- का राजस्व प्राप्त किया गया। इसके अतिरिक्त, कुल राजस्व रुपये 36,72,788/- एनडीआरआई स्थित पशु पालन इकाई से दूध की बिक्री के माध्यम से प्राप्त किया गया। 3 नवंबर, 2019 को माननीय महानिदेशक, भारतीय कृषि अनुसंधान परिषद, नई दिल्ली द्वारा फ्रीजवाल को नस्ल के रूप में घोषित किया गया तथा इसके उपरान्त अस्थायी संदर्भ संख्या 4361504 के साथ एक ट्रेडमार्क हेतु दर्ज किया गया है।

Genetic improvement of crossbred cattle under field conditions- Field Progeny Testing Project

क्षेत्रीय परिस्थितियों में संकर गोवंशों का आनुवंशिक सुधार - क्षेत्र संतति परीक्षण परियोजना

The Field Progeny Testing (FPT) Project is being operated at 4 centres viz. 1. Guru Angad Dev Veterinary & Animal Sciences University, Ludhiana, Punjab (GADVASU), 2. Kerala Veterinary and Animal Sciences University, Thrissur, Kerala, (KVASU), 3. BAIF Development Research Foundation, Central Research Station, Uruli-Kanchan, Pune and 4. GB Pant University of Agriculture & Technology, Pantnagar, Uttarakhand (GBPUA&T). The objective of the project is to undertake progeny testing of Frieswal bulls on a large scale for genetic improvement of cattle in the field.

क्षेत्र संतति परीक्षण परियोजना चार केन्द्रों पर संचालित की जा रही है। 1. गुरु अंगद देव पशु चिकित्सा एवं पशु विज्ञान विश्वविद्यालय, लुधियाना, पंजाब, 2. केरल पशु चिकित्सा एवं पशु विज्ञान विश्वविद्यालय, त्रिचूर, केरल, 3. बैफ अनुसंधान विकास फाउंडेशन, उरलीकंचन, पुणे, महाराष्ट्र, 4. गोविन्द वल्लभ पंत कृषि एवं प्रौद्योगिकी विश्वविद्यालय, पंतनगर। इस परियोजना का मुख्य उद्देश्य क्षेत्र में गोवंशों के आनुवंशिक सुधार के लिए बड़े स्तर पर फ्रीजवाल साँड़ों के परीक्षण का कार्य करना है।

At GADVASU, Ludhiana unit, a total of 334 bulls have so far been introduced in 15 sets. Out of 154508 inseminations, 20759 female progenies were born of which 6607 reached to the age at first calving. During the year 2019, a total of 6225 artificial inseminations were carried out with an overall conception rate of 48.5%. The average first lactation 305 days milk yield of daughters which completed first lactation in the year 2019 was 3787.3 kg. The average age at first calving was

1063.7 days. Due to different causes, 23.6 % of the data were lost of which sale of animals was the major cause.

गुरु अंगद देव पशु चिकित्सा एवं पशु विज्ञान विश्वविद्यालय, लुधियाना, पंजाब में अब तक 15 समूहों में 334 साँड़ों से कुल 154508 गर्भाधान किये जा चुके हैं, जिनमें 20759 बछड़िया पैदा हुईं जिनमें से 6607 बछड़ियाँ प्रथम ब्यांत की उम्र पर पहुँच चुकी है। वर्ष 2019 के दौरान, कुल 6225 कृत्रिम गर्भाधान किये गये जिससे औसत गर्भधारण की दर 48.5 प्रतिशत प्राप्त हुई। वर्ष 2019 में बछड़ियों की प्रथम ब्यांत में 305 दिनों की दूध उत्पादकता 3787.3 किग्रा. थी तथा प्रथम ब्यांत पर औसत उम्र 1063.7 दिन थी। विभिन्न कारणों से 23.6% आंकड़ों की हानि हो गयी थी जिसमें गोवंश का विक्रय किया जाना प्रमुख कारण था।

At KVASU, Kerala unit, 315 bulls have so far been introduced in 16 sets. Out of 128234 inseminations, 10697 female progenies were born of which 2686 reached to the age at first calving. During 2019, a total of 5569 artificial inseminations were carried out with an overall conception rate of 43.9%. The average first lactation 305 days milk yield of daughters which completed first lactation in the year 2019 was 3232.9 kg. The average age at first calving was 1045.55 days. The per cent loss of data in the project was 1.28 in 13th set, 1.34 in 14th set and 6.39 in 15th set of bulls.

केरल पशु चिकित्सा एवं पशु विज्ञान विश्वविद्यालय, त्रिचूर, केरल इकाई में अब तक 16 समूहों में कुल 315 साँड़ों को शामिल किया जा चुका है तथा कुल 128234 कृत्रिम गर्भाधान से 10697 बछड़ियाँ पैदा हुईं जिनमें से 2686 बछड़ियाँ अपने प्रथम ब्यांत की उम्र प्राप्त कर चुकी है। वर्ष 2019 के दौरान, कुल 5569 कृत्रिम गर्भाधान किये गये जिससे औसत गर्भधारण की दर 43.9 प्रतिशत प्राप्त हुई। इस वर्ष 305 दिन के प्रथम ब्यांत में औसत दूध उत्पादकता 3232.9 किग्रा. थी तथा प्रथम ब्यांत पर औसत आयु 1045.55 दिन थी। विभिन्न कारणों से 1.3, 1.4 एवं 15 समूह में क्रमशः 1.28, 1.34 एवं 6.39 प्रतिशत आंकड़ों की हानि हो गयी थी।

At BAIF, Pune, a total of 311 bulls have so far been introduced in 14 sets. Out of 126798 inseminations, 15988 female progenies were born of which 5411 reached to the age at first calving. During 2019, a total of 5837 artificial inseminations were carried out with an overall conception rate of 45.0 %. The averages first lactation 305 days milk yield and age at first calving of daughters completed their first lactation during the year were 3228.34



kg and 937.0 days, respectively. The overall loss of data was 22.0 % till the end of the reporting period.

बैफ अनुसंधान विकास फाउंडेशन, उरलीकंचन, पुणे, महाराष्ट्र इकाई में अब तक 14 समूहों में कुल 311 साँड़ों को शामिल किया जा चुका है तथा कुल 126798 कृत्रिम गर्भाधानों से, 15988 बछड़ियाँ पैदा हुईं जिनमें से 5411 बछड़ियाँ प्रथम ब्यांत की उम्र पर पहुँच चुकी हैं। वर्ष 2019 के दौरान, कुल 5837 कृत्रिम गर्भाधान किये गये जिससे औसत गर्भधारण दर 45.00 प्रतिशत प्राप्त हुई। प्रतिवेदन अवधि के दौरान बछड़ियों की प्रथम ब्यांत में 305 दिनों की औसत उत्पादकता 3228.34 किग्रा थी। प्रथम ब्यांत पर औसत उम्र 937.00 दिन थी। इस अवधि में विभिन्न कारणों से 22.00 प्रतिशत आंकड़ों की हानि हो गयी थी।

At GBPUAT, Pantnagar, a total of 121 bulls have so far been introduced in 7 sets. Out of 33790 inseminations, 6433 female progenies were born of which 1194 reached to the age at first calving. During 2019, a total of 4303 inseminations were carried out with an overall conception rate of 59.8%. The average first lactation 305 days milk yield and the age at first calving of daughters completed their first lactation during reporting period were 3326.4 kg and 1083.6 days, respectively.

गोविन्द वल्लभ पंत कृषि एवं प्रौद्योगिकी विश्वविद्यालय, पंतनगर इकाई में अब तक 7 समूहों में कुल 121 साँड़ों को शामिल किया जा चुका है तथा कुल 33790 कृत्रिम गर्भाधानों अपने से 6433 बछड़ियाँ पैदा हुईं जिनमें से 1194 बछड़ियाँ प्रथम ब्यांत की उम्र पर पहुँच चुकी हैं। इस वर्ष के दौरान, कुल 4303 कृत्रिम गर्भाधान किये गये जिससे औसत गर्भधारण दर 59.80 प्रतिशत प्राप्त हुई। वर्ष 2019 में बछड़ियों की प्रथम ब्यांत में 305 दिनों की औसत दुग्ध उत्पादकता 3326.40 किग्रा थी। प्रथम ब्यांत पर औसत आयु 1083.6 दिन थी।

In the FPT project, the average first lactation 305 days milk yields of the Frieswal progenies increased by 67.77 % in KVASU (3285.69 kg in 2019 from 1958.4 kg in 1994), 41.95 % in GADVASU, (3829.6 kg in 2019 from 2697.8 kg in 1995), 12.41 % in BAIF (3294.3 kg in 2019 from 2930.4 kg in 1995) and 36.07 % in GBPUA&T unit (3394.8 kg in 2019 from 2494.8 kg in 2010). Also the average age at first calving (AFC) of Frieswal progenies decreased by 15.77 % in KVASU (957.1 days in 2019 from 1136.4 days in 1994), 31.91 % in GADVASU (811.6 days in 2019 from 1192 days in 1995), 18.79 % in BAIF (793 days in 2019 from

976.5 days in 1995) and 14.2 % in GBPUA&T unit (985.8 days in 2019 from 1149 days in 2010).

क्षेत्र संतति परीक्षण परियोजना में फ्रीजवाल संततियों की औसतन 305 दिनों की दुग्ध उत्पादन में वृद्धि हुई, त्रिचूर केरल इकाई में 67.77% (1994 में 1958.4 किग्रा से 2019 में 3285.69 किग्रा तक), लुधियाना इकाई में 41.75% (1995 में 2697.80 किग्रा से 2019 में 3829.6 किग्रा), बैफ, पुणे इकाई में 12.41% (1995 में 2930.4 किग्रा से 2019 में 3294.3 किग्रा) एवं पंतनगर इकाई में 36.07% (2010 में 2494.8 किग्रा से 2019 में 3394.8 किग्रा)। फ्रीजवाल बछड़ियों की औसत प्रथम ब्यांत आयु (एएफसी) भी घट गई है, केरल इकाई में 15.77% (1136.4 दिनों से 2019 में 957.1 दिन), लुधियाना इकाई में 31.91% (1995 में 1192 दिनों से 2019 में 811.6 दिन), बैफ, पुणे इकाई में 18.79% (1995 में 976.5 दिनों से 2019 में 793 दिन) एवं पंतनगर इकाई में 14.2% (2010 में 1149 से 985.8 दिन)।

Conservation and Genetic improvement of Indigenous cattle breeds - Indigenous Breeds Project

स्वदेशी गोवंशों का संरक्षण एवं आनुवंशिक सुधार - स्वदेशी नस्ल परियोजना

In Indigenous Breeds Project (IBP), three breeds viz. Gir, Kankrej and Sahiwal are being addressed for their improvement through selection of elite animals maintained at Germplasm (GP) unit and also at associated herds (AH) maintained by different agencies including farmer herds in the field area. The Junagarh Agricultural university (JAU), Junagarh is identified as the GP unit for Gir, Sardar Krushi Nagar Dantiwada Agricultural University (SDAU), SK Nagar for Kankrej and National Dairy Research Institute (NDRI), Karnal for Sahiwal breed of cattle.

स्वदेशी नस्ल परियोजना में, तीन नस्लों अर्थात गिर, कांकरेज और साहीवाल को जर्मप्लाज्म इकाई में बनाए गए संग्रहित जानवरों के चयन के माध्यम से उनके आनुवंशिक सुधार के लिए संबोधित किया जा रहा है तथा विभिन्न क्षेत्रीय एजेंसियों एवं किसानों के समूह के माध्यम से सहायक इकाईयों का रखरखाव किया जा रहा है। गिर की जर्मप्लाज्म इकाई के लिए जूनागढ़ कृषि विश्वविद्यालय, जूनागढ़, कांकरेज इकाई के लिए सरदार क्रूशीनगर दांतीवाड़ा कृषि विश्वविद्यालय, सरदार क्रूशीनगर एवं भाकृअनुप - राष्ट्रीय डेयरी अनुसंधान संस्थान, करनाल में साहीवाल इकाई कार्य कर रही है।

गिर नस्ल

Gir breed:

The herd strength of GP unit as on 31st December, 2019 was 195 comprising of 148 females and 47 males. During the year 2019, 32 calves were born with 15 females and 17 males. The total breedable females at GP unit were 119 consisting of 50 milch cows, 34 dry cows and 35 heifers of more than 2 years of age. GP unit had 16 young bulls of above one year of age. The DR units of the breed are located in 10 farmer herds and three associated herds. So far, 13,557 breedable females were identified and registered under the project.

गिर की जनन द्रव्य इकाई पर 31 दिसंबर, 2019 को गिर पशुओं की कुल संख्या 195 थी जिनमें 148 मादाएँ एवं 47 नर थे। वर्ष 2019 के दौरान, कुल 32 गायों ने 15 बछड़ियों एवं 17 बछड़ों को जन्म दिया। इस इकाई पर कुल 119 प्रजनन योग्य मादाएँ उपलब्ध थी, जिनमें 50 दुधारू, 34 शुष्क मादाएँ तथा 2 वर्ष से अधिक की 35 बछड़ियाँ थी। वर्ष 2019 के दौरान, जनन द्रव्य इकाई द्वारा 16 युवा साँड़ों का पालन भी किया जा रहा है। इस परियोजना की डाटा रिकॉर्डिंग यूनिट के अंतर्गत 10 कृषक इकाई एवं 03 सहायक इकाई हैं। अब तक कुल 13,557 प्रजनन योग्य गायें पहचानकर पंजीकृत की जा चुकी हैं।

So far, 28 bulls in four sets have been placed under semen collection. The semen doses available as on 31st December 2019 were 183319 (20186, 74373, 70060 and 18700 doses for I, II, III and IV set, respectively). During the year, 25990 semen doses (620, 9740 and 15630) were frozen from II, III and IV set of bulls, respectively. A total of 3379 doses were utilized during the year. Since inception of the project, 245813 semen doses were produced of which 62494 were utilized for breeding.

परियोजना में अब तक चार समूहों में 28 साँड़ों को वीर्य संग्रह हेतु शामिल किया गया। 31 दिसंबर, 2019 तक कुल 1,83,319 वीर्य मात्राएं (20186, 74373, 70060 एवं 18700 क्रमशः प्रथम, द्वितीय, तृतीय एवं चतुर्थ समूहों) वीर्य भंडार में उपलब्ध थी। वर्ष के दौरान कुल 25990 वीर्य मात्राओं (620, 9740 एवं 15630 क्रमशः द्वितीय, तृतीय एवं चतुर्थ समूह के साँड़ों) को हिमीकृत किया गया। वर्ष के दौरान कुल 3379 वीर्य मात्राओं का उपयोग किया गया। परियोजना की स्थापना के बाद से कुल 245813 वीर्य मात्राओं का उत्पादन किया गया जिनमें से 62494 मात्राओं का उपयोग प्रजनन हेतु किया गया।

A total of 1905 inseminations were carried out and 938 pregnancies were confirmed with a conception rate of 49.23% and birth of 399 daughters in the year 2019. Since inception of the project, 28922 (12194, 8335, 6613 and 1780) inseminations have been carried out and 13877 pregnancies were confirmed. The overall conception rate was 47.98%. A total of 5960 daughters were born since inception of the project.

वर्ष 2019 में कुल 1905 कृत्रिम गर्भाधान किए गए और 49.23 प्रतिशत गर्भधारण की दर से 938 गायें गर्भित पायी गयी तथा 399 बछड़ियाँ पैदा हुई। परियोजना की स्थापना के बाद से कुल 28922 (12194, 8335, 6613 एवं 1780) कृत्रिम गर्भाधान किए जा चुके हैं और 13877 गायें गर्भित पाई गई थी। सम्पूर्ण गर्भधारण दर 47.98 प्रतिशत थी। परियोजना की स्थापना के बाद से कुल 5960 बछड़ियाँ पैदा हो चुकी हैं।

The average first lactation 305-days milk yield of GP unit was 2337.7 while all lactation 305-days milk yield was 2571.6 kg. The average first lactation length and first peak yield were 441.0 days and 14.50 kg, respectively. The overall age at first calving, first service period, first dry period and calving interval were 1393.8 (46 months), 123.0, 56.4 and 408.6 days, respectively. The wet and dry averages of the GP unit were 7.2 and 3.7 kg, respectively.

गिर की जनन द्रव्य इकाई पर 305 दिन का प्रथम औसत दुग्ध उत्पादन 2337.7 किग्रा जबकि 305 दिनों का कुल दुग्ध उत्पादन 2571.6 किग्रा था। प्रथम औसत दुग्धकाल एवं कुल औसत उच्च दुग्ध उत्पादन क्रमशः 441.0 दिन एवं 14.50 किग्रा था। सम्पूर्ण प्रथम औसत ब्यांत, प्रथम सेवाकाल अवधि, प्रथम शुष्क काल अवधि एवं ब्यांत अंतराल पर कुल आयु क्रमशः 1393.8 (46 महीने), 123.0, 56.4 एवं 408.6 दिन थी। जनन द्रव्य इकाई पर दुग्ध एवं शुष्क औसत क्रमशः 7.2 एवं 3.7 किग्रा था।

कांकरेज नस्ल

Kankrej breed:

The herd strength of GP unit as on 31st December 2019 was 243 comprising 183 females and 60 males. The total number of breedable females above 2 years was 127 including 43 heifers, 60 milch and 24 dry cows. During the year 2019, 73 calves were born (34 female and 39 male calves). The unit had four breeding bulls of above 2 years of age, 15 young males and 32 calves for breeding purpose. A total of 3 DR units consisting



of organized farms, gaushalas and about 6200 farmers' animals belonging to 52 villages covered under 14 AI centres have been registered in the project area.

दिसंबर, 2019 को जनन द्रव्य इकाई पर पशुओं की कुल संख्या 243 थी जिनमें 183 मादाएँ एवं 60 नर थे। 2 वर्ष से अधिक की प्रजनन योग्य कुल 127 मादाएँ थी जिनमें 60 दुआरु और 24 शुष्क गायें तथा 43 बछड़े/ बछड़ियाँ थी। वर्ष 2019 के दौरान, 73 बच्चों (34 मादा एवं 39 नर) का जन्म हुआ। इस इकाई पर 2 वर्ष से अधिक उम्र के 4 प्रजनन योग्य साँड, 15 युवा साँड एवं 32 बछड़े/बछड़ियाँ प्रजनन के लिए थे। संगठित क्षेत्र, गौशालाओं और 14 कृत्रिम गर्भाधान केंद्रों के अंतर्गत आने वाले 52 गाँवों के लगभग 6200 किसानों के पशुओं से युक्त कुल 3 डाटा रिकॉर्डिंग इकाइयाँ परियोजना क्षेत्र में पंजीकृत की गई हैं।

A total of 35 Kankrej bulls in four sets have been inducted so far. The opening balance of semen doses as on 01st January 2019 was 154152 and during the year 2019, a total of 39,020 doses of semen were frozen from the bulls of third and fourth set. A total of 11421 doses were utilized for insemination during the year. At the end of the year, 1,00,474 doses of frozen semen covering 2627 doses of 1st set, 47552 doses of 2nd set, 30037 of 3rd set and 20258 of 4th set were available for future breeding. A total of 150 doses of top ranked bulls were used for nominated mating for the production of young male calves and 806 semen doses were sold / supplied to the stakeholders for the improvement of Kankrej cattle. A total of 4855 doses were deposited to the ICAR-NBAGR for gene bank.

अब तक चार समूहों में 35 साँडों को शामिल किया है। 1 जनवरी, 2019 को वीर्य मात्राओं का कुल शेष 154152 था और वर्ष 2019 के दौरान, कुल 39020 वीर्य मात्राएं तृतीय एवं चतुर्थ समूहों के साँडों से हिमीकृत की गई। वर्ष के दौरान, कुल 11421 वीर्य मात्राओं का उपयोग कृत्रिम गर्भाधान के लिए किया गया। वर्ष के अन्त में, कुल 100474 वीर्य मात्राएँ (2627, 47552, 30037 एवं 20258 क्रमशः प्रथम, द्वितीय, तृतीय एवं चतुर्थ समूह) भविष्य में प्रजनन हेतु उपलब्ध थी। सर्वश्रेष्ठ साँडों की कुल 150 वीर्य मात्राओं का उपयोग युवा बछड़ों को प्राप्त करने के लिए प्रजनन हेतु किया गया तथा 806 वीर्य मात्राओं को कांकरेज गोवंश के उत्थान के लिए हितधारकों को विक्रय / वितरण किया गया। कुल 4855 वीर्य मात्राओं को भाकृअनुप-पशु आनुवंशिक संसाधन ब्यूरो, करनाल के जीन बैंक में जमा कराया गया।

During the year 2019, a total of 2707 animals were inseminated and 1268 animals were confirmed for pregnancy. The conception rate during the year was 46.84 per cent against overall rate of 47.45 per cent (8801 conceptions out of 18547 inseminations). During the reporting period, a total of 363 daughters were born resulting 2743 daughters since inception of the project.

वर्ष 2019 के दौरान, कुल 2707 गायों का कृत्रिम गर्भाधान किया गया जिनमें से 1268 गाय गर्भित पायी गयी। वर्ष के दौरान, गर्भधारण दर 46.84% पायी गयी जबकि सम्पूर्ण गर्भधारण दर 47.45% (18547 कृत्रिम गर्भाधान से 8801 गाय गर्भित) पायी गयी। प्रतिवेदन अवधि के दौरान, कुल 363 बछड़ियाँ पैदा हुई, परियोजना में अब तक कुल 2743 बछड़ियाँ पैदा हो चुकी है।

The average first lactation total milk yield, first lactation 305-days milk yield, all lactation total milk yield and first peak yield of GP unit were 2308.42, 2138.64, 2503.79 and 11.29 kg, respectively. The average first lactation length was 314.60 days. The average age at first calving, first service period, first dry period and calving interval were 1237.35 (41 months), 144.92, 139.25 and 434.00 days, respectively. The wet and dry average was 8.68 and 5.19 kg, respectively.

जनन द्रव्य इकाई पर औसत प्रथम कुल दुग्ध उत्पादन, 305 दिन का औसत दुग्ध उत्पादन, सम्पूर्ण दुग्ध उत्पादन एवं प्रथम उच्च दुग्ध उत्पादन क्रमशः 2308.42, 2138.64, 2503.79 एवं 11.29 किग्रा. था। औसत प्रथम दुग्ध उत्पादन काल 314.60 दिन था। सम्पूर्ण प्रथम औसत ब्यांत, प्रथम सेवा काल, प्रथम शुष्क काल एवं ब्यांत अंतराल पर कुल आयु क्रमशः 1237.35 (41 महीने), 144.92, 139.25 एवं 434.00 दिन थी। इस इकाई पर दुग्ध एवं शुष्क औसत क्रमशः 8.68 एवं 5.19 किग्रा. था।

साहीवाल नस्ल

Sahiwal breed:

Herd strength of GP unit at NDRI, Karnal as on 31st December 2019 was 442 comprising 347 females and 95 males. This unit had 37 young bulls of above two years of age. The number of breedable females above two years of age in GP and different DR units was 607 comprising of 244 in NDRI, Karnal, 113 in GADVASU, Ludhiana; 94 in LUVAS, Hisar; and 156 in GBPUAT, Pantnagar.

दिसंबर, 2019 को राष्ट्रीय डेयरी अनुसंधान संस्थान, करनाल की जनन द्रव्य इकाई में कुल पशुओं की संख्या 442 थी जिसमें 347 मादाएँ एवं 95 नर थे। इस इकाई में

2 वर्ष से अधिक के 37 युवा साँड थे। जनन द्रव्य इकाई एवं विभिन्न डाटा रिकॉर्डिंग इकाइयों पर 02 वर्ष से अधिक की 607 प्रजनन योग्य मादाएँ थी जिसमें 244 करनाल में, 113 लुधियाना में, 94 हिसार में एवं 156 पंतनगर में शामिल थीं।

So far, 35 Sahiwal bulls in four sets were inducted for progeny testing. During the year 2019, 24996 doses were frozen and 7506 doses were utilized for breeding. At the end of year, a total of 122528 semen doses were available for breeding. Since inception of the project, 229050 semen doses were frozen and 106522 doses were utilized/supplied/sold to the stakeholders and for the project for the genetic improvement of cattle. A total of 3051 frozen semen doses were collected from three Sahiwal bulls inducted in fourth set and maintained at CIRC, Meerut during the year.

अब तक चार समूहों में संतति परीक्षण के लिए 35 साहीवाल साँडों को शामिल किया गया है। वर्ष 2019 के दौरान, कुल 24996 वीर्य मात्राओं को हिमीकृत किया गया तथा 7506 वीर्य मात्राओं का उपयोग प्रजनन हेतु किया गया। वर्ष के अन्त में, कुल 122528 वीर्य मात्राएं प्रजनन हेतु उपलब्ध थी। परियोजना की शुरुआत के बाद से कुल 229050 वीर्य मात्राओं को हिमीकृत किया गया और 106522 मात्राओं को आनुवांशिक सुधार हेतु हितधारकों को उपयोग/वितरण/विक्रय हेतु दिया गया। वर्ष के दौरान भाकृअनुप-केंद्रीय गोवंश अनुसंधान संस्थान, मेरठ के चार साहीवाल साँडों को चतुर्थ समूह में शामिल करके कुल 3051 वीर्य मात्राएं तैयार की गईं।

During the year 2019, a total of 743 inseminations (296 in Karnal, 106 in Hisar, 160 in Ludhiana and 181 in Pantnagar) were carried out and 330 cows were conceived (138 in Karnal, 62 in Hisar, 52 in Ludhiana and 78 in Pantnagar). The conception rate (%) was 45.94 in Karnal, 58.49 in Hisar, 32.5 in Ludhiana and 43 in Pantnagar. During the year 2019, 141 daughters (43 in Pantnagar, 23 in Ludhiana, 28 in Hisar and 47 in Karnal) were born. Since inception of the project, 6715 inseminations were carried out with an overall 38.64% conception rate and a total of 1003 daughters (307 in Pantnagar, 133 in Ludhiana, 67 in Hisar and 496 in Karnal) were born.

वर्ष 2019 के दौरान, कुल 743 गर्भाधान (करनाल 296, हिसार 106, लुधियाना 160 एवं पंतनगर 181) किए गए जिसमें 330 गायें (पंतनगर 78, लुधियाना 52, हिसार 62 एवं करनाल 138) गर्भित पायी गयी। गर्भधारण दर प्रतिशत 45.94 करनाल, 32.5 लुधियाना, 58.49 हिसार,

एवं 43.0 पंतनगर में थी। वर्ष 2019 के दौरान, कुल 141 बछड़ियों (पंतनगर 43, लुधियाना 23, हिसार 28 एवं करनाल 47) ने जन्म लिया। परियोजना की शुरुआत के बाद से कुल 6715 कृत्रिम गर्भाधान किए गए, जिनमें 2595 गायें गर्भित पायी गयी तथा सम्पूर्ण गर्भधारण दर 38.64% थी और कुल 1003 बछड़ियाँ (पंतनगर 307, लुधियाना 133, हिसार 67 एवं करनाल 496) पैदा हुईं।

The average first lactation total milk yield, first lactation 305-days milk yield and first peak yield at Karnal GP unit were 2210.34, 2148.63 and 10.59 Kg, respectively. The average first lactation length was 288.0 days. Overall average age at first calving, first service period, first dry period and first calving interval were 1176.55 (39 months), 133.32, 140.18 and 377.42 days, respectively. The wet and dry average was 7.87 and 3.17 Kg, respectively.

प्रथम दुग्धकाल के कुल दुग्ध उत्पादन का औसत, प्रथम दुग्धकाल के 305 दिनों का दुग्ध उत्पादन एवं जनन द्रव्य इकाई, भाकृअनुप-राष्ट्रीय डेयरी अनुसंधान संस्थान, करनाल की प्रथम उच्चतम उत्पादन क्रमशः 2210.34, 2148.63 एवं 10.59 किग्रा. थी। प्रथम दुग्धकाल अवधि का औसत 288.0 दिन था। प्रथम ब्यांत उम्र, प्रथम संषेचन अवधि, प्रथम शुष्क अवधि और प्रसव अंतराल का औसत क्रमशः 1176.55 (39 महीने), 133.32, 140.18 एवं 377.42 दिन था। दुग्ध एवं शुष्क काल का औसत क्रमशः 7.87 और 3.17 किग्रा. था।

Studies on genetic aspects of cattle

The association of two SNPs (rs442633552G>A and rs42022871C>T) of KISS1 gene with reproductive and productive traits was analysed. The results revealed that genotypes g.108 G>A and g.292 C>T had significant association with dry period. The cows with genotypes GG had higher dry period as compared to other genotypes. Further, g.292 C>T heterozygotes had higher dry period in comparison to both homozygotes. But none of the genotypes had significant influence on age at first service. The TT genotype had higher standard lactation milk yield (300 days), total lactation milk yield and peak yield ($p<0.05$). The average total lactation milk yield and standard lactation milk yield of cows with TT genotypes were 3052 and 2900 kg, respectively. The significant role of g.292 C>T in both reproduction and production traits may be utilized in marker assisted selection.

DNA samples of Kankrej (147), Gir (23) and Frieswal (72) were used for the analysis of genetic variation in Neuropeptide Y gene. SNPs



were screened in the 5'-UTR and exon-1 regions of NPY gene by PCR-SSCP and PCR-RFLP method, respectively. The exon-1 of NPY gene was studied by PCR-RFLP method digested by SfoI restriction enzyme. Further sequence analysis revealed three genotypes viz. CC, CT and TT. In Kankrej cattle, the allelic frequencies of C and T were 70% and 30%, respectively with genotypes CC (64), CT (81), TT(02). In Gir cattle the allelic frequencies of C and T were 67.3 and 32.6 per cent, respectively with genotypes CC (09), CT(13) and TT(01) and in Frieswal cattle, the allelic frequencies of C and T were 54.16 and 45.84%, respectively with the genotypes CC (08), CT(62) and TT(02). In 100 samples of Kankrej cattle, identified three SNPs at 5'-UTR. At position g.75 G>A observed GG (44), GA (55), AA (01) genotypes with G (71.5%) and A (28.5%) alleles, at g.195 C>T observed CC (76), CT (22), TT (02) genotypes with C (87%) and T (13%) alleles and at g.253 G>A observed GG (29), GA (70), AA (01) genotypes with G (64%) and A (36%) alleles.

The X and Y chromosome-specific markers i.e. bovine proteolipid protein (PLP) and sex-determining region Y (SRY) genes were simultaneously quantified in semen samples of Frieswal bulls. qRT-PCR studies indicated Male : Female ratio of 1.080 in the neat semen samples. Alteration of pH and procedure for separating motile sperms with time combinations for retrieval of high motility sperm and cryopreservation did not change the sex ratio.

Developed a web based online portal SIREdAM in collaboration with the scientists of CABin, IASRI, New Delhi. This software has been primarily developed for the real time data retrieval and management of all the information collected under the All India Co-ordinated Research Project on Cattle and can be used for buffaloes also. Databases have been developed and implemented in MySQL as back-end RDBMS. Web tools have been developed using PHP as server side scripting language for embedding HTML, database connectivity and database operations. R software has been used for analysis process at back-end. HTML and Java have been used for developing front-end tools. Presently, the software is under validation and data entry has been started by the units.

The test day milk records of Gir and Kankrej cattle were subjected to random regression analysis to estimate the genetic parameters and expected breeding values (EBVs). Heritability estimates of

different test day yields ranged from 0.218 (TD240) to 0.271 (TD150) in Gir cattle and 0.039 (TD240) to 0.126 (TD120 and TD135) in Kankrej cattle. Average EBVs of different test day yields ranged from -0.365 (TD300) to 0.123 (TD105 and TD120) in Gir cattle and -1.721 (TD15) to 0.31 (TD225 and TD240). Estimated nine different lactation persistency measures using the EBVs and rank correlations between the different estimates were high and statistically highly significant ($P<0.01$). Rank correlation estimates revealed similarities in ranking of animals based on the persistency measures estimated by different methods.

गोपशुओ के आनुवंशिक पहलुओं पर अध्ययन

किसपेप्टीन 1 जीन के दो एसएनपी (rs442633552G>A और rs42022871C>T) के संबंध का विश्लेषण उनके प्रजनन और उत्पादक लक्षण के साथ किया गया था। परिणामों से पता चला कि जीनोटाइप g.108 G>A और g.292 C>T का गोवंश के शुष्क काल के साथ महत्वपूर्ण संबंध था। अन्य जीनोटाइप की तुलना में GG जीनोटाइप के साथ गायों में शष्क अवधि अधिक थी। इसके अलावा, g.292 C>T हेटेरोजाइगोट्स में दोनों होमोजाइगोट्स की तुलना में अधिक शुष्क अवधि थी। लेकिन प्रथम बयान्त पर किसी भी जीनोटाइप का महत्वपूर्ण प्रभाव नहीं था। TT जीनोटाइप वाले गोवंशों में कुल मानक दुग्ध उत्पादन (300 दिन), कुल दुग्ध उत्पादन और उच्चतम उत्पादन ($P<0.05$) अधिक था। TT जीनोटाइप वाली गायों में कुल औसत दुग्ध उत्पादन और मानक दुग्ध उत्पादन क्रमशः 3052 और 2900 किलोग्राम थी। g.292 C>T मार्कर (चिन्हक), प्रजनन और उत्पादन लक्षणों में गोवंश चयन के लिए उपयोग किया जा सकता है। कांकरेज (147), गिर (23) और फ्रीजवाल (72) के डीएनए नमूनों का उपयोग न्यूरोपेप्टाइड वाई जीन में आनुवंशिक भिन्नता के विश्लेषण के लिए किया गया था। एनपीवाई (NPY) जीन के 5' यूटीआर और एक्सॉन-1 क्षेत्रों पर मौजूद एसएनपी को क्रमशः पीसीआर एसएससीपी और पीसीआर आरएफएलपी विधि द्वारा अध्ययन किया गया। एनपीवाई जीन के एक्सॉन-1 का अध्ययन पीसीआर-आरएफएलपी विधि द्वारा किया गया था जो एसएफओआई प्रतिबंध एंजाइम द्वारा खंडित करता है। अनुक्रम विश्लेषण से तीन जीनोटाइप CC, CT और TT का पता चला। कांकरेज गोवंशों में, C और T की ऐलील आवृत्तियां क्रमशः 70% और 30% तथा जीनोटाइप CC (64), CT (81), TT (02) थी। गिर गायों में C और T की ऐलील आवृत्तियां 67.3 और 32.6 प्रतिशत तथा जीनोटाइप CC (09), CT (13) और TT (01) के साथ थी और फ्रीजवाल गोवंशों में, C और T की ऐलील आवृत्तियां 54.16% और 45.84% एवं

जीनोटाइप CC (08), CT (62) व TT (02) थी। कांकरेज गायों के 100 नमूनों में 5'-यूटीआर जीनोमिक क्षेत्र में तीन एसएनपी की पहचान की गयी। एनपीवाई (NPY) जीन के g.75 G>A स्थल पर GG (44), GA (55), AA (01) जीनोटाइप्स के साथ G (71.5%) व A (28.5%) ऐलील आवृत्तियां, g.195 C>T स्थल पर CC (76), CT (22), TT (02) जीनोटाइप्स के साथ C (87%) व T (13%) ऐलील आवृत्तियां तथा g.253 G>A स्थल पर GG (29), GA (70), AA (01) जीनोटाइप्स के साथ G (64%) व A (36%) ऐलील आवृत्तियां देखी गयी।

एक्स और वाई गुणसूत्र-विशिष्ट मार्कर जैसे कि गोजातीय प्रोटियोलिपिड प्रोटीन (पीएलपी) और लिंग-निर्धारण क्षेत्र वाई (एसआरवाई) जीनों का फ्रीजवाल सांडों के वीर्य नमूनों में एक साथ अध्ययन किया गया। वीर्य के ताजे नमूनों में क्यूआरटी-पीसीआर विश्लेषण से नर : मादा शुक्राणुओं का अनुपात 1.080 पाया गया। उच्च गतिशील शुक्राणु व शीत परिरक्षण की पुनः प्राप्ति हेतु लिंग अनुपात पर पीएच और समय संयोजन सहित गतिशील शुक्राणु प्रथक्करण की प्रक्रिया के परिवर्तन का कोई प्रभाव नहीं पाया गया।

एक वेब आधारित ऑनलाइन पोर्टल एसआईआरडीएएम (SIREdAM) जिसे कैबिन आईएसआरआई (CABin, IASRI), नई दिल्ली के वैज्ञानिकों के सहयोग से विकसित किया गया है। इस सॉफ्टवेयर का उपयोग मुख्य रूप से अखिल भारतीय समन्वित अनुसंधान परियोजना के अंतर्गत गोवंशों की सभी सूचनाओं के वास्तविक आंकड़ों की पुनर्प्राप्ति और प्रबंधन के लिए विकसित किया गया है साथ ही इस सॉफ्टवेयर का उपयोग भैंसों के लिए भी किया जा सकता है। डेटाबेस का विकास और इसको लागू माईएसक्यूएल (MySQL) में बैक-एंड आरडीबीएमएस (RDBMS) के रूप में किया गया। वेब टूल को स्थापित करने के लिए पीएचपी (PHP) को एचटीएमएल (HTML) सर्वर साइड स्क्रिप्टिंग भाषा के रूप में, डेटाबेस जुड़ाव, और डेटाबेस संचालन को एक साथ मिलकर किया गया। बैक-एंड पर, आर-सॉफ्टवेयर का उपयोग विश्लेषण प्रक्रिया के लिए किया गया है। HTML और Java का उपयोग फ्रंट-एंड टूल विकसित करने के लिए किया गया है। वर्तमान में यह सॉफ्टवेयर सत्यापन के अनंतर्गत है और संबन्धित इकाइयों द्वारा आंकड़ों की प्रविष्टि शुरू की जा चुकी है।

गिर और कांकरेज गोवंशों के दिन के दूध के रिकॉर्ड के परीक्षण के लिए यादृच्छिक प्रतिगमन विश्लेषण का प्रयोग आनुवांशिक मापदंडों और अपेक्षित प्रजनन मूल्यों (ईबीवी) का अनुमान लगाने के लिए किया गया। गिर गोवंशों में परीक्षण के दिन के उत्पादन आनुवांशिक अनुमान

0.218 (TD240) से 0.271 (TD150) तक लगाया गया तथा कांकरेज गोवंश में 0.039 (TD240) से 0.126 (TD120 और TD135) था। गिर गोवंशों में, विभिन्न परीक्षण दिनो में उत्पादन दिवस का औसत ईबीवी - 0.365 (TD300) से 0.123 (TD105 और TD120) तक एवं कांकरेज में यह -1.721 (TD15) से 0.31 (TD225 और TD240) तक था। ईबीवी का उपयोग करते हुए नौ अलग-अलग दुग्धकाल की दृढ़ता के उपायों का अनुमान लगाया गया था तथा विभिन्न अनुमानों के बीच रैंक सहसंबंध उच्च और सांख्यिकीय रूप से अत्यधिक महत्वपूर्ण (पी <0.01) थे। रैंक सहसंबंध के अनुमानों से गोवंशों की श्रेणी में समानता का पता लगाया। इसके आधार पर विभिन्न तरीकों द्वारा गोवंशों में अनुमानित दृढ़ता उपायों को स्थापित किया गया।

Semen Production

The overall average semen volume (ml), sperm concentration (million/ml), initial motility (%) and post thaw motility (%) were 5.14, 932.25, 53.43 and 37.57, respectively in 4076 ejaculates collected from 112 Frieswal bulls during April-December, 2019. Total 309 semen samples with more than 50% post-thaw motility were frozen to produce 63147 semen doses from 55 bulls.

इस अवधि में फ्रीजवाल नस्ल के 112 सांडों से प्राप्त वीर्य स्खलन के कुल 4076 नमूनों का आंकलन किया गया जिसमें औसत वीर्य आयतन (मिली), शुक्राणु सांद्रता (मिलियन/मिली), आरंभिक शुक्राणु गतिशीलता (%) और विगलन पश्चात् गतिशीलता (%) क्रमशः 5.14, 932.25, 53.43 एवं 37.57 पायी गयी। 55 सांडों के 50% से अधिक विगलन पश्चात् गतिशीलता (पी.टी.एम.) वाले 309 नमूनों से वीर्य की कुल 63147 मात्राएँ तैयार की गयी।

The overall average semen volume (ml), sperm concentration (million/ml), initial motility (%) and post thaw motility (%) were 3.75, 825.26, 52.67 and 36.31, respectively in 266 ejaculates collected from 4 Sahiwal bulls. Total 3051 semen doses were frozen during the reported period from the semen ejaculates of 3 bulls.

साहीवाल नस्ल के चार सांडों से प्राप्त 266 वीर्य स्खलन के नमूनों का औसत आयतन (मिली), शुक्राणु सांद्रता (मिलियन/मिली), आरंभिक शुक्राणु गतिशीलता (%) और विगलन पश्चात् गतिशीलता (%) क्रमशः 3.75, 825.26, 52.67 और 36.31 पाया गया। इस अवधि में साहीवाल नस्ल के तीन सांडों से वीर्य की 3051 मात्राएँ तैयार की गयी।

The younger Frieswal bulls (26-36m) donated



significantly least semen volume but with higher spermatozoa concentration. Middle age group bulls (49-60m) donated significantly highest semen volume but lower sperm concentration. Age had no significant effect on average initial sperm motility, however, post-thaw motility reduced significantly in bulls aged more than 60 m of age.

युवा फ्रीजवाल सांडों (26–36 माह) से प्राप्त वीर्य का आयतन सार्थक रूप से न्यूनतम परन्तु अधिक शुक्राणु सांद्रता युक्त था। इसके विपरीत मध्यम आयु वर्ग (49–60 माह) के सांडों से उत्पन्न वीर्य का आयतन सार्थक रूप से अधिकतम परन्तु न्यून शुक्राणु सांद्रता युक्त था। शुक्राणुओं की आरंभिक गतिशीलता पर सांडों की आयु का कोई विशेष प्रभाव नहीं पाया गया लेकिन 60 महीने से अधिक आयु के सांडों के वीर्य में विगलन पश्चात् शुक्राणु गतिशीलता सार्थक रूप से कम पायी गयी।

All the serum samples of 177 Frieswal bulls tested were found negative for brucellosis but 119 samples were found sero-positive for IBR. The samples of preputial wash of 99 bulls tested for trichomoniasis and vibriosis were found negative. The frozen semen samples (396) tested for IBR were also found negative.

फ्रीजवाल सांडों के रक्त के सभी नमूने (177) ब्रुसेलोसिस से मुक्त पाए गए जबकि 119 नमूने आई बी आर ग्रसित पाए गए। शिश्न गुहा के प्रक्षालन के सभी नमूने (99) ट्राईकोमोनिएसिस तथा विब्रिओसिस से मुक्त पाए गए। हिमीकृत वीर्य के सभी नमूने (396) आई बी आर से मुक्त पाए गए।

Frozen semen samples from 99 breeding bulls were evaluated for quality parameters. The per cent progressive motility following thawing at 0, 30 and 60 minutes of incubation at 37°C was 50.80, 42.52 and 34.39, respectively. The plasma membrane integrity (%) and acrosome integrity (%) were 50.40 and 72.29, respectively. The average sperm concentration per 0.25 ml straw was 20.79 million. When examined these frozen semen samples, the mean bacterial load per ml was 419.15 CFU and none of the samples had bacterial load of more than 5000 CFU/ml. No bacterial growth was observed in 18.18% samples.

फ्रीजवाल सांडों के 99 हिमीकृत वीर्य के नमूनों की जांच गुणवत्ता मापदंडों हेतु की गयी, जिसमें 37°C तापमान पर 0, 30, एवं 60 मिनट के ऊष्मायन काल पश्चात् शुक्राणुओं की गतिशीलता क्रमशः 50.80, 42.52 एवं 34.39 प्रतिशत पायी गयी। प्लाज्मा झिल्ली एवं एक्रोजोम की अखंडता क्रमशः 50.40, 72.29 प्रतिशत थी।

प्रति 0.25 मिली स्ट्रॉ शुक्राणु सांद्रता 20.79 मिलियन थी। जांचे गए इन सभी हिमीकृत वीर्य नमूनों में औसत जीवाणु भार 419.15 सी. एफ. यू. प्रति मिली था और किसी भी नमूने में जीवाणु भार 5000 सी. एफ. यू. प्रति मिली से अधिक नहीं पाया गया। इनमें से 18.18% नमूने जीवाणु रहित पाए गए।

The average percent live sperms, intact acrosome and abnormalities of the head, mid piece and tail were 61.75, 70.10, 12.64, 7.46 and 3.59, respectively in the neat semen of 25 newly introduced bulls for semen collection. The neat semen samples of problem bulls (14) had 52.91% live sperms and 37.02% total sperm abnormalities.

वीर्य संग्रह में लाये गए 25 युवा सांडों के वीर्य के नमूनों में जीवित शुक्राणु, अक्षत एक्रोजोम एवं सिर, मध्य भाग व पूंछ सम्बन्धी शुक्राणु असामान्यताएँ क्रमशः 61.75, 70.10, 12.64, 7.46, 3.59 प्रतिशत पाई गयी। समस्याग्रस्त सांडों (14) के वीर्य के नमूनों में जीवित शुक्राणु 52.91% एवं कुल शुक्राणु असामान्यताएँ 37.02% थी।

The microorganisms belonging to *Staphylococcus aureus*, *Staphylococcus epidermidis*, *Proteus*, *Klebsiella*, *Bacillus cereus*, *Bacillus subtilis* and *Actinomyces* spp were identified in the semen samples. The antibiotic sensitivity testing of the bacterial isolates revealed that most of the bacterial isolates were sensitive to gentamicin and were resistant to benzyl penicillin.

वीर्य के नमूनों में विभिन्न प्रकार के जीवाणुओं जैसे स्टैफाइलोकॉकस औरियस, स्टैफाइलोकॉकस एपिडरमिडिस, प्रोटियस, क्लैबसियेला, बेसिलस सबटिलिस, बेसिलस सिरियस एवं एक्टिनोमायिसिस इत्यादि की पहचान की गयी। इन जीवाणुओं के एंटीबायोटिक संवेदनशीलता परीक्षण करने पर पाया गया कि अधिकतर जीवाणु जेंटामायिसिन के लिए संवेदनशील तथा बेंजाइल पेनिसिलिन के लिए प्रतिरोधी थे।

Microbial load had significant negative correlation with HOST, acrosome integrity and Live sperm concentration while positive correlation with sperm abnormalities.

वीर्य में जीवाणु भार एवं गुणवत्ता मापदंडों के सांख्यिकीय विश्लेषण पर होस्ट, एक्रोजोम एवं जीवित शुक्राणु संख्या नकारात्मक तथा शुक्राणु अनियमितताएं सकारात्मक तौर से सह-सम्बंधित पाए गए।

Scrotal thermal profile and semen quality of Frieswal bulls managed under two different designs of sheds were assessed during hot and humid

season. Scrotal thermal gradient was significantly higher ($p < 0.05$) in bulls kept in North-South (NS) oriented than in the bulls kept in East-West (EW) oriented sheds during afternoon period, however, no difference was observed between both shed bulls during morning period.

दो भिन्न-भिन्न प्रकार के बाड़े में रखे गए फ्रीजवाल सांडों की अंडकोष तापीय रूपरेखा और वीर्य गुणवत्ता का विश्लेषण वर्षा ऋतु के समय किया गया। अपराह्न के समय उत्तर-दक्षिण दिशा वाले बाड़े के सांडों में अंडकोष तापीय प्रावण्य पूर्व-पश्चिम दिशा वाले बाड़े के सांडों की अपेक्षा सार्थक रूप से अधिक पाया गया जबकि पूर्वाह्न के समय दोनों बाड़े के सांडों में कोई सार्थक अंतर नहीं पाया गया।

Mean semen volume, sperm concentration/ml of semen and initial sperm progressive motility were significantly ($p < 0.05$) higher in NS bulls than the EW bulls. Total sperm abnormalities including head, mid piece and tail were within the normal range without any difference between two groups.

औसत वीर्य आयतन, शुक्राणु सांद्रता / मिली, आरंभिक शुक्राणु गतिशीलता सार्थक रूप से उत्तर-दक्षिण दिशा वाले बाड़े के सांडों में पूर्व-पश्चिम दिशा वाले बाड़े के सांडों की अपेक्षा अधिक पाए गए। कुल शुक्राणु असामान्यताएं शीर्ष, मध्य व पूछ भाग सहित दोनों समूहों में बिना किसी भेद के सामान्य अनुक्रम में पाई गईं।

The findings of studies on cryodamages of bull spermatozoa showed that glutathione at 10 mM concentration had better cryopreservation during freezing and thawing process with respect to sperm motility, HOST and acrosome reaction. However, alfa-tocopherol at 5 mM concentration minimized bull spermatozoa cryodamages during freezing and thawing process.

सांड के शुक्राणुओं के शीताघात के अध्ययनों से परिणाम निकला कि हिमीकरण एवं विगलन के दौरान वीर्य तनुकारक में ग्लूटाथियोन 10 एम. एम. की सांद्रता ने शुक्राणु गतिशीलता, एच. ओ. एस. टी., और एक्रोसोम प्रतिक्रिया के सन्दर्भ में उत्तम शीतसंरक्षण प्रदान किया। जबकि हिमीकरण एवं विगलन के दौरान अल्फा-टोकोफेरॉल की 5 एम. एम. की सांद्रता पर सांड के शुक्राणुओं में शीताघात न्यून पाए गए।

Augmentation of Reproductive Efficiency

In repeat breeding cows, higher conception rate was observed by administration of 1500 IU hCG (58.33%) at 2nd AI than single injection of GnRH (50%) at 1st AI of oestrus. The early resumption of cyclicity with oestrus induction (30-

50 days post-partum) and higher conception rate (66.66%) was achieved by uterine douching along with administration of GnRH (10ug) followed by prostaglandin injection at day 11-14 as post-partum fertility management in cattle.

रिपीट ब्रीडर गायों में मदकाल के द्वितीय कृत्रिम गर्भाधान (58.33%) के समय 1500 आई. यू. hCG के इंजेक्शन लगाने से प्रथम कृत्रिम गर्भाधान (50.00%) के समय GnRH के इंजेक्शन की तुलना में अधिक गर्भधारण दर पाई गईं। प्रसवोत्तर (30-50 दिन) प्रजनन प्रबंधन हेतु GnRH (10 ug) के इंजेक्शन सहित गर्भाशय की सफाई और उसके 11-14 दिन पश्चात् प्रोस्टाग्लैंडीन के इंजेक्शन द्वारा गायों में मदकाल अनुगमन एवं उसकी चक्रीयता का शीघ्र पुनारारंभ और अधिक गर्भधारण दर (66.66%) पाई गईं।

Improvement of Cattle through Nutritional Manipulation

The feeding system based on paddy straw, wheat bran, maily (Sugarcane juice scum with 19.39% CP) and kutta (a brewery industry by-product with 45.50% CP) provided economical balanced ration to crossbred cows and buffaloes in Sardhana tehsil of Meerut district.

मेरठ जनपद की सरधना तहसील में धान की पुआल, गेहूं का चोकर, मैली (गुड़ उद्योग का उपोत्पाद, 19.39% क्रूड प्रोटीन) और जौ के कुट्टे (मध्य उद्योग का उपोत्पाद, 45.50% क्रूड प्रोटीन) पर आधारित पशु आहार पद्धति संकर नस्ल की गायों व भैंसों के संतुलित आहार हेतु किफायती पायी गईं।

The feed samples (141) received from different Military Farms, and other stakeholders were analysed for proximate principles in Animal Nutrition laboratory of the institute during the period reported upon.

रिपोर्ट की अवधि के दौरान विभिन्न सैनिक प्रक्षेत्रों एवं हितधारकों से प्राप्त पशु आहार के नमूनों (141) का संस्थान की पशु पोषण प्रयोगशाला में प्रोक्सिमेट प्रिंसिपल्स के लिए विश्लेषण किया गया।

Farmers First Project

During the report period, a total of 113 outreach visits were conducted covering 2263 animals belonging to 925 farmers through mobile ambulatory clinic services in FFP and MGMG adopted villages. Apart from this 07 animal health and fertility Camps and kisan goshties were also organised in different villages. Different activities



related to farmers' field including reproduction management in dairy animals, prevention and control of mastitis, vermicomposting as waste management and demonstration of integrated farming system were carried out under Farmer FIRST programme.

इस अवधि के दौरान FFP एवं MGMG के तहत गोद लिए हुए गाँवों में सचल पशु चिकित्सालय सेवा के माध्यम से 925 किसानों के 2263 पशुओं के उपचार सहित कुल 113 प्रक्षेत्र भ्रमण आयोजित किये गए. इसके अतिरिक्त विभिन्न गाँवों में 07 पशु स्वास्थ्य एवं प्रजनन शिविर तथा किसान गोष्ठियों का आयोजन भी किया गया। फार्मर फर्स्ट परियोजना के अन्तर्गत किसान प्रक्षेत्र उपयोगी विभिन्न गतिविधियाँ जिनमें डेयरी पशुओं में प्रजनन प्रबंधन, थनैला की रोकथाम और नियंत्रण, अपशिष्ट प्रबंधन के रूप में वर्मीकम्पोस्टिंग और समन्वित कृषि प्रणाली का प्रदर्शन आयोजित की गई.

Water Budgeting

Water budgeting at Military Dairy Farm, Meerut indicated smaller direct water footprint for milk in Frieswal than in Sahiwal cows. Though the quantity of water utilized for drinking purpose was similar in both the genetic groups, average daily milk yield was higher in Frieswal than in Sahiwal cows.

मिलिट्री डेरी फार्म, मेरठ में जल के आय व्ययन के विश्लेषण से ज्ञात हुआ कि फ्रीजवाल नस्ल की गायों में दूध के लिए प्रत्यक्ष जल पदछाप साहीवाल गायों की अपेक्षा छोटे थे। यद्यपि दोनों नस्लों में जल ग्रहण की मात्रा समान थी तथापि फ्रीजवाल गायों का दैनिक दुग्ध उत्पादन साहीवाल गायों की तुलना में अधिक था।

A comparison was made to assess the water utilization on washing of breeding bulls through hose pipe and customized animal washing system. The water utilized on washing of bulls kept on pucca/cemented+kachcha floor was significantly higher ($p<0.05$) than that of bulls kept on pucca/cemented under hose pipe and animal washing system. The bulls of both the sheds were washed with significant ($p<0.05$) lesser water quantity in animal washing system than using hose pipe.

प्रजनन सांडों को होस पाईप तथा विशिष्ट रूप से निर्मित पशु स्नान व्यवस्था द्वारा नहलाने पर जल के उपयोग में अंतर जानने हेतु एक तुलनात्मक अध्ययन किया गया। पक्के व कच्चे संयुक्त फर्श पर रखे गए सांडों को होस पाईप तथा विशिष्ट रूप से निर्मित पशु स्नान व्यवस्था द्वारा नहलाने पर जल का उपभोग केवल पक्के

फर्श पर रखे गए सांडों की अपेक्षा सार्थक रूप से अधिक था। दोनों प्रकार के बाड़े में रखे गए सांडों को विशिष्ट रूप से निर्मित पशु स्नान व्यवस्था द्वारा नहलाने पर जल का उपभोग होस पाईप से नहलाने की अपेक्षा सार्थक रूप से कम था।

The use of trigger shut off on hose pipe reduced water requirement for floor cleaning significantly ($p<0.05$) than cleaning with hose pipe as such. For cleaning of floor, average 195.05 and 289.90 L service water/bull/day was utilized with trigger shut off and hose pipe, respectively.

होस पाईप में ट्रिगर शट-ऑफ के प्रयोग से पशु बाड़े के फर्श की धुलाई में केवल होस पाईप की तुलना में सार्थक रूप से जल की खपत में कमी पाई गई। फर्श की धुलाई में औसतन 195.05 व 289.90 लीटर जल खर्च क्रमशः होस पाईप में ट्रिगर शट-ऑफ तथा केवल होस पाईप के प्रयोग से हुआ।

Extension activities

Baseline survey of SCSP adopted villages in Uttarakhand

A field survey was conducted to review the animal production system of Bilkhet, Dhuroli and Bunga villages in Kaljikkhal block of Pauri Garhwal district. To generate baseline information, the data were collected from 113 dairy farmers under these villages.

- The study revealed that most (76.12%) of dairy farmers are marginal (Up to 2 acres of land holding) farmers and own small herd size (up to 3 milch cattle).
- Majority (66.37%) of dairy farmers was getting 1-4 kg milk /day from their animals and maximum number of cattle owners (93.81%) bred their cows with natural service by stray Badri / nondescript bulls.
- Majority of the respondents followed vaccination (87.61%) and deworming (60.18%) to their cattle.
- It was observed that 86.73 % of respondents provided concentrate mixture to their animals; however, only 8.85 % respondents provided mineral mixtures.
- The data indicated that water scarcity (100%), fodder deficiency (91.15%), poor AI facilities (59.56%), inappropriate veterinary services (78.76%) and low milk yield (81.42%) are some major problems of dairy farmers.

उत्तराखंड में SCSP के अंतर्गत चयनित गांवों का आधारभूत सर्वेक्षण

पौड़ी गढ़वाल जिले के कल्जीखाल ब्लाक के बिल्खेत, धुरोली और बूंगा गांवों में पशुधन उत्पादन तंत्र की समीक्षा करने के लिए एक क्षेत्र सर्वेक्षण किया गया। आधारभूत सूचना एकत्र करने के लिए गांवों के 113 पशुपालकों से आंकड़े इकट्ठे किये गये।

- अध्ययन से पता चला कि 76.12 प्रतिशत किसान सीमांत किसान (2 एकड़ से कम कृषि भूमि) की श्रेणी में आते हैं और उनके पास पशुओं का छोटा समूह (तीन दुधारू गायें तक) हैं।
- अधिकतर पशुपालकों (66.37%) को उनके पशुओं से 1-4 किलोग्राम तक दूध मिलता है और अधिकतर पशुपालक (93.81%) अपने पशुओं का प्रजनन आवारा बदरी या अवर्गीकृत सांडों से प्राकृतिक रूप में करवाते हैं।
- अधिकतर पशुपालक अपने पशुओं का टीकाकरण (87.61%) करवाते हैं और पशुओं को पेट के कीड़े मारने की दवा (60.18%) देते हैं।
- अधिकतर पशुपालक (86.73%) अपने पशुओं को रातिब मिश्रण खिलाते हैं जबकि मात्र 8.85% पशुपालक अपने पशुओं को खनिज मिश्रण खिलाते हैं।
- आंकड़ों से पता चलता है कि उस क्षेत्र में पानी की कमी (100%), चारे की कमी (91.15%), कृत्रिम गर्भाधान सुविधाओं की कमी (59.56%), पशु चिकित्सा सुविधाओं की कमी (78.76%) और कम दुग्ध उत्पादन (81.42%) पशुपालकों की प्रमुख समस्याएं हैं।

Organization of National Conference

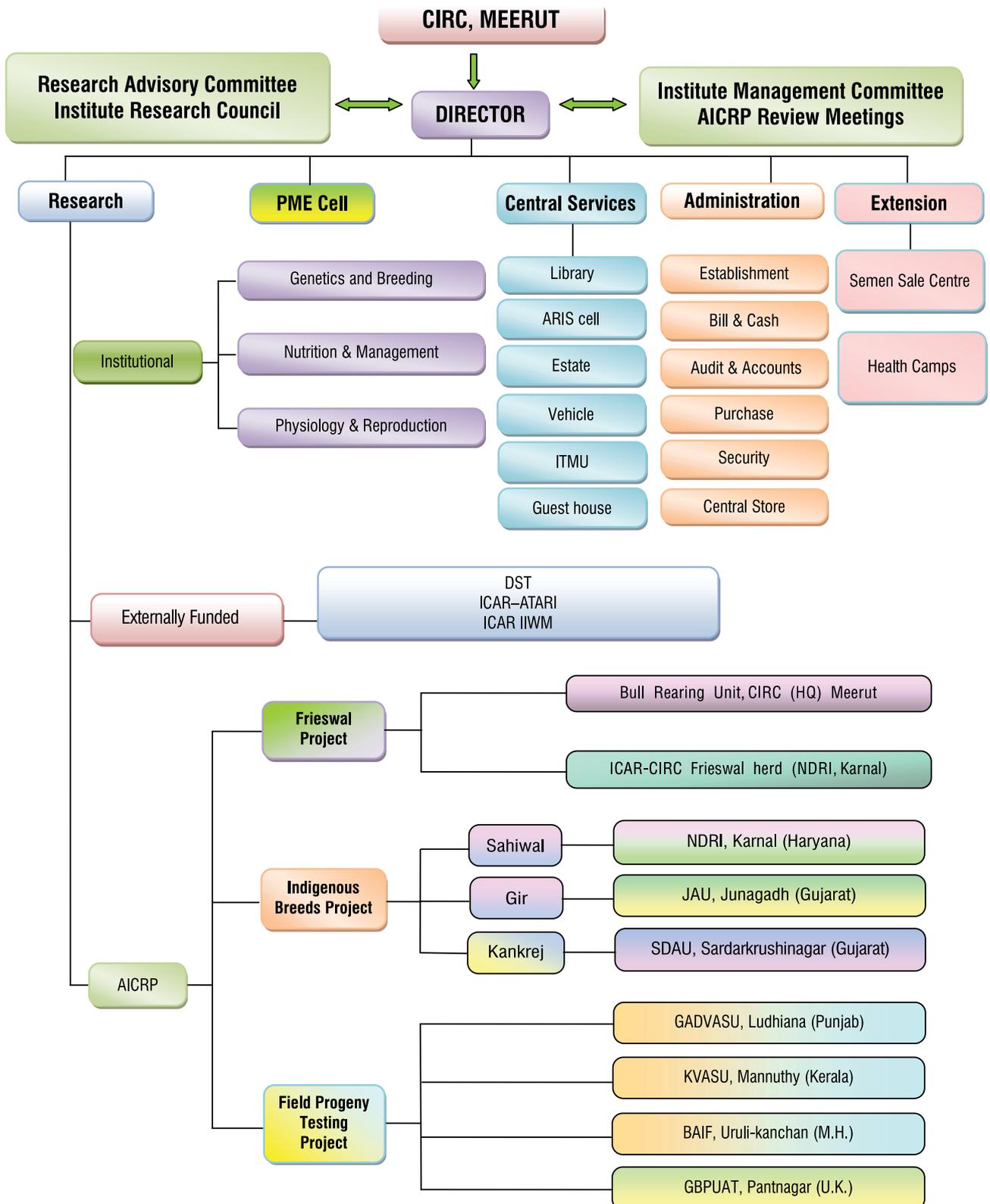
The institute organized National Conference on Livelihood Improvement through Sustainable Livestock Production during 3-4 November, 2019 in collaboration with the Pashu Poshan Kalyan Samittee. The conference witnessed by more than 300 participants was inaugurated by Dr. Trilochan Mohapatra, Secretary (DARE) and Director General (ICAR) as Chief Guest. Two kits viz. ICAR-CIRC - CATTLE BLAD Diagnostic Assay Kit for detection of carrier bulls of Bovine Leukocyte Adhesion Deficiency (BLAD), a genetic disease and ICAR-CIRC - COWCAM Assay Kit to detect the adulteration of cow milk even at 1% level with camel milk or vice-versa were also released during the occasion.

राष्ट्रीय सम्मेलन का आयोजन

संस्थान में पशुपोषण कल्याण समिति के सहयोग से 3-4 नवंबर, 2019 के दौरान आजीविका सुधार हेतु सतत पशुधन उत्पादन पर राष्ट्रीय सम्मेलन का आयोजन किया गया। सम्मेलन का उद्घाटन 300 से अधिक प्रतिभागियों की उपस्थिति में मुख्य अतिथि डॉ. त्रिलोचन महापात्र, सचिव (DARE) और महानिदेशक (ICAR) द्वारा किया गया। इस अवसर पर दो रसायन समूहों (किट्स) जैसे एक अनुवांशिक बीमारी Bovine Leukocyte Adhesion Deficiency (BLAD) के वाहक सांडों की जांच हेतु ICAR-CIRC - CATTLE BLAD निदान जांच और दूसरा गाय के दूध में ऊँटनी अथवा ऊँटनी के दूध में गाय के दूध की कम से कम 1% स्तर पर भी मिलावट की जाँच हेतु ICAR-CIRC - COWCAM जांच रसायन समूह का लोकार्पण किया गया।



Organogram



STAFF POSITION (as on 31.12.2019)

| S. No. | Category | Sanctioned | Filled | Vacant |
|--------|----------------|------------|--------|--------|
| 1. | R.M.P. | 01 | 00 | 01 |
| 2. | Scientific | 38 | 23 | 15 |
| 3. | Technical | 08 | 08 | 00 |
| 4. | Administrative | 14 | 11 | 03 |
| 5. | Supporting | 09 | 09 | 00 |
| | Total | 70 | 51 | 19 |

**FINANCIAL STATEMENT
ICAR-CENTRAL INSTITUTE FOR RESEARCH ON CATTLE, MEERUT**

**Budget Information & Revenue Receipt for April-December, 2019 for ICAR Schemes
ICAR-Central Institute for Research on Cattle, Meerut (Main Scheme)**

| Head | Budget (Rs) RE (2019-20) | Expenditure (Rs) w.e.f. 01.4.2019 to 31.12.2019 |
|------------------------------------|--------------------------|--|
| Grant in Aid-Capital | 7400000 | 2163183 |
| Grant in Aid-Salaries | 87500000 | 72660201 |
| Grant in Aid- General | | |
| (i) Pension & Retirement Benefits | 5400000 | 1883585 |
| (ii) Other Contingency Expenditure | 35800000 | 20641759 |
| Grand Total (including SCSP) | 136100000 | 97348728 |
| SCSP Expenditure | | 2487000 |
| Revenue Generation | | 627567 |

AICRP on Cattle Scheme

| Head | Budget (Rs) | Expenditure (Rs) |
|--|-------------|------------------|
| Grant in Aid-Capital | 6125000 | 3600000 |
| Grant in Aid-Salaries | 23495000 | 17668000 |
| Grant in Aid- General(Other Contingency Expenditure) | 62200000 | 38764000 |
| Grand Total | 91820000 | 60032000 |

ITMU Project (ICAR HQ)

| Head | Budget (Rs) | Expenditure (Rs) |
|---------------------------------------|-------------|------------------|
| Grant in Aid-Capital | | |
| Grant in Aid- General(Operation Cost) | 450000 | 255206 |
| Total | 450000 | 255206 |

**CRP on Water IIWM, Bhubaneswar**

| Head | Budget (Rs) | Expenditure (Rs) |
|---------------------------------------|-------------|------------------|
| Grant in Aid- General(Operation Cost) | | |
| Research & Operational | 660000 | 288352 |
| TA | 60000 | 634 |
| Other Miscellaneous | 10000 | |
| Grant in Aid- General(SCSP) | 100000 | 24001 |
| TOTAL | 830000 | 312987 |

Farmer's First Programme (FFP), ATARI, Zone-IV, Kanpur

| Head | Budget (Rs) | Expenditure (Rs) |
|---------------------------------------|-------------|------------------|
| Grant in Aid-Capital | 250000 | 0 |
| Grant in Aid- General(Operation Cost) | | |
| Research & Operational | 1300000 | 721186 |
| TA | 100000 | 10479 |
| HRD | 75000 | 45000 |
| Other Administrative Expenses | 50000 | |
| Total | 1775000 | 776665 |

**Budget Information for April-December, 2019 for Sponsored Projects/Schemes
MANAGE, Hyderabad sponsored training programme for Certified Livestock Advisor**

| Head | Budget (Rs) | Expenditure (Rs) |
|---------------------------------------|-------------|------------------|
| Grant in Aid- General(Operation Cost) | | |
| Operational Expenses | 342500 | 342500 |
| TA | 25000 | 25000 |
| Contingencies | 15000 | 15000 |
| Total | 382500 | 382500 |

**Department of Science & Technology (SERB), New Delhi (DST Young Scientist Project)
Dr. Rani Singh, Women Scientist**

| Head | Budget (Rs) | Expenditure (Rs) |
|---------------------------------------|-------------|------------------|
| Grant in Aid- General(Operation Cost) | | |
| Manpower | 302435 | 302435 |
| Consumable | 252538 | 252538 |
| TA | 20110 | 20110 |
| Contingencies/ Other cost | 42372 | 42372 |
| Total | 617455 | 617455 |

Department of Science & Technology (SERB), New Delhi (DST Project) Dr. Rajib Deb, Scientist

| Head | Budget (Rs) | Expenditure (Rs) |
|---------------------------------------|-------------|------------------|
| Grant in Aid- General(Operation Cost) | | |
| TA | 89413 | 89413 |
| Total | 89413 | 89413 |

Research Achievements

I. ALL INDIA COORDINATED RESEARCH PROJECT ON CATTLE

A. Studies on Genetic Aspects of Holstein-Sahiwal Crossbreds-Frieswal Project

Frieswal is a crossbred cattle having 5/8 Holstein Friesian and 3/8 Sahiwal blood, developed by ICAR-Central Institute for Research on Cattle, Meerut in collaboration with Ministry of Defence. The Frieswal project envisages evolving National Milch Breed "Frieswal", a Holstein- Sahiwal cross, yielding 4000 kg of milk with 4% butter fat in a mature lactation of 300 days. The evolution of Frieswal has been achieved by utilizing the existing crossbred herds available at 36 Military Farms located in various agro-climatic regions of the country.

During Animal Review Meet held in 2018, it was decided that ICAR-CIRC will establish a herd of Frieswal cow by selecting elite Frieswal cows as bull mother farm for production of young male calves for testing in Field Progeny Testing Programme at four different centres. The male calves born from mating of elite cows with ranked bull semen. These young bulls will be reared at Bull Rearing Unit at Meerut for collection of semen, storage and distribution. The ranked bull semen will also be used at bull mother farm maintained at ICAR-NDRI, Karnal for production of young bulls.

Selection of Frieswal animals

A total of 208 Frieswal animals were selected from Military Farm Meerut on the basis of body condition, reproductive health records and milk records. These animals were transferred to ICAR-NDRI during April to August 2019 after testing for all designated diseases of cattle. As on 31.12.2019, the herd strength of Frieswal animals at ICAR - NDRI, Karnal was 234 including 115 adult cows, 92 heifers and 27 calves. During 2019, 21 Frieswal calves born (12 female and 9 male) in the herd are being reared as young bulls.

Herd strength at BRU, Meerut

The strength of Bull Rearing Unit at Meerut

was 175, including 158 adult and 17 young stocks. Since inception, based on breed characteristics and physical conformity 1655 male calves born out of nominated mating were received/ available at BRU Meerut for selection of young male calves for future breeding. A total of 36 bull calves were received/ due to receive at Bull Rearing Unit during April 2019 to December 2019. During the year, 7319 doses have been distributed to different Military Farms. Frieswal has been declared and released as a breed by Hon'ble DG on 3rd November, 2019 and subsequently a trademark was filed with reference number No. 4361504.



Semen production and sale

During the period under report, a total of 63147 semen doses of Frieswal bulls were produced totaling to 4695266 doses since inception of the project. As on 31.12.2019, a total of 2055322 semen doses are available in the stock. This year 22829 doses have been sold to para-vets, State Animal Husbandry Departments, Livestock Development Boards, State Agriculture Universities and a revenue of Rs. 3,28,180/- was generated. Beside this, revenue of Rs. 36,72,788/- has also been generated through sale of milk from the CIRC cattle herd.



B. Genetic Improvement of Crossbred Cattle Under Field Conditions- Field Progeny Testing Project

Evaluation of bulls through progeny testing and their extensive use has been a major source of genetic improvement in dairy animals. So far, 334 young HF crossbred bulls (Frieswal Bull) have been inducted for test mating in different sets at four units. Daughters born from 12th sets of bull have completed their first lactation milk yield and have evaluated. A total of 205 bulls have been evaluated on the basis of first lactation milk yield of their daughters. Through the intervention of Field Progeny Testing programme of this Institute the

average first lactation 305 days milk yield of the Frieswal progenies in the adopted villages of FPT project has been increased by 67.76 % in KVASU, 41.95 % in GADVASU, 12.41 % in BAIF and 36.07 % in GBPUA&T unit. Average age at first calving (AFC) of Frieswal progenies has been reduced by 15.77 % in KVASU, 31.91 % in GADVASU, 18.79 % in BAIF and 14.20 % in GBPUA&T unit. The details on the comparative performance of crossbred cattle in four different FPT units during the year 2019 are summarized in Table 1.

Table 1. Comparative performance of different units of FPT project during the reporting period (1.1.2019 to 31.12.2019)

| Particulars | GADVASU Ludhiana | KVASU Thrissur | BAIF Pune | GBPUAT Pantnagar |
|---|---------------------|-------------------|--------------|---------------------|
| Total Artificial inseminations | 6225 | 5569 | 5837 | 4715 |
| Pregnancies confirmed | 2568 | 2275 | 2004 | 2517 |
| Conception rate % | 48.5 | 43.9 | 45.0 | 59.8 |
| Total calving | 1813 | 1425 | 1651 | 2216 |
| Female calves born | 897 | 715 | 784 | 1049 |
| Female calves reached AFC | 454 | 235 | 231 | 245 |
| Female calves completed first lactation | 442 | 165 | 180 | 211 |
| Average 305 days milk yield (kg) | 3787.3 | 3232.9 | 3228.3 | 3326.4 |
| Average AFC (days) | 1063.7 | 1045.5 | 937.0 | 1083.6 |
| Total loss of data (%) | 23.6 | 6.39 | 22.0 | 22.5 |

Guru Angad Dev Veterinary & Animal Sciences University, Ludhiana

The GADVASU unit of Field Progeny Testing programme covers a population of about 13780 cows and 5133 breedable heifers. Artificial insemination is undertaken through 32 A.I. centres in Ludhiana district. Four of these centres are operated by Punjab State Department of Animal Husbandry and others by trained inseminators. During the year, 6225 artificial inseminations were conducted with frozen semen of 26 bulls of 15th set and 25 bulls of 16th set with an overall conception rate of 48.5%. The average first lactation 305 days milk yield and age at first calving of daughters completed their first lactation in the reporting period (2019) were 3787.3 kg and 1063.7 days, respectively. The per cent loss of data was 23.6 and

the sale of animals was the major cause of the loss of data.

So far 184, 154, 397, 361, 361,278, 351, 326, 647, 576, 677,526 and 58 daughters of 2nd, 3rd, 4th, 5th, 6th, 7th, 8th, 9th, 10th, 11th, 12th, 13th and 14th set of test bulls completed their first lactation and their average 305 days milk yields were 2697.8±40.1, 2827.09±48.7, 2878.7±25.5, 2896.1±26.0, 2855.9±25.9, 3051.8±24.5, 3305.4±28.9, 3556.6±31.2, 3714.7±22.9, 3751.8±22.9, 3770.7±21.4, 3805.7±23.5 and 3829.6±55.9 kg, respectively. A total of 334 bulls have so far been introduced in 16 different sets and 154508 inseminations done in which 20759 female progenies born of which 6607 have reached age at first calving (Table-2).

Table 2. Information regarding different sets of Bulls (GADVASU)

| Set No. | Date of start | Total bulls used | Total inseminations | Total A. Is. followed | Pregnancies confirmed | Conception rate % | Followed for calving | Females calves | |
|--------------|---------------|------------------|---------------------|-----------------------|-----------------------|-------------------|----------------------|----------------|-------------|
| | | | | | | | | Born | Reached AFC |
| III | 1.04.95 | 18 | 7595 | 7355 | 3065 | 41.7 | 3000 | 855 | 227 |
| IVa | 1.01.97 | 10 | 5150 | 4865 | 2132 | 43.8 | 2000 | 789 | 210 |
| IVb | 1.01.99 | 23 | 18006 | 17159 | 8258 | 48.1 | 8000 | 1844 | 562 |
| V | 16.12.01 | 30 | 12548 | 11504 | 5720 | 49.7 | 5720 | 1368 | 490 |
| VI | 1.04.03 | 22 | 10409 | 10154 | 4362 | 43.0 | 4362 | 1497 | 478 |
| VII | 1.2.05 | 25 | 8265 | 8105 | 3476 | 42.9 | 3476 | 1181 | 359 |
| VIII | 1.8.06 | 22 | 9710 | 9710 | 3999 | 41.1 | 3999 | 1120 | 448 |
| IX | 1.1.08 | 16 | 9611 | 9611 | 3898 | 40.6 | 3898 | 1186 | 461 |
| X | 1.7.09 | 24 | 14581 | 14581 | 5679 | 38.9 | 5679 | 1671 | 885 |
| XI | 1.3.11 | 20 | 12971 | 12971 | 5604 | 43.2 | 5604 | 2072 | 688 |
| XII | 1.8.12 | 28 | 15662 | 15662 | 7008 | 44.7 | 7008 | 2500 | 770 |
| XIII | 1.2.14 | 15 | 6662 | 6662 | 3039 | 45.6 | 3039 | 1321 | 741 |
| XIV | 1.8.15 | 30 | 8299 | 8299 | 3851 | 46.4 | 3851 | 1571 | 285 |
| XV | 1.6.17 | 26 | 10715 | 10715 | 5043 | 47.1 | 5043 | 1784 | 3 |
| XVI | 1.6.19 | 25 | 4324 | 1131 | 584 | 51.6 | 0 | 0 | 0 |
| Total | | 334 | 154508 | 148484 | 65718 | 44.3 | 64679 | 20759 | 6607 |

In first set of bulls (1995), the average 305-days yield was 2697.8 kg and in 14th set of bulls it was 3829.6 kg indicating a sharp increase of 1131.8 kg milk (41.95 %) in the daughters. The AFC was 1192 days in progenies of first set of bulls (1995) which reduced to 811.6 days in current set showing a sharp decrease of 380.4 days (31.91 %). (Figure 1).

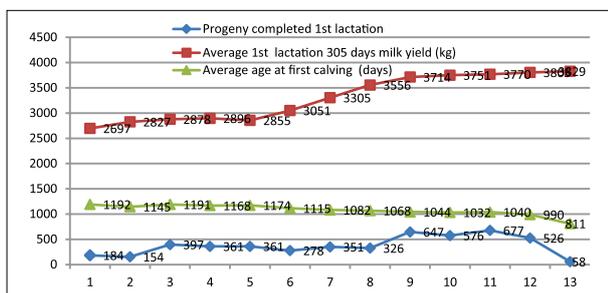


Figure 1. Set wise progeny performance at GADVASU unit since inception

During the year, two calf rallies and eight village level group meetings and awareness programmes were organized to impart knowledge on scientific breeding, feeding, management and health care practices for improving the production performance of their animals. Field Progeny Testing Project has major contribution in changing

the scenario of dairy farming in the adopted villages in Ludhiana district by providing technical knowhow, germplasm and motivation to farmers. The supply semen of high genetic potential test bulls and progeny tested bulls to the farmers in the villages adopted under the Field Progeny Testing Project has helped in improving their economic level. The average first lactation 305 days milk yields of the crossbred progenies in the adopted villages in the year 1993 was 2449.7±57.0 kg. in year 2006 was 2965.5±35.3 and in the year 2011 was 3133.8±38.0. As a result of supply of high quality semen of test bulls, milk yield has increased to 3787.3±25.8 kg. during the year 2019. Some progressive dairy farmers after getting training and superior germplasm from the project have established outstanding crossbred herds with first lactation milk yield of more than 6400 kg and peak yield of more than 42 kg a day.

Socio-economic status of farmers under the Project:

The production performance of the animals according to different categories of farmers (Table 3) showed that the farmers with own fodder production had higher milk yield of their crossbred cows than the cows maintained by



farmers without fodder. Figure 3 depicts land holding pattern of animal owners participating in the project. Crossbred cows maintained by farmers having adequate fodder supply produced 3799.3 ± 26.1 kg during first lactation against 3354.7 ± 123 kg of milk by the farmers having little or no

green fodder supply. Commercial farmers had high milk yield (3792.0 ± 25.9 kg) of their animals than non-commercial farmers (3369.5 ± 202.1). With the availability of remunerative milk prices, commercial farmers give more attention to feeding and management practices.

Table 3. Production performance of the animals according to different categories of farmers:

| Category | No. | Percentage | 1 st lact. 305-days milk yield (kg.) |
|----------------------------|-----|------------|---|
| Overall mean | 442 | 100 | 3787.3±25.8 |
| Feeding System | | | |
| 1. With fodder | 430 | 97.3 | 3799.3±26.1 |
| 2. Without fodder | 12 | 2.7 | 3354.7±123.0 |
| Type of farmer | | | |
| 1. Commercial | 437 | 98.9 | 3792.0±25.9 |
| 2. Non-commercial | 5 | 1.1 | 3369.5±202.1 |
| Education | | | |
| 1. Illiterate | 11 | 2.5 | 3651.8±154.1 |
| 2. Up to primary | 38 | 8.6 | 3686.9±82.5 |
| 3. Up to matric | 328 | 74.2 | 3780.2±30.8 |
| 4. Up to secondary | 47 | 10.6 | 3899.9±70.3 |
| 5. College level | 18 | 4.1 | 3915.0±105.5 |
| Herd size | | | |
| 1. ≤3 | 102 | 23.1 | 3610.6±46.3 |
| 2. 4 to 5 | 109 | 24.7 | 3659.4±42.9 |
| 3. 6 to 10 | 154 | 34.8 | 3850.2±43.1 |
| 4. > 10 | 77 | 17.4 | 4076.4±72.0 |
| Land holding | | | |
| 1. Landless | 15 | 3.4 | 3606.0±137.9 |
| 2. Less than 1 acre | 6 | 1.4 | 3768.8±267.7 |
| 3. 1 to 2 acres | 34 | 7.7 | 3710.0±81.7 |
| 4. 2 to 5 acres | 194 | 43.9 | 3723.6±32.9 |
| 5. 5 to 10 acres | 140 | 31.7 | 3860.5±50.2 |
| 6. > 10 acres | 53 | 11.9 | 3929.7±91.8 |
| Occupation of owner | | | |
| 1. Agric. Farmer | 372 | 84.2 | 3782.0±27.3 |
| 2. Agric. labour | 23 | 5.2 | 3477.0±81.9 |
| 3. Service | 8 | 1.8 | 3737.5±236.9 |
| 4. Business | 4 | 0.9 | 3422.1±214.1 |
| 5. Dairying | 32 | 7.2 | 4131.2±112.9 |
| 6. Others | 3 | 0.7 | 3759.6±342.2 |

Highest milk production (3915.0 ± 105.5 kg) was recorded by owners having college level education. Educated owners have more awareness and practiced dairying on scientific lines for getting higher productivity. (Figure 2).

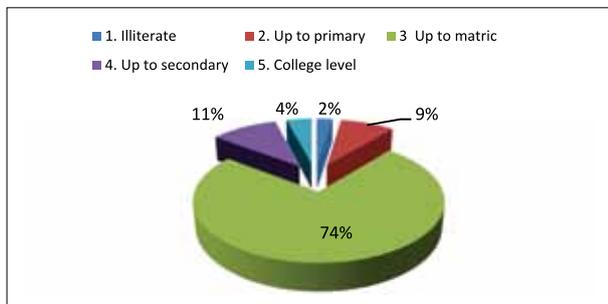


Figure 2. Education Level of Animal Owners participating in the project

The farmers having herd size of more than ten animals had the maximum lactation milk yield of their cows (4076.4 ± 72 kg). It was also observed that animals of the farmers having more than 10 acres of land produced maximum milk (3929.7 ± 91.8 kg). A total of 7.2% of the owners were having dairy as their whole time occupation and the milk production of cows reared by such farmers was 4131.2 ± 112.9 kg which was significantly higher than the milk production of animals owned by agricultural labour, service and businessman.

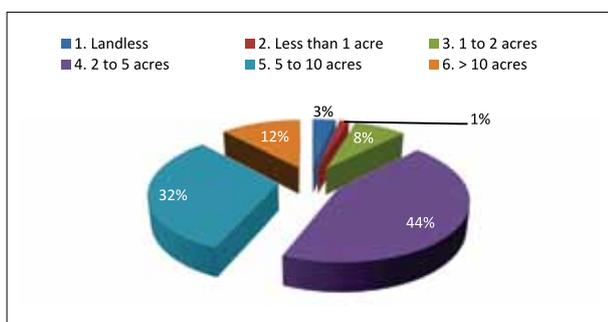


Figure 3. Land holding pattern of Animal Owners participating in the project

The milk production of the cows reared by agricultural farmers (3782.0 ± 27.3 kg) was also higher than agricultural labour, service and business. This could be due to the fact that the agricultural farmers are giving more attention towards dairy farming along with agriculture farming and providing good quality feed, fodder, health care and management to the animals.

Kerala Veterinary and Animal Sciences University Thrissur, Kerala, (KVASU)

Crossbred constitute more than 93% of cattle population of Kerala state as crossbreeding is the accepted breeding policy for genetic improvement of cattle. Continued genetic improvement of the crossbred cattle of the state is attempted through the project. It opens up the availability of genetically superior Frieswal bull semen to the farmers of the state. The progenies born under the project normally produce 450 to 500 kg milk over and above their contemporaries and hence are in high demand. Apart from the genetic improvement of cattle, the farmers are provided with first aid services for their animals and supply of other inputs like dewormers, mineral mixtures, feed and feed supplements etc. The increasing number of inseminations under the project is an indicator for increasing popularity of the scheme under field conditions of Kerala. The first set of bull at KVASU was executed in January 1992. A total of 315 bulls in 16 different sets have so far been inducted in the program. A total of 128234 artificial Inseminations have so far been done in which 10697 female progenies born of which 2686 have reached age at first calving (Table 4).

Table 4. Information regarding different sets of Bulls (KVASU)

| Set No | Date of start | Total bulls used | Total inseminations | Total A Is followed | Pregnancies confirmed | Conception rate (%) | Followed for calving | Female calves | |
|--------|---------------|------------------|---------------------|---------------------|-----------------------|---------------------|----------------------|---------------|-------------|
| | | | | | | | | Born | Reached AFC |
| 1 | 01.01.1992 | 12 | 23351 | 6722 | 2420 | 36 | 1902 | 956 | 319 |
| 2 | 01.04.1994 | 11 | 12817 | 4800 | 1680 | 35 | 1300 | 603 | 240 |
| 3 | 01.07.1995 | 11 | 9331 | 3942 | 1324 | 33.6 | 1065 | 757 | 89 |



| | | | | | | | | | |
|--------------|------------|------------|---------------|--------------|--------------|---------------|--------------|--------------|-------------|
| 4 | 01.11.1998 | 15 | 11750 | 3753 | 1501 | 39.9 | 1489 | 676 | 178 |
| 5 | 01.07.2001 | 17 | 3437 | 3261 | 1136 | 34.8 | 847 | 401 | 139 |
| 6 | 01.07.2003 | 20 | 8173 | 7683 | 2582 | 33.6 | 1689 | 746 | 216 |
| 7 | 01.02.2005 | 24 | 5759 | 5211 | 2281 | 43.7 | 1298 | 597 | 180 |
| 8 | 01.09.2006 | 22 | 5703 | 5514 | 2472 | 44.8 | 1538 | 768 | 160 |
| 9 | 01.02.2008 | 16 | 3393 | 3131 | 1181 | 37.7 | 801 | 394 | 81 |
| 10 | 01.07.2009 | 24 | 5781 | 5612 | 2124 | 37.8 | 1324 | 664 | 162 |
| 11 | 01.04.2011 | 21 | 4820 | 4401 | 2006 | 45.6 | 1280 | 659 | 235 |
| 12 | 01.08.2012 | 28 | 6045 | 5531 | 2357 | 42.61 | 1302 | 642 | 262 |
| 13 | 01.03.2014 | 14 | 5211 | 4850 | 2063 | 41.97 | 1114 | 545 | 252 |
| 14 | 01.07.2015 | 29 | 9650 | 9211 | 4134 | 44.88 | 2446 | 1193 | 173 |
| 15 | 02.08.2017 | 26 | 10735 | 10191 | 4639 | 45.52 | 2193 | 1096 | 0 |
| 16 | 09.08.2019 | 25 | 2278 | 647 | 280 | 43.28 | - | - | - |
| Total | | 315 | 128234 | 84460 | 34180 | 640.76 | 21588 | 10697 | 2686 |

During the period of report, 5569 artificial inseminations were carried out with the overall conception rate as 43.9%. The average first lactation 305 days milk yield and average age at first calving of daughters completed their first lactation in the reporting period (2019) was 3232.99 ± 35.23 kg and 1045.55 ± 11.47 days, respectively. The loss of data in the project was 1.28 % for 13th set, 1.34 % for 14th set and 6.39 % in 15th set of bulls till the end of report period. So far 2112 daughters from first fourteen sets of bulls have completed their first lactation 305 days milk yield. There is a consistent trend of increase in first lactation 305 days milk yield of daughters in subsequent sets of bulls as it was 1958.4 kg in first set (1992) and in current set it was 3285.69 kg showing a sharp increase of 1327.3 kgs milk (67.76 %). A trend of decrease in age at first calving was also observed from 1136.4 days in progenies of first set of bulls (1992) to 957.1 days in current set with a sharp decrease of 179.3 days (15.77 %) (Figure4).

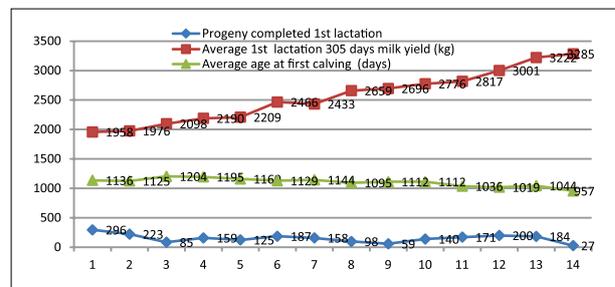


Figure 4. Set wise Progeny Performance at KVASU unit since inception.

The calving under 15th set of bulls has completed. Recording of first lactation milk yield of daughters of 12th set of bulls had completed and 13th set of bulls is under progress. Number of daughters completed their first lactation during the report period was 165 which is 18.71% more than that of last year. During 2019, the project could produce 715 female progenies which is 16.26% more than that of 2018. The age at first calving of progenies

is continued to be significantly lower than that of contemporaries. Inseminations of 16th set of bulls are under progress. The average conception rate of 15th and 16th set of bulls were 45.8 and 43.9 % respectively. Average fat percentages of morning milk of progenies during the period were 3.49, 3.51, and 3.66 during 2nd, 5th and 8th month of lactation, respectively.

Socio-economic status of farmers under the Project

Socio-economic status of 553 dairy farmers owning progeny calved during the period in Thrissur district have been collected and analysed and results are presented in Table 5.

Table 5. Production performance of the animals according to different categories of farmers:

| Category | No. of Observations | Percentage (%) | Average 1 st lact. 305 days milk yield (kg) | |
|----------------------------------|---------------------|----------------|--|-----|
| | | | Average | No. |
| Overall mean | 553 | 100 | 3282.00± 39.03 | 139 |
| Feeding system | | | | |
| 1. With fodder | 184 | 33.27 | 3149.75 | 40 |
| 2. Without fodder | 369 | 66.73 | 3335.43 | 99 |
| Education status of Owner | | | | |
| 1. Illiterate | 4 | 0.72 | 0 | 0 |
| 2. Up to primary | 141 | 25.50 | 3272.43 | 38 |
| 3. Up to matric | 295 | 53.35 | 3238.39 | 74 |
| 4. Up to secondary | 68 | 12.30 | 3458.86 | 21 |
| 5. College level | 45 | 8.14 | 3261.50 | 6 |
| Herd size | | | | |
| 1. ≤3 | 256 | 46.29 | 3244.67 | 66 |
| 2. 4 to 5 | 179 | 32.37 | 3319.72 | 46 |
| 3. 6 to 10 | 97 | 17.54 | 3295.36 | 21 |
| 4. >10 | 21 | 3.80 | 3356.67 | 6 |
| Land holding | | | | |
| 1. Landless | 0 | 0 | 0 | 0 |
| 2. Below 10 cents | 18 | 3.25 | 3328.88 | 4 |
| 3. 10 to 49 cents | 177 | 32.01 | 3363.58 | 48 |
| 4. 50 to 99 cents | 93 | 16.82 | 3209.77 | 26 |
| 5. 1 to 2 acres | 141 | 25.50 | 3243.17 | 38 |
| 6. 2 to 3 acres | 63 | 11.39 | 3119.80 | 15 |
| 7. 3 to 4 acres | 27 | 4.88 | 3525.00 | 3 |
| 8. More than 4 acres | 34 | 6.15 | 3472.80 | 5 |
| Occupation of Owner | | | | |
| 1. Agric. Farmer | 445 | 80.47 | 3258.30 | 121 |
| 2. Agric. Labour | 62 | 11.21 | 3349.79 | 12 |
| 3. Government Job | 7 | 1.27 | 3692.50 | 3 |
| 4. Private Job | 18 | 3.25 | 3805.50 | 2 |
| 5. Business | 21 | 3.80 | 3057.50 | 1 |

The owners of female progeny born during the year were classified into five different groups as Agriculture farmers, agriculture labourers, government job, private job and business based on their occupation. Majority of the farmers are classified as “Agricultural Farmer” and account for more than 80% of the total. This is clear indication that livestock is only a subsidiary enterprise for these farmers. Agricultural Labours accounts for 11.21% and the other occupational groups of owners are negligible. The educational status of owners of the progenies was analysed. More than half of the farmers (53.3%) are having an educational level of “Matric”. Around 8% of the farmers had college education whereas 12.3% had higher secondary education. The progeny performance was found to be correlated with educational status of farmers (Figure 5).

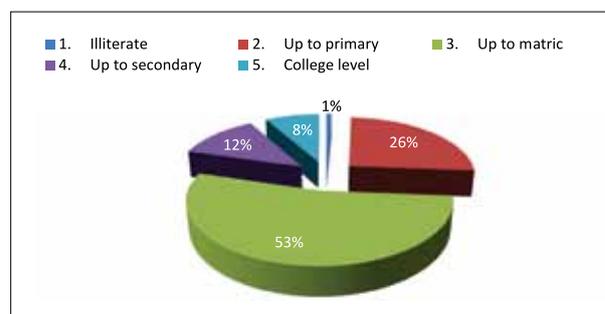


Figure 5. Education level of animal owners

The land holding pattern showed that 31.6% farmers had holding of 10-49 cents and 25.2% had 1-2 acers of land. More than half of the farmers had landholding less than 1 acre which was classified as small holder systems. There were 19.4% farmers with more than two acres of land. (Figure 6).

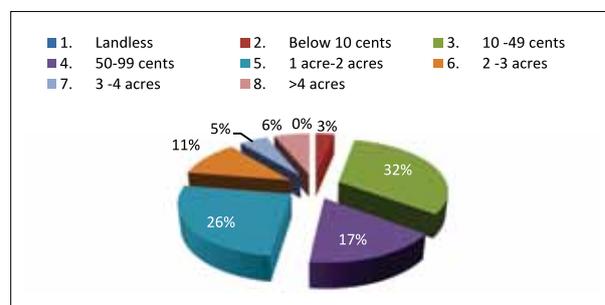


Figure 6. Land Holding pattern of animal owners

Average herd size of farmers was near to 4. The farmers with three or less than three animals accounted for 46.29%. The farmers with more than 10 animals in their herd were very less in number (3.8%). This clearly indicates that the production



system followed by farmers in Kerala is small holder type. The herd structure of the project areas shows that milking cows account for 45.9% of total cattle and 36.2% of the animals were calves. Dry cows are only 5.8% indicating sale of dry animals is a common practice in the area. The lower percentage of heifers in the herd (12.1%) indicates that farmers are not keeping all their female calves as replacement stock.

BAIF Development Research Foundation, Uruli-Kanchan, Pune

Data generated over 25 years from 1995 to 2019 on 5411 crossbred progenies born out of

260 sires and owned by 1445 farmers spread over 143 village in 27 cattle developing centres from Ahmednagar, Pune and Satara district of Western Maharashtra were analysed. Out of these crossbred progeny born 3899 (72.05 %) completed their first lactation milk yield. A total of 311 bulls from 14 different sets have so far been used for insemination. A total of 126798 artificial inseminations have so far been done, of which, 119049 AI followed and 53723 progenies were confirmed, leading to a conception rate of 45.0 %. A total 15988 female progenies born and 5411 female progenies have reached at the age of first calving through the use of semen of these test bulls (Table 6).

Table 6. Information regarding different set of bulls in BAIF unit

| Set No | Batch Start month | Bulls used | A.I. done | A.I. followed | Pregnancies Confirmed | Conception rate | Followed for Calving | Female calves | |
|--------------|-------------------|------------|---------------|---------------|-----------------------|-----------------|----------------------|---------------|-------------|
| | | | | | | | | Born | Reached AFC |
| III | Jul-95 | 20 | 16118 | 15063 | 7001 | 46.48% | 4868 | 2344 | 1563 |
| IV | Jul-98 | 19 | 21321 | 17239 | 7673 | 44.51% | 3815 | 1756 | 514 |
| V | Jul-01 | 20 | 7461 | 7380 | 3398 | 46.04% | 2626 | 1201 | 364 |
| VI | Jul-03 | 20 | 5249 | 5162 | 2162 | 41.88% | 1493 | 731 | 289 |
| VII | Feb-05 | 25 | 6806 | 6638 | 2989 | 45.03% | 1969 | 856 | 394 |
| VIII | Sep-06 | 22 | 6533 | 6327 | 2899 | 45.82% | 1993 | 885 | 371 |
| IX | Feb-08 | 16 | 4902 | 4902 | 2169 | 44.25% | 1561 | 733 | 313 |
| X | Aug-09 | 24 | 6893 | 6867 | 2987 | 43.50% | 1997 | 878 | 391 |
| XI | Apr-11 | 21 | 6364 | 6364 | 3109 | 48.85% | 2270 | 1010 | 409 |
| XII* | Aug-12 | 28 | 9270 | 9030 | 4190 | 46.40% | 2509 | 1182 | 504 |
| XIII* | Mar-14 | 15 | 7139 | 7139 | 3221 | 45.12% | 2536 | 1163 | 273 |
| XIV* | Aug-15 | 30 | 14223 | 14189 | 6196 | 43.67% | 4007 | 1783 | 26 |
| XV** | Jul-17 | 26 | 12535 | 12301 | 5515 | 44.83% | 3107 | 1466 | 0 |
| XVI | Jul-19 | 25 | 1984 | 448 | 214 | 47.77% | 0 | 0 | 0 |
| Total | | 311 | 126798 | 119049 | 53723 | 45.13% | 34751 | 15988 | 5411 |

A total of 3899 daughters from first 12 sets of bulls have completed their first lactation milk yield. During the year 2019, a total of 5837 artificial inseminations were carried out with the overall conception rate 45%. Average first lactation 305 days milk yield and age at first calving of daughters completed their first lactation in the reporting period (2019) were 3228.3 kg and 937 days, respectively. The overall loss of data was recorded as 22.0% at the end of this reporting period.

The first lactation 305 days milk yield showed an increasing trend over the sets as in first set (1995) it was 2930.4 kg, which has increased to 3294.3 kg in the current set showing a sharp increase of 363.9 kg (12.41%). A trend of decrease in age at first calving was also observed as 976.5 days in progenies of first set of bulls (1995) has reduced to 793.0 days in current set with a decrease of 183.5 days (18.79%) (Figure 7).

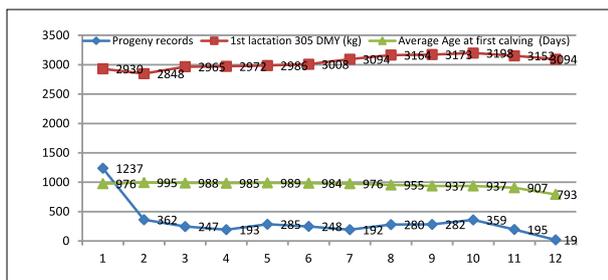


Figure 7. Set wise Progeny Performance at BAIF unit since inception

The 16th bull set was introduced in July 2019 and inseminations, pregnancy diagnosis and calving are in progress. Milk recording has been completed for 12th bull set progenies while progenies of 13th and 14th bull sets are under recording. The status of feeding and management of crossbred animals

in field has favourably changed due to frequent visits of scientists and discussions with herd owners. Process of identification of quality sires based on their progeny is standardized and their use in development process for improving milk production in rural dairy animals demonstrated. The information generated through the project is used by the farmers for marketing animals and getting more price to their animals whenever they sale recorded animals.

Socio-economic status of farmers under the Project

Socio economic status of the dairy farmers under the project and the performance of progenies during the reporting period are presented in the Table 7.

Table 7. Socio-economic status of farmers

A. Education Status of farmers participating in the project.

| Education Level | Illiterate | Primary | Secondary | Higher secondary | Graduate & above | Total |
|------------------|---------------|----------------|----------------|------------------|------------------|---------------|
| No. of cow Owner | 139 (9.39) | 598 (40.41) | 549 (37.09) | 126 (8.51) | 68 (4.59) | 1480 (100) |

B. Land holding wise frequency of farmers.

| Frequency of farmers | Land holding (Acres) | | | | Total |
|-------------------------------------|----------------------|----------------|----------------|----------------|---------------|
| | 0 | Up to 5 | 5 To 10 | Above 10 | |
| According to total land holding | 63 (4.26) | 875 (59.12) | 383 (25.88) | 159 (10.74) | 1480 (100) |
| According to land under fodder crop | 451 (30.47) | 955 (64.53) | 61 (4.12) | 13 (0.88) | 1480 (100) |

C. Main Occupation of farmers participating in the project.

| Occupation Type | Agriculture | Dairy | Service | Other | Agriculture labour | Business | Total |
|-------------------|-----------------|-----------|-----------|-----------|--------------------|--------------|------------|
| No. of Cow Owners | 1346 (90.95) | 50 (3.38) | 38 (2.57) | 18 (1.22) | 16 (1.08) | 12 (0.81) | 1480 (100) |

D. Types of cattle housing in the project area.

| Housing Type | Permanent | Semi-permanent | Temporary | Thatched | Total |
|--------------|----------------|----------------|----------------|----------------|---------------|
| No. of Herds | 264 (17.84) | 458 (30.95) | 298 (20.13) | 460 (31.08) | 1480 (100) |

Note. Figures in parenthesis indicate percentage

Out of total 1480 farmers, 40.41% farmers had education up to primary level. The percentage of farmers having secondary education was 37.09, whereas the proportion of illiterate cow owner was 9.39% (Figure 8). The percentage of farmers having graduate and above education was 4.59. The average herd size in the project operational area was 6.04.

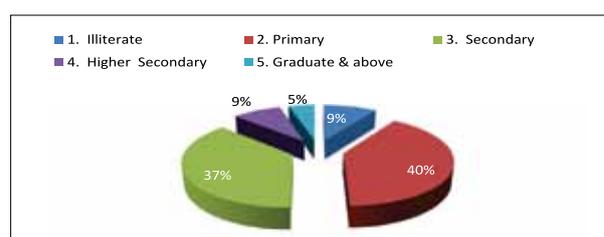


Figure 8. Education status of Animal Owners participating in the project

Among landholders, more than 2/3rd (69.53%) cattle owners were cultivating different fodder crops. The proportion of landless and those who didn't have land under fodder crop was 4.26 % and 30.47%, respectively. The fodder crops commonly grown are sorghum, bajra, sugarcane, lucerne and maize. The dry and green fodders thus available to animals are sorghum straw, bajra straw, sugarcane tops, lucerne and maize., Animals are fed with ready-made feeds purchased from market. The thumb rule of concentrate feeding is half kg for every litre of milk produced. Due to non-availability of sufficient land, grazing is not practiced and the animals are managed intensively. About 90.95 per cent of cattle owners were agriculturists and almost all (95.74%) owned land. Nearly 60 per cent farmers had land up to 5 acres and the percentage of farmers having land more than 10 acres was 10.74 (Figure 9)

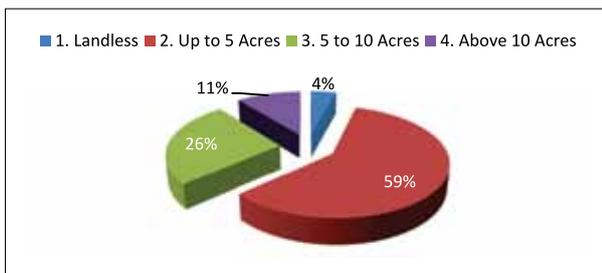


Figure 9. Land Holding pattern of Animal Owners participating in the project

The herd owners protect their animals from infectious diseases through vaccinations against FMD, HS and BQ regularly. For external parasite control, insecticides are used. The use of internal parasiticides is found restricted to calf hood stage. Regarding veterinary aids whenever required, help from nearby Govt. Dispensaries is sought. Nearly half (48.79%) of herd owners had permanent or semi-permanent cattle sheds for their animals. The cattle sheds were found constructed from either bricks, stones using clay as a cementing material or re-in-force cement concrete. 20.13 per cent owners had temporary type and 31.08 per cent thatched type of housing to their animals, which was made by using wood, dried wheat straws or bajra stovers. None of the animal was kept without shelter

G. B. Pant University of Agri. & Tech. (GBPUA & T) Pantnagar.

This unit is functioning through eight A.I. centers of U.S.Nagar and Nainital districts of Uttarakhand. During 2019, a total of 4715 AI were carried out, of which, 4203 followed for pregnancy diagnosis and 2517 confirmed pregnancies leading to a conception rate of 59.88%. A total of 1049 daughters of 15th set of bulls born. A total 121 bulls has so far been introduced in 7 different sets and total 33790 AI were carried out, 18519 PD confirmed, 6433 female progenies born of which 1194 has reached age at first calving (Table 8).

Table 8. Information regarding different set of bulls in GBPAU & T, Pantnagar unit.

| Set No. | Date (FSD received) | Bulls used | Total AI | A.I. followed | Pregnancy confirmed | Total calving | Female calves | |
|--------------|---------------------|------------|--------------|---------------|---------------------|---------------|---------------|-------------|
| | | | | | | | Born | Reached AFC |
| X | 20.01.2010 | 10 | 1,784 | 1,750 | 1,030 | 782 | 340 | 201 |
| XI | 16.03.2011 | 6 | 2,303 | 2,303 | 1,546 | 1,207 | 542 | 296 |
| XII | 25.07.2012 | 9 | 2,473 | 2,473 | 1,405 | 1,215 | 573 | 224 |
| XIII | 05.02.2014 | 15 | 5,205 | 5,205 | 2,944 | 2,433 | 1,058 | 306 |
| XIV | 22.07.2015 | 30 | 9787 | 9787 | 5414 | 4582 | 2126 | 165 |
| XV | 15.06.2017 | 26 | 9886 | 9864 | 5644 | 3838 | 1794 | 02 |
| XVI | 25.06.2019 | 25 | 2352 | 909 | 536 | - | - | - |
| Total | | 121 | 33790 | 32291 | 18519 | 14057 | 6433 | 1194 |

The average first lactation 305 days milk yield and average age at first calving of daughters completed their first lactation during the reporting period (2019) were 3326.4 kg and 1083.6 days, respectively. The overall loss of data was 22.5 % till the end of this reporting period. So far 923 daughters from first four sets of bulls have

completed their first lactation 305 days milk yields which showed an increasing trend as it was 2494.8 kgs in first set (2010) which has increased to 3394.8 kg in daughters of current set of bulls showing a sharp increase of 900.0 kg (36.07 %). A trend of decrease in age at first calving was also observed as it was 1149 days in progenies of first

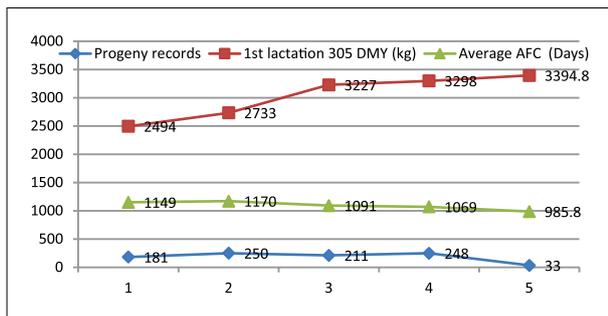


Figure 10. Set wise progeny performance at GBP UA & T, Pantnagar unit since inception

set of bulls (2010) which has reduced to 985.8 days in current set indicating a decrease of 163.2 days (14.20 %) (Figure 10).

Socio-economic status of farmers under the Project

Socio-economic status of the animal farmers classified according to different categories during the reporting period are presented in the Table 9.

Table 9. Status of Farmers participating in the project according to different Category.

| Education | Illiterate | Primary | Secondary | HSC | Graduate | PG | Diploma |
|--------------|------------|----------|-----------|----------|------------|----------|---------|
| | 8.3 | 11.8 | 43.2 | 17.6 | 14.5 | 3.4 | 1.2 |
| Land Holding | Landless | < 1 acre | 1-2 acre | 2-5 acre | 5-10 acre | >10 acre | - |
| | 15.9 | 11.9 | 10.6 | 14.2 | 20.6 | 26.8 | - |
| Occupation | Farmer | Labour | Service | Business | Dairy | Other | - |
| | 65.4 | 16.2 | 14.2 | 1.3 | 2.4 | 0.5 | - |
| Housing | Attached | Separate | | Perm. | Semi perm. | Temp. | Thatch |
| | 52.2 | 47.8 | | 62.0 | 22.6 | 14.2 | 1.2 |
| Feeding | Stall | Grazing | Both | - | - | - | - |
| | 97 | 0 | 3 | - | - | - | - |

About 65.4% of animal owners belong to farming community, 16.20% belongs to labour class and 14.2% belongs to service class. About 97% farmers keep their animals under stallfeeding. The educational status of the owners of the progenies was analyzed. The owners of animals with an educational qualification of Higher Secondary were 17.6%. Illiterate owners were 8.3% and 43.2% of the owners were having an educational qualification of matriculation whereas 14.5% of the owners were having graduate/college qualification and 3.4% owners having post graduate qualification (Figure 11).

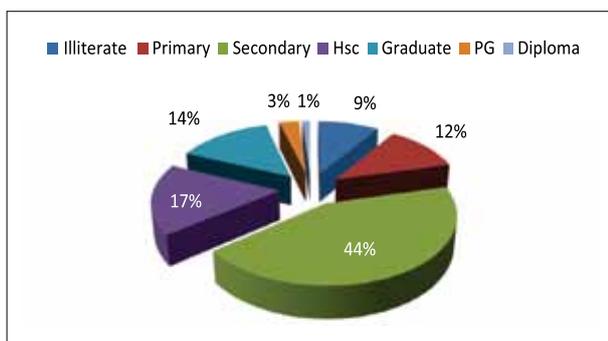


Figure 11. Education status of Animal Owners participating in the project

According to land holding pattern, about 26.8% farmers were having more than 10 acres of land, 11.9% farmers having less than one acres and 15.9 farmers are landless whereas 20.6% farmers having 5-10 acres of land. About 24.8% famers (10.6% up to 2 acres and 14.2%, up to 2-5 acres) having 1-5 acres of land (Figure 12).

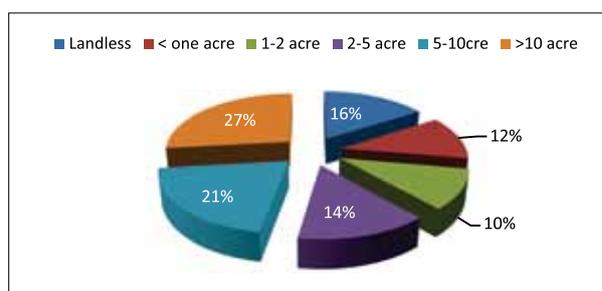


Figure 12. Land Holding pattern of Animal Owners participating in the project

A total of two field level training programs, 2 animal welfare camps and 2 Kisan-Chaupal were conducted where in 176 farmers attended and benefitted. Data loss in terms of mortality and sales of daughters, etc. was 405 (153 of set 12, 156 of set 13, 19 of set 14(a), 35 of set 14(b) and 42 of Set 15) i.e. 38.60% during the year. However, since inception of the project, 1453 daughter data were lost amounting to 22.58% of total daughters born.



C. Conservation and Genetic Improvement of Indigenous Cattle Breeds – Indigenous Breeds Project

Genetic studies on performance of important indigenous breeds of cattle and their improvement through selection.

Indigenous Breeds project is being implemented in the home tracts of three important indigenous cattle breeds viz., Kankrej, Gir and Sahiwal in collaboration with State Veterinary/Agricultural Universities, ICAR institutes, NGOs and Gaushalas. Germplasm (GP) units for each breed were identified at organized farms and data recording (DR) units were identified under both farm and field conditions with farmers animals registered in their native tract. Genetic evaluation of bulls are being done on the basis of their expected breeding values (EBVs) calculated from the first lactation 305-days milk yield of their daughters and frozen semen doses proven bulls ranked for EBVs will be used to breed large cattle population for improving the milk production potential.

As per the technical programme, for each breed of cattle, about 75 elite breedable females will be made available at the GP unit and about 750 breedable females shall be identified at about 5 DR units (herds). The elite females in the GP unit will be mated with genetically superior proven bulls of the breed for production of superior young bulls. The young bulls born out of nominated mating in the germplasm unit will be utilized for breeding the females registered in the DR units and around 60 to 70 females will be mated by each bull so as to get the first lactation milk production records of at least 20 daughters per bull. The information on growth, reproduction, milk production and survivability will be recorded for performance evaluation, selection and genetic improvement of recommended indigenous cattle breeds.

Gir breed

The GP unit of Gir cattle is located at Cattle Breeding Farm, Junagadh Agricultural University, Junagadh, Gujarat. The DR units of the breed are located in 247 villages (13 AI centres) and three associated herds. So far 13557 breedable females were identified and registered under the project.

Herd strength

The herd strength of GP unit as on 31st December, 2019 was 195 containing of 148 females

and 47 males. During the year, 32 normal calvings took place with 15 female and 17 male calves. The total breedable females were 119 consisting of 50 milch cows, 34 dry cows and 35 heifers of more than 2 years of age. During 2019, GP unit maintained 16 young bulls of above one year of age.

The closing herd strength of the DR unit at CBF, Junagadh was 329 consisting of 261 female and 68 male animals. A total of 63 normal calving with 35 female and 28 male calves occurred during the year. The unit maintained 204 breedable females aged above 2 years.

Bulls inducted and frozen semen doses produced

So far, 28 bulls in four sets (six in first, nine in second, nine in third and four in fourth) have been placed under semen collection and the frozen semen doses of all bulls were used for breeding. Beside this, in fourth set, semen collection has been initiated from 4 bulls while 3 bulls are still under training. The semen doses available as on 31st December 2019 was 183319 (20186, 74373, 70060 and 18700 doses for I, II, III and IV set, respectively). During the year, 25990 semen doses (620, 9740 and 15630) were frozen from II, III and IV set of bulls, respectively. A total of 3379 doses were utilized during the year. Since inception of the project, 245813 semen doses were produced of which 62494 were utilized for breeding.

Insemination carried out, conception rate and daughters born:

The details of insemination carried out, conception and daughters born are presented in Table 11. A total of 1905 inseminations were carried out and 938 pregnancies were confirmed resulting with a conception rate of 49.23 per cent. Since inception of the project, 28922 inseminations have been carried out and 13877 pregnancies were confirmed. The overall conception rate was 47.98 per cent. The total number of inseminations carried out since inception for I, II, III and IV sets of bulls were 12194, 8335, 6613 and 1780, respectively. A total of 399 daughters born during the year 2019. A total of 5960 of daughters born since inception of the project.

Set wise performance

A total of 28 bulls in four sets (6+9+9+4 bulls) have so far been inducted in the program. Total no. of semen doses frozen was 245813 (40133+97526+86674+21480) out of which 62494 were utilized for test mating. The number of cows covered for inseminations in different sets was 28922 (12194+8335+6613+1780). A total of 5960 (3120+1648+1104+88) daughters have so far been produced out of the four sets. A total of 658 daughters (540 in 1st set, 117 in 2nd set and 01 in 3rd set) have reached the age at first calving, out of which 472 (365+107) have completed their first lactation.

Body weights

The average weight of female animals at birth 3, 6, 12 months and weight at maturity and calving of female animals were 21.3, 46.4, 96.0, 146.1, 242 and 387.1 kg, respectively. The average weight at birth, 3, 6, 12 months and weight at maturity were 22.7, 47, 98, 147.5 and 272.0 kg, respectively.

Productive and reproductive performance

The productive and reproductive performance of Gir cattle maintained at GP and DR unit of CBF, Junagadh are as follows:

Germplasm unit

The average first lactation 305-days milk yield was 2337.7 ± 132.5 while all lactation 305-days milk yield was 2571.6 ± 132.0 kg. The overall average first lactation total milk yield was 3029.4 ± 283.5 kg while average milk yield for all lactation was 3411.1 ± 260.1 kg. The average first lactation length and first peak yield were 441.0 ± 40.1 days and 14.50 ± 0.6 kg, respectively. The overall age at first calving, first service period, first dry period and calving interval were 1393.8 ± 32.7 (46 months), 123.0 ± 24.2 , 56.4 ± 16.8 and 408.6 ± 25.3 days, respectively. The wet and dry averages of the GP unit were 7.2 and 3.7 kg, respectively.

Data recording unit

The averages first lactation 305 days and all lactation total milk yields were 1863.7 ± 204.6 and 2237.0 ± 131.3 kg, respectively. First lactation length averaged of 386.9 ± 38.7 days. The average first lactation peak yield was 14.8 ± 1.8 kg while all lactation wet and dry averages were 5.8 and 2.8 kg, respectively. The average age at first calving was 1418.3 ± 40.2 days (47 months). The average

first service period, first dry period and first calving interval were 172.3 ± 26.7 , 150.3 ± 0.9 and 459.7 ± 25.4 days, respectively.

Other activities:

Gynaecological/farmers awareness/health camp was organized at Gondal AI centre of AICRP, on December 20th, 2019. Twenty one farmers/livestock owners have participated in the camp. Scientific information regarding dairy husbandry, feeding of dairy animals and importance of Gir cattle were distributed after etc to dairy farmers and Gaushala workers. Distributed mineral mixture, de-wormer, calcium supplement, plastic bowl etc., to farmers and Schedule Caste beneficiaries under the program.

Three training/meetings of AI workers were conducted during the year 2019. All the workers were instructed to make correct and timely recording of every daughter without fail. AI workers were trained and given necessary technical information to improve conception rate. They were also instructed to convince the farmers for keeping daughters till completion of first lactation to reduce data loss.

Kankrej breed

The GP unit of Kankrej cattle is located at Livestock Research Station, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar, Gujarat. Three DR units consisting of organized farms and gaushalas and about 6200 farmers animals of 52 villages covered under 14 AI centres have been registered in their native tract.

Herd Strength

The herd strength of GP unit as on 31st December 2019 was 243 which included 183 females and 60 males. The total of number of breedable females above 2 years was 127 including of 60 milch, 24 dry and 43 heifers. During the year, 73 normal calvings were taken place (34 female and 39 male calves). The unit also maintained four breeding bulls of above 2 years of age, 15 young males and 32 calves for breeding purpose.

The closing herd strength of DR unit of LRS, Dantiwada was 162 consisting of 126 females and 36 males. The unit maintained 90 breedable females above 2 of age of which 34 were in milking, 24 dry and 32 heifers.



Bulls inducted and frozen semen doses produced

A total of 35 Kankrej bulls in four sets have been inducted so far. The first set consisted of eight bulls from Banas Dairy while the second, third and fourth sets consisted of nine bulls each. The opening balance of semen doses as on 01st January 2019 was 154152 and during the year 2019, a total of 39,020 doses of semen were frozen from the third and fourth set of bulls (Table 10). A total of 11421 doses were utilized for insemination during the year. At the end of the year, 1,00,474 doses of frozen semen covering 2627 doses of 1st set, 47552 doses of 2nd set, 30037 of 3rd set and 20258 of 4th set were available for future breeding. A total of 280250 doses of top ranked bulls were used for nominated mating for the production of young male calves and 806 semen doses were sold/supplied to the stakeholders for the improvement of Kankrej cattle. A total of 4855 straws were also supplied to the ICAR-NBAGR for gene bank.

Insemination carried out, conception rate and daughters born

During the year 2019, a total of 2707 animals were inseminated, 1268 animals were confirmed for pregnancy (Table 11). The conception rate during the year was 46.84 per cent against overall conception rate of 47.45 per cent (8801 conceptions out of 18547 inseminations). During the reporting period, a total of 363 daughters were born. The number of daughters born for the first, second, third and fourth set of bulls were 407, 1257, 1053 and 26, respectively resulting 2743 daughters since the inception of the project.

Set wise performance

A total of 35 bulls in four sets (8+9+9+9 bulls) have so far been inducted in the program. Total number of semen doses frozen was 193172 (8000+89438+61774+33960) out of which 46936 frozen semen doses were utilized/supplied. About 24319, 16362 and 5081 semen doses in 2nd, 3rd and 4th sets were discarded also. The number of cows covered for inseminations in different sets was 13500 (3000+3500+3500+3500). A total of 2743 (407+1257+1053+26) daughters have so far been produced from first four sets. A total of 379 from three sets have reached at the age of calving, out of which 300 (131+169) have completed their first lactation. Eight Kankrej bulls of first set had already been evaluated.

Body weights - female and male

The average weight of female animals at birth, 3, 6, 12 months, and calving were 22.35 ± 0.33 , 57.52 ± 1.53 , 96.11 ± 1.78 , 172.47 ± 2.88 and 409.25 ± 4.45 kg, respectively. The average birth weight 3, 6, 12 months and weight at maturity were 23.35 ± 0.31 , 59.33 ± 1.32 , 95.41 ± 2.30 , 175.79 ± 2.63 and 616.11 ± 23.57 kg, respectively.

Productive and reproductive performance

The productive and reproductive performance of Kankrej cattle maintained under GP and DR unit of LRS, Sardarkrushinagar during the year 2019 are presented below:

Germplasm unit

The average first lactation total milk yield, first lactation 305-days milk yield, all lactation total milk yield and first peak yield of GP unit were 2308.42 ± 221.15 , 2138.64 ± 185.23 , 2503.79 ± 104.25 and 11.29 ± 0.60 kg, respectively. The average first lactation length was 314.60 ± 18.94 days. The overall averages for age at first calving, first service period, first dry period and calving interval were 1237.35 ± 25.20 (41 months), 144.92 ± 17.57 , 139.25 ± 22.77 and 434.00 ± 15.5 days, respectively. The wet and dry averages were 8.68 and 5.19 kg, respectively.

Data recording unit (SDAU):

Overall average first lactation total milk yield, first lactation 305-days milk yield, all lactation total milk yield and peak yield were 2465.43 ± 162.51 , 2319.57 ± 100.99 , 2521.06 ± 100.60 and 12.07 ± 0.43 kg, respectively. The average first lactation length was 319.69 ± 14.73 days. The average estimates of age at first calving, first service period, first dry period and first calving interval were 1270.50 ± 41.24 (42 months), 192.98 ± 23.68 , 132.83 ± 17.54 and 437.33 ± 25.68 days, respectively. The wet and dry averages were 8.86 and 5.61 kg, respectively.

Other activities:

During the year, one farmer's day was organized in collaboration with Jay Bajarag Gaushala Gela and small farmers event was also organized at each center. Scientists and staff working at station had frequently visited farmers herd and regular advice given on different aspects of animal management and feeding. Telephonic advises were also given to 62 farmers under the project and also farmers

of other parts of country. During the reporting period, 6207 farmers/visitors and 16 dignitaries had visited the farm. Three AI workers meeting were organized to review field work. During the year, published four research papers, presented eight abstracts papers, published six popular articles, and five seminars were also attended. Gynecological treatment was provided at farmer's door as and when cases of infertility were reported by inseminators working in the field.

Sahiwal breed

The GP unit of Sahiwal breed is located at National Dairy Research Institute, Karnal and three DR units are located at i) GADVASU, Ludhiana, ii) G.B. Pant University of Agricultural and Technology, Pantnagar, Uttarakhand and iii) Livestock Farm, LUVAS, Hisar.

Herd strength

Herd strength of GP unit at NDRI, Karnal as on 31st December 2019 was 442 including 347 females and 95 males. Out of 132 normal calvings, 65 females and 67 males calves born during the year with a female: male ratio of 49: 51. The Germplasm unit also maintained 37 young bulls of above two years of age. The number of breedable females above two years of age in GP and different DR units was 607 consisting of 244 in Karnal, 113 in Ludhiana; 94 in LUVAS, Hisar; and 156 in Pantnagar. In Sahiwal DR unit GBPUAT, Pantnagar, out of 87 normal calvings, 52 females and 35 males born with a female: male ratio of 60:40. In Sahiwal DR unit, LUVAS, Hisar, out of 60 calvings, 28 females and 32 males born with a female: male ratio of 47:53. Sahiwal DR unit, GADVASU, Ludhiana, had 55 calvings with a female: male ratio of 42:58.

Bulls inducted and frozen semen doses produced:

So far 35 Sahiwal bulls in four sets (8 in first, 7 in second, 10 each in third & fourth sets) were inducted for progeny testing under the project. During the year, 24996 doses were frozen and 7506 doses were utilized for breeding. At the end of year 2019, a total of 122528 (22795 in 1st set, 34306 in 2nd set, 32819 in 3rd set and 32608 in 4th set) semen doses were available for breeding (Table 10). Since inception of the project, 229050 semen doses were frozen and 106522 doses were utilized/supplied/sold to the stakeholders and for the project for

the genetic improvement of cattle. A total of 7167 frozen semen doses from three Sahiwal bulls viz., Watan- CMT-1452, Wills-CMT-1449 and Malik-CMT-1447 of ICAR-CIRC, Meerut inducted in fourth set were collected during the year.

Insemination carried out, conception rate and daughters born:

During the year 2019, a total of 743 inseminations (296 in NDRI, Karnal, 106 in LUVAS, Hisar, 160 in GADVASU, Ludhiana and 181 in Pantnagar) were carried out and 330 cows were conceived (78 in Pantnagar, 52 in Ludhiana, 62 in Hisar and 138 in Karnal). The conception rate (%) was 46.62 in Karnal, 32.5 in Ludhiana, 58.49 in Hisar and 43 in Pantnagar. During the year 2019, 141 daughters (43 in Pantnagar, 23 in GADVASU, Ludhiana, 28 in LUVAS, Hisar and 47 in NDRI Karnal) born.

Since inceptions of the project, 6715 inseminations were carried out, of which 2595 cows were conceived with an overall conception rate of 38.64 per cent. A total of 1003 daughters (307 in Pantnagar, 133 in Ludhiana, 67 in Hisar and 496 in Karnal) born since inception of the project.

Set wise performance since inception:

A total of 35 bulls in four sets (8+7+10+10 bulls) have so far been inducted in the program. Total no. of semen doses frozen was 229050 (54754+64365+56869+53062) of which 106522 frozen semen doses were utilized/supplied. The number of cows covered for inseminations in different sets was 2544 (840+784+614+306). A total of 1003 daughters (343+294+326+40) have so far been produced out of the four sets. A total of 378 (225+147+06) daughters from first three sets have reached the age of first calving, of which 331 (221+105+5) have completed their first lactation. A total of 1,22,528 doses of frozen semen were available as on 31st December 2019.

Productive and reproductive performance:

The details of productive and reproductive performance of Sahiwal cattle maintained under GP and different DR units are presented below:

Germplasm unit- ICAR-NDRI Karnal:

The average first lactation total milk yield, first lactation 305-days milk yield and first peak



yield were 2210.34 ± 126.50 , 2148.63 ± 112.10 and 10.59 ± 0.54 Kg, respectively. The average first lactation length was 288.0 ± 14.13 days. Overall average age at first calving, first service period, first dry period, first calving interval were 1176.55 ± 28.96 (39 months), 133.32 ± 14.95 , 140.18 ± 12.39 and 377.42 ± 14.92 days, respectively. The wet and dry averages were 7.87 and 3.17 Kg, respectively.

Data recording units:

The highest first lactation total milk yield and 305 days lactation milk yield of 2202.1 ± 84.4 and 2183.3 ± 81.9 kg were recorded in GADVASU Ludhiana followed by 1949.71 ± 169.47 and 1900.41 ± 150.29 in GBPUAT, Pantnagar while the lowest yield of 1678.67 ± 130.07 and 1636.39 ± 117.03 kg was recorded in LUVAS, Hisar, respectively. The average first lactation length of

Sahiwal cows at Hisar, Ludhiana and Pantnagar were 265.94 ± 14.45 , 272.5 ± 14.15 and 267.85 ± 16.30 days, respectively. The averages for first calving interval of Sahiwal animals in Hisar, Ludhiana and Pantnagar were 427.47 ± 12.26 , 450.0 ± 17.97 and 431.16 ± 28.30 days, respectively. The lowest average age at first calving (AFC) of 1181.35 ± 27.45 (39 months) was observed at Pantnagar unit while highest AFC of 1353.09 ± 69.91 days (45 months) was noticed in GADVASU, Ludhiana. However, first service period was lowest (127.66 ± 13.42 days) in GBPUAT, Pantnagar and highest (165.16 ± 18.24 days) in GADVASU, Ludhiana. The average first dry period of Hisar, Ludhiana and Pantnagar was 173.12 ± 16.51 , 163.4 ± 15.70 and 159.25 ± 19.69 days, respectively. The wet averages in Hisar, Ludhiana and Pantnagar were 7.84, 7.53 and 7.55 kg, respectively while the corresponding herd averages were 4.13, 5.42 and 4.50 kg, respectively.

Table 10. Breed wise details of semen doses collected and utilized during the year 2019

| Breed | Set No. | No. of bulls inducted | Semen doses produced | | Total | Semen doses utilized | | | Balance as on 31-12-2019 |
|----------|---------|-----------------------|----------------------------------|--------------|--------|---------------------------------|--------------|-----------------------|--------------------------|
| | | | Up to 31 st Dec -2018 | Jan-Dec 2019 | | Up to 31 st Dec 2018 | Jan-Dec 2019 | Total since inception | |
| Sahiwal | I | 8 | 54754 | 0 | 54754 | 31846 | 113 | 31959 | 22795 |
| | II | 7 | 64365 | 0 | 64365 | 30059 | 0 | 30059 | 34306 |
| | III | 10 | 55053 | 1816 | 56869 | 23625 | 425 | 24050 | 32819 |
| | IV | 10 | 29882 | 23180 | 53062 | 13486 | 6968 | 20454 | 32608 |
| | Total | 35 | 204054 | 24996 | 229050 | 99016 | 7506 | 106522 | 122528 |
| Gir | I | 6 | 40133 | 0 | 40133 | 19743 | 204 | 19947 | 20186 |
| | II | 9 | 96906 | 620 | 97526 | 23063 | 90 | 23153 | 74373 |
| | III | 9 | 76934 | 9740 | 86674 | 15899 | 715 | 16614 | 70060 |
| | IV | 4 | 5850 | 15630 | 21480 | 410 | 2370 | 2780 | 18700 |
| | Total | 28 | 219823 | 25990 | 245813 | 59115 | 3379 | 62494 | 183319 |
| Kankrej* | I | 8 | 8000 | 0 | 8000 | 5223 | 150 | 5373 | 2627 |
| | II | 9 | 89438 | 0 | 89438 | 15967 | 1600 | 17567 | 47552 |
| | III | 9 | 46044 | 15730 | 61774 | 13310 | 2065 | 15375 | 30037 |
| | IV | 9 | 10670 | 23290 | 33960 | 1015 | 7606 | 8621 | 20258 |
| | Total | 35 | 154152 | 39020 | 193172 | 35515 | 11421 | 46936 | 100474 |

*Kankrej unit: Semen doses used for nominated matting (250) and supplied to field/sold/stakeholder (806). Discarded semen doses of Kankrej in 2nd set, 3rd set and 4th set were 24319, 16362 and 5081, respectively.

Table 11. Breed wise details of insemination carried out, conception and daughter born (Sahiwal DR unit included)

| Breed | Set No. | No. of bulls inducted | AI done | | | Conception | | | Daughters born | | |
|---------|---------|-----------------------|---------------------|-------------|-------|---------------------|-------------|-------|---------------------|-------------|-------|
| | | | Up to December 2018 | During 2019 | Total | Up to December 2018 | During 2019 | Total | Up to December 2018 | During 2019 | Total |
| Sahiwal | I | 8 | 2215 | 22 | 2237 | 776 | 2 | 778 | 343 | 0 | 343 |
| | II | 7 | 1939 | 0 | 1939 | 729 | 0 | 729 | 294 | 0 | 294 |
| | III | 10 | 1739 | 286 | 2025 | 704 | 170 | 874 | 192 | 134 | 326 |
| | IV | 10 | 799 | 435 | 514 | 56 | 158 | 214 | 33 | 7 | 40 |
| | Overall | 35 | 6692 | 743 | 6715 | 2265 | 330 | 2595 | 862 | 141 | 1003 |
| Gir | I | 6 | 12186 | 8 | 12194 | 6207 | 2 | 6209 | 3120 | 0 | 3120 |
| | II | 9 | 8335 | 0 | 8335 | 4108 | 0 | 4108 | 1648 | 0 | 1648 |
| | III | 9 | 6243 | 370 | 6613 | 2538 | 398 | 2936 | 793 | 311 | 1104 |
| | IV | 4 | 253 | 1527 | 1780 | 86 | 538 | 624 | 0 | 88 | 88 |
| | Overall | 28 | 27017 | 1905 | 28922 | 12939 | 938 | 13877 | 5561 | 399 | 5960 |
| Kankrej | I | 8 | 2178 | 0 | 2178 | 1138 | 0 | 1138 | 407 | 0 | 407 |
| | II | 9 | 7681 | 0 | 7681 | 3855 | 0 | 3855 | 1256 | 1 | 1257 |
| | III | 9 | 5981 | 472 | 6453 | 2540 | 498 | 3038 | 717 | 336 | 1053 |
| | IV | 9 | 0 | 2235 | 2235 | 0 | 770 | 770 | 0 | 26 | 26 |
| | Overall | 35 | 15840 | 2707 | 18547 | 7533 | 1268 | 8801 | 2380 | 363 | 2743 |



II. INSTITUTIONAL PROGRAMMES

A. Expression and association of genes with production and reproduction traits

Genetic variation of bovine Kisspeptin gene among indigenous and crossbred cattle breeds:

The association of two SNPs (rs442633552G>A and rs42022871C>T) of KISS1 gene was associated with reproductive and productive traits in 80 Gir, 200 Kankrej and 70 Frieswal animals was analysed. The results revealed that genotypes g.108 G>A and g.292 C>T had significant association with dry period. The cows with genotypes GG had higher dry period as compared to other genotypes. Further, g.292 C>T heterozygotes had higher dry period in comparison to both homozygotes. But none of the genotypes had significant influence on age at first service. The TT genotype had higher standard lactation milk yield (300 days), total lactation milk yield and peak yield ($p < 0.05$). The average total lactation milk yield and standard lactation milk yield of cows with TT genotypes were 3052 and 2900 kg, respectively. The significant role of g.292 C>T in both reproduction and production traits may be utilized in marker assisted selection.

The genotypic analysis of two SNPs (rs442633552G>A and rs42022871C>T) of KISS1 gene was associated with native (200 Kankrej, 80 Gir) and crossbred (70 Frieswal) cattle reproduction and production traits. The genotypes present in three populations with frequency of

more than 5% were only included for association studies. The results of least squares analysis and the mean values and the associations of the SNP genotypes with reproduction and production traits are shown in Table 12 and 13. Significant genotypic effects on dry period was observed. Breed and period of birth played an important role in the variation in the traits of age at first service. All the non-genetic factors had significant role in standard lactation milk yield of 305 days whereas season had significant effect on total lactation milk yield. Parity wise variation existed for peak yield. But in the case of lactation length breed wise variation was prominent.

The results revealed that genotypes g.108 G>A and g.292 C>T had significant association with dry period. The cows with genotypes GG had higher dry period as compared to other genotypes. Further, g.292 C>T heterozygotes had higher dry period in comparison to both homozygotes. But none of the genotypes had significant influence on age at first service. The TT genotype had higher standard lactation milk yield (300 days), total lactation milk yield and peak yield ($p < 0.05$). The average total lactation milk yield and standard lactation milk yield of cows with TT genotypes were 3052 and 2900 kg, respectively. The significant role of g.292 C>T in both reproduction and production traits may be utilized in marker assisted selection.

Table 12. Least Squares means of reproduction traits with respect to genotypes of KISS 1 gene

| | | Dry Period (days) | Calving interval (days) | Service Period (days) | Age at first service (days) |
|-----------|----|------------------------------------|-------------------------|-----------------------|-----------------------------|
| g.108 G>A | | ** | | | |
| GG | GG | 247.45±19.79 ^a (20) | 491.26±21.96 (19) | 139.16±29.99 (11) | 881.41±74.81 (48) |
| GA | GA | 185.93±12.70 ^b (88) | 465.42±12.42 (95) | 192.72±18.23 (56) | 757.87±22.90 (111) |
| AA | AA | 182.01± 9.91 ^b (247) | 452.61± 9.93 (255) | 178.08±16.63 (107) | 760.75±17.70 (9) |
| g.292 C>T | | * | | | |
| CC | CC | 177.58±11.81 ^a (88) | 446.36±11.90 (93) | 181.92±20.21 (47) | 740.85±28.36 (36) |
| CT | CT | 204.06±10.75 ^b (192) | 466.76±10.83 (196) | 172.82±15.36 (103) | 763.70±18.96 (75) |
| TT | TT | 182.42±12.86 ^{ab} (75) | 464.59±13.06 (80) | 198.43±24.22 (24) | 776.42±22.66 (51) |

** $p < 0.01$; * Significant ($p < 0.05$) (No. of records used with each genotype is presented in brackets)

Table 13. Least Squares means of production traits with respect to genotypes of KISS1 gene

| | Lactation length(days) | Peak yield (kg) | 305 days lactation milk yield (kg) | Total lactation milk yield (kg) |
|-----------|------------------------|-----------------------------------|--------------------------------------|--------------------------------------|
| g.108 G>A | | | | |
| GG | 308.76± 13.39 (22) | 13.32± 2.01 (5) | 2416.46±204.84 (17) | 2554.00±201.45 (23) |
| GA | 332.80± 5.91 (179) | 13.79± 0.79 (65) | 2697.73±105.04 (122) | 2911.22± 90.62 (179) |
| AA | 325.30± 4.60 (440) | 14.54± 0.64 (160) | 2776.96± 92.21 (250) | 2950.46± 70.14 (443) |
| g.292 C>T | | * | * | * |
| CC | 321.07± 6.65 (131) | 12.50± 1.13 ^a (19) | 2632.71±120.20 ^a (81) | 2808.82±101.68 ^a (131) |
| CT | 326.24± 5.23 (315) | 13.80± 0.73 ^b (100) | 2631.12± 95.18 ^a (196) | 2846.36± 79.55 ^b (317) |
| TT | 329.26± 5.51 (195) | 15.15± 0.67 ^b (111) | 2900.55±107.33 ^b (112) | 3052.23± 83.59 ^c (197) |

* - p<0.05 (No. of records used with each genotype is presented in brackets)

Genetic variation of bovine Neuropeptide Y gene among indigenous and crossbred cattle breeds

DNA samples of Kankrej (147), Gir (23) and Frieswal (72) were used for the analysis of genetic variation in Neuropeptide Y gene. Neuropeptide Y gene 5'-UTR and exon-1 comprising of 341 bp and 323 bp amplicons were amplified by their respective primers from blood DNA of Kankrej, Gir and Frieswal cattle. The SNPs in NPY gene were identified by PCR-SSCP and PCR-RFLP method leads to custom sequencing for final validation of sequence variation. For the study of 5'-UTR SNPs evaluation PCR-SSCP method was used. On the basis of different banding pattern obtained in SSCP PAGE electrophoresis the samples were sent for sequencing which revealed three missense SNPs at position g.75 G>A, g.195 C>T and g.253 G>A. The exon-1 of NPY gene was studied by PCR-RFLP method in cattle breeds.

The exon-1 of NPY gene was studied by PCR-RFLP method digested by SfoI restriction enzyme and further sequence analysis revealed the three genotypes CC (64), CT(81), TT(02) with C (70%) and T (30%) genotypic frequency in Kankrej, CC (09), CT(13), TT(01) with C (67.3%) and T (32.6%) genotypic frequency in Gir cattle and CC (08), CT(62), TT(02) with C (54.16%) and T (45.84%) genotypic frequency in Frieswal cattle. In 100 samples of Kankrej cattle, identified three SNPs

at 5'-UTR. At position g.75 G>A observed GG (44), GA (55), AA (01) genotypes with G (71.5%) and A (28.5%) alleles, at g.195 C>T observed CC (76), CT (22), TT (02) genotypes with C (87%) and T (13%) alleles and at g.253 G>A observed GG (29), GA (70), AA (01) genotypes with G (64%) and A (36%) alleles.

Table 14. Genotype and allelic frequencies of NPY SNPs of Exon 1 in indigenous and crossbred cattle

| Animal Breed | Number of Animals | SNP at EXON 1 | | | | |
|--------------|-------------------|---------------------|-----|-----|-------------------|-------|
| | | Genotypic Frequency | | | Allelic Frequency | |
| | | CC% | CT% | TT% | C% | T% |
| Kankrej | 147 | 64 | 81 | 02 | 70 | 30 |
| Gir | 23 | 09 | 13 | 01 | 67.3 | 32.6 |
| Frieswal | 72 | 08 | 62 | 02 | 54.16 | 45.84 |

Table 15. Genotype and allelic frequencies of NPY SNPs of 75 (5'-UTR) in indigenous cattle

| Animal Breed | Number of Animals | SNP at 75 (5'-UTR) | | | | |
|--------------|-------------------|---------------------|-----|-----|-------------------|------|
| | | Genotypic Frequency | | | Allelic Frequency | |
| | | GG% | GA% | AA% | G% | A% |
| Kankrej | 100 | 44 | 55 | 01 | 71.5 | 28.5 |

Table 16. Genotype and allelic frequencies of NPY SNPs of 195 (5'-UTR) in indigenous cattle

| Breed | Number of Animals | SNP at 195 (5'-UTR) | | | | |
|---------|-------------------|---------------------|-----|-----|-------------------|----|
| | | Genotypic Frequency | | | Allelic Frequency | |
| | | CC% | CT% | TT% | C% | T% |
| Kankrej | 100 | 76 | 22 | 02 | 87 | 13 |

Table 17. Genotype and allelic frequencies of NPY SNPs of 235 (5'-UTR) in indigenous cattle

| Breed | Number of Animals | SNP at 235 (5'-UTR) | | | | |
|---------|-------------------|---------------------|-----|-----|-------------------|----|
| | | Genotypic Frequency | | | Allelic Frequency | |
| | | GG% | GA% | AA% | G% | A% |
| Kankrej | 100 | 29 | 70 | 01 | 64 | 36 |

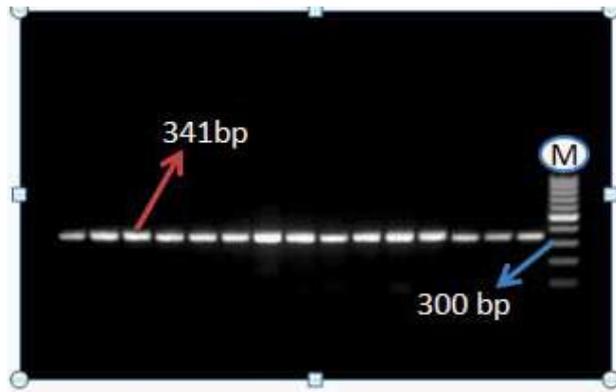
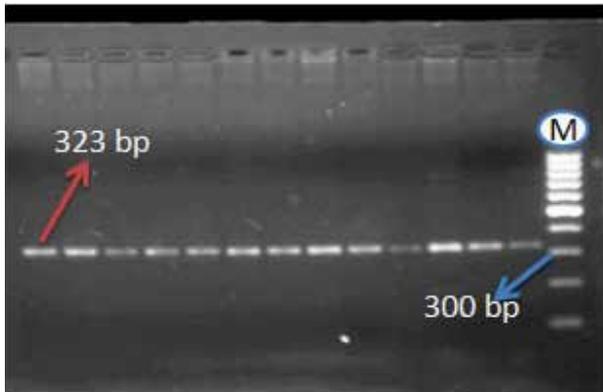


Figure 13. PCR product representing amplicons with 323 bp and 341 bp of exon-1 and 5'-UTR of NPY gene, respectively (M=100 bp DNA ladder)

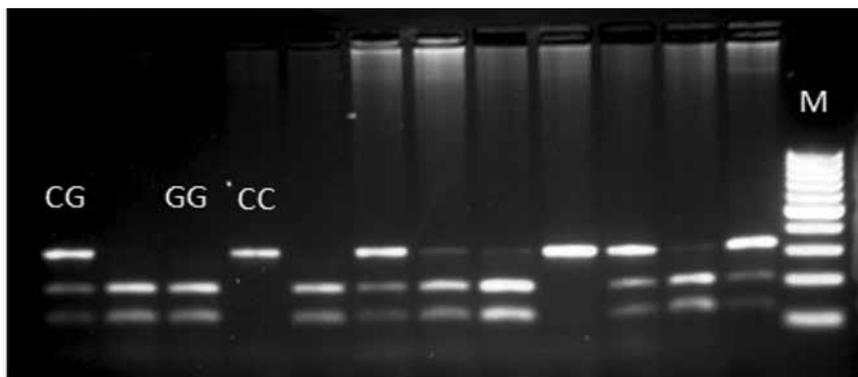


Figure 14. Representative 3% agarose gel electrophoresis of SfoI restriction enzyme digestion of exon-1 of Neuropeptide gene PCR products, where 3 fragments at 323, 201, 122 bp showing CG genotype, 2 fragments 201,122 showing GG genotype and intact 323 bp showing CC Genotype. Lane M = 100 bp DNA ladder Marker Ladder

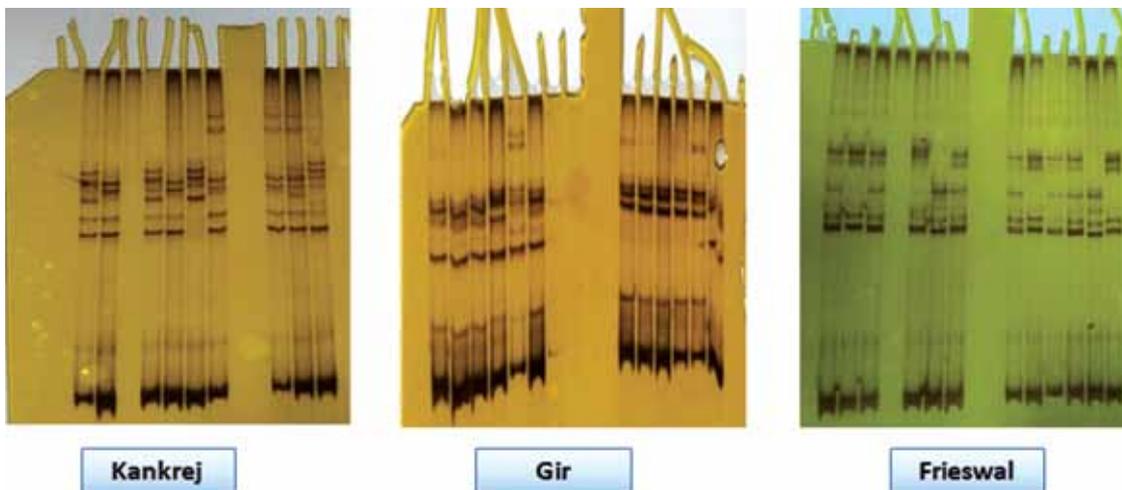


Figure: 15. SSCP of 5'-UTR of NPY Gene

```

20382-12-NFYUTR-1F      GCCATTACTGTCGGCTCTCCAGCGGGGAGACCCAAAACGAAAAAGGAGAACTCTT  60
20382-67-NFYUTR-1F      GCCATTACTGTCGGCTCTCCAGCGGGGAGACCCAAAACGAAAAAGGAGAACTCTT  60
20382-35-NFYUTR-1F      GCCATTACTGTCGGCTCTCCAGCGGGGAGACCCAAAACGAAAAAGGAGAACTCTT  60
Original                GCCATTACTGTCGGCTCTCCAGCGGGGAGACCCAAAACGAAAAAGGAGAACTCTT  60
20382-09-NFYUTR-1F      GCCATTACTGTCGGCTCTCCAGCGGGGAGACCCAAAACGAAAAAGGAGAACTCTT  60
20382-1-NFYUTR-1F       GCCATTACTGTCGGCTCTCCAGCGGGGAGACCCAAAACGAAAAAGGAGAACTCTT  60
20382-10-NFYUTR-1F      GCCATTACTGTCGGCTCTCCAGCGGGGAGACCCAAAACGAAAAAGGAGAACTCTT  60
20382-06-NFYUTR-1F      GCCATTACTGTCGGCTCTCCAGCGGGGAGACCCAAAACGAAAAAGGAGAACTCTT  60
20382-32-NFYUTR-1F      GCCATTACTGTCGGCTCTCCAGCGGGGAGACCCAAAACGAAAAAGGAGAACTCTT  60
.....

20382-12-NFYUTR-1F      CCTCTAACAGGGCGTTTGGGGAGAGGGTAGGAAAGGGATAAGTTCACAGTGCAGGGG  120
20382-67-NFYUTR-1F      CCTCTAACAGGGCGTTTGGGGAGAGGGTAGGAAAGGGATAAGTTCACAGTGCAGGGG  120
20382-35-NFYUTR-1F      CCTCTAACAGGGCGTTTGGGGAGAGGGTAGGAAAGGGATAAGTTCACAGTGCAGGGG  120
Original                CCTCTAACAGGGCGTTTGGGGAGAGGGTAGGAAAGGGATAAGTTCACAGTGCAGGGG  120
20382-09-NFYUTR-1F      CCTCTAACAGGGCGTTTGGGGAGAGGGTAGGAAAGGGATAAGTTCACAGTGCAGGGG  120
20382-1-NFYUTR-1F       CCTCTAACAGGGCGTTTGGGGAGAGGGTAGGAAAGGGATAAGTTCACAGTGCAGGGG  120
20382-10-NFYUTR-1F      CCTCTAACAGGGCGTTTGGGGAGAGGGTAGGAAAGGGATAAGTTCACAGTGCAGGGG  120
20382-06-NFYUTR-1F      CCTCTAACAGGGCGTTTGGGGAGAGGGTAGGAAAGGGATAAGTTCACAGTGCAGGGG  120
20382-32-NFYUTR-1F      CCTCTAACAGGGCGTTTGGGGAGAGGGTAGGAAAGGGATAAGTTCACAGTGCAGGGG  120
.....

20382-12-NFYUTR-1F      AGGAACTTCTAATCTGTITTTTAAAGTGTTTAAATGGGCGGGAGCCTCCCAACTCA  180
20382-67-NFYUTR-1F      AGGAACTTCTAATCTGTITTTTAAAGTGTTTAAATGGGCGGGAGCCTCCCAACTCA  180
20382-35-NFYUTR-1F      AGGAACTTCTAATCTGTITTTTAAAGTGTTTAAATGGGCGGGAGCCTCCCAACTCA  180
Original                AGGAACTTCTAATCTGTITTTTAAAGTGTTTAAATGGGCGGGAGCCTCCCAACTCA  180
20382-09-NFYUTR-1F      AGGAACTTCTAATCTGTITTTTAAAGTGTTTAAATGGGCGGGAGCCTCCCAACTCA  180
20382-1-NFYUTR-1F       AGGAACTTCTAATCTGTITTTTAAAGTGTTTAAATGGGCGGGAGCCTCCCAACTCA  180
20382-10-NFYUTR-1F      AGGAACTTCTAATCTGTITTTTAAAGTGTTTAAATGGGCGGGAGCCTCCCAACTCA  180
20382-06-NFYUTR-1F      AGGAACTTCTAATCTGTITTTTAAAGTGTTTAAATGGGCGGGAGCCTCCCAACTCA  180
20382-32-NFYUTR-1F      AGGAACTTCTAATCTGTITTTTAAAGTGTTTAAATGGGCGGGAGCCTCCCAACTCA  180
.....

20382-12-NFYUTR-1F      GCGCCTCTCACCTCCGAATCCTTGGCTCTGCTACTGGACCAAAGTGTTCAGAGTTTTCG  240
20382-67-NFYUTR-1F      GCGCCTCTCACCTCCGAATCCTTGGCTCTGCTACTGGACCAAAGTGTTCAGAGTTTTCG  240
20382-35-NFYUTR-1F      GCGCCTCTCACCTCCGAATCCTTGGCTCTGCTACTGGACCAAAGTGTTCAGAGTTTTCG  240
Original                GCGCCTCTCACCTCCGAATCCTTGGCTCTGCTACTGGACCAAAGTGTTCAGAGTTTTCG  240
20382-09-NFYUTR-1F      GCGCCTCTCACCTCCGAATCCTTGGCTCTGCTACTGGACCAAAGTGTTCAGAGTTTTCG  240
20382-1-NFYUTR-1F       GCGCCTCTCACCTCCGAATCCTTGGCTCTGCTACTGGACCAAAGTGTTCAGAGTTTTCG  240
20382-10-NFYUTR-1F      GCGCCTCTCACCTCCGAATCCTTGGCTCTGCTACTGGACCAAAGTGTTCAGAGTTTTCG  240
20382-06-NFYUTR-1F      GCGCCTCTCACCTCCGAATCCTTGGCTCTGCTACTGGACCAAAGTGTTCAGAGTTTTCG  240
20382-32-NFYUTR-1F      GCGCCTCTCACCTCCGAATCCTTGGCTCTGCTACTGGACCAAAGTGTTCAGAGTTTTCG  240
.....

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Figure 16. Nucleotide sequence variation in 5'-UTR of NPY Gene

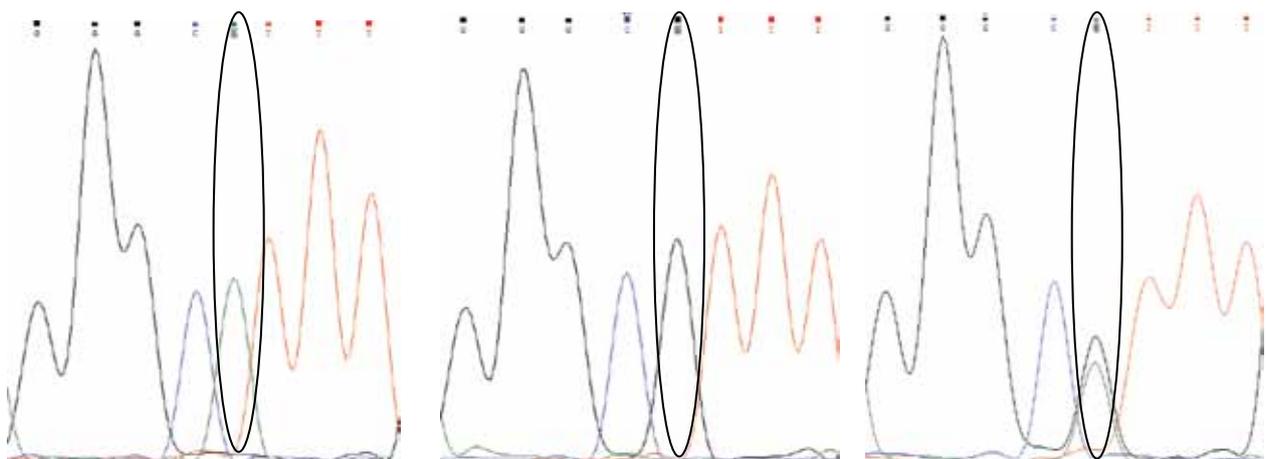


Figure17. Chromatograph showing g.75 G>A (5'-UTR) SNP in Neuropeptide Y gene in Kankrej cattle

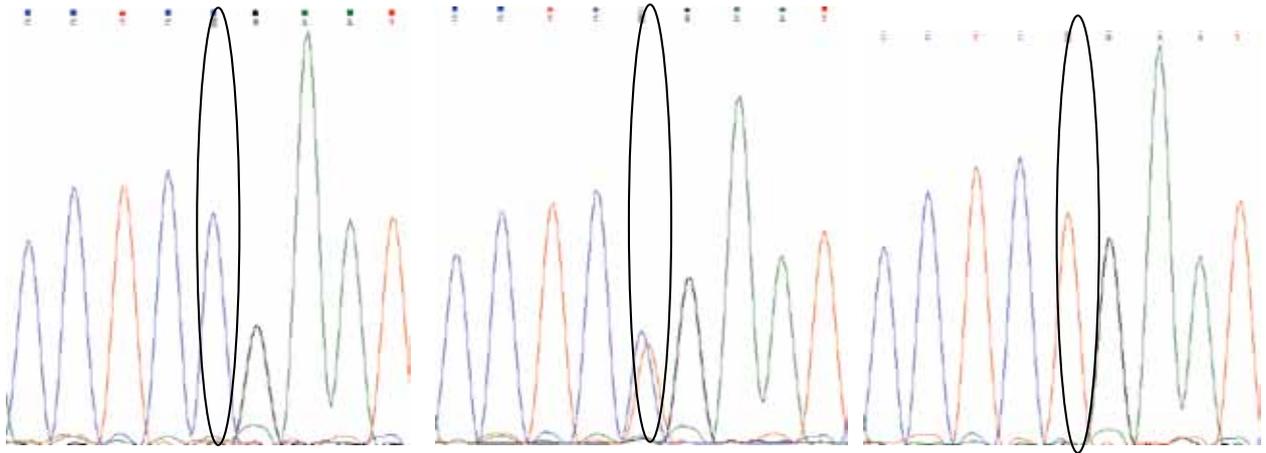


Figure18 Chromatograph showing g.195 C>T (5'-UTR) SNP in Neuropeptide Y gene in Kankrej cattle

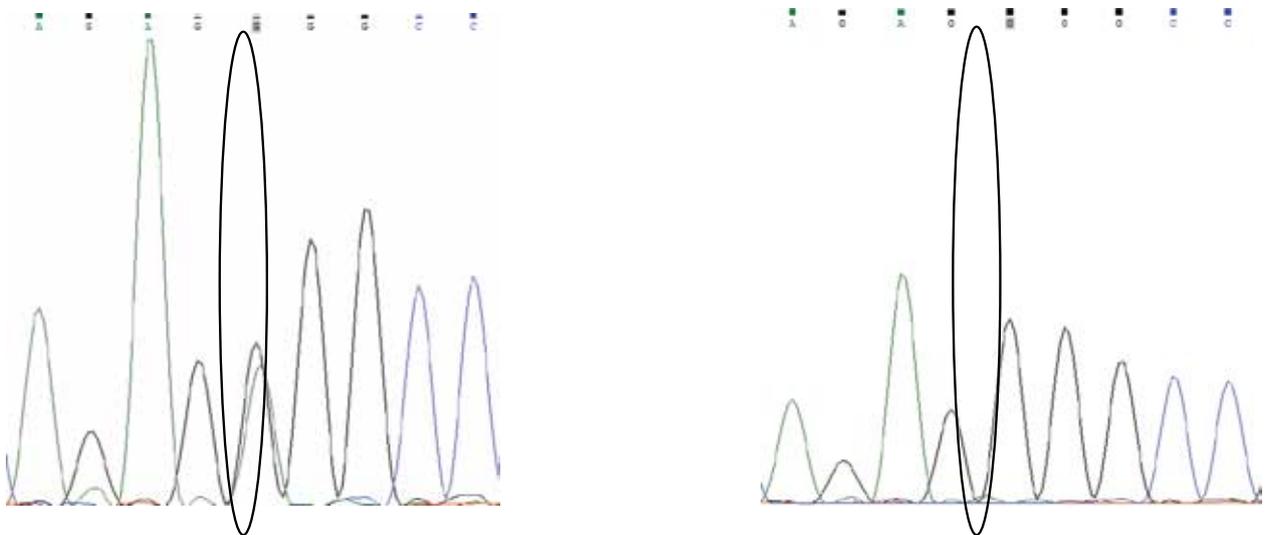


Figure19. Chromatograph showing g.253 G>A (5'-UTR) SNP in Neuropeptide Y gene in Kankrej cattle

Genetic variability of X and Y bearing spermatozoa to cryopreservation stress and its implication on their motility

The X and Y chromosome-specific markers i.e. bovine proteolipid protein (PLP) and sex-determining region Y (SRY) genes were simultaneously quantified. A total of 50 semen samples of Frieswal bulls were used for quantification of PLP and SRY gene expression. The real time PCR assay showed high amplification efficiencies of 98% and 104% for PLP and SRY genes, respectively. The acceptable qRT-PCR efficiency ranged from 90 to 110%. Analysed qRT-PCR data showed that in unprocessed control semen samples, the average male: female ratio was 1.080. Alteration of pH and procedure for separating motile sperms with time combinations for retrieval of high motility sperm and cryopreservation did not change the sex ratio.

Development of web server for phenotype and genotype analysis for cattle breeding management (SIReDAM)

Developed web based online portal SIReDAM in collaboration with the scientists of CABIn, IASRI, New Delhi. This software has been primarily developed for the real time data retrieval and management of all the information collected under the All India Co-ordinated Research Project on Cattle and can be used for buffaloes also. Databases have been developed and implemented in MySQL as back-end RDBMS. Web tools have been developed using PHP as server side scripting language for embedding HTML, database connectivity and database operations. R software has been used for analysis process at back-end. HTML and Java have been used for developing front-end tools.

The data entered is verified at various levels

and with the approval of the Project In-charge, the data is updated in the primary database. Provisions are also given to generate report at various hierarchy levels so as to make the timely reporting without any hardship. Thus, it is an overall Management Information System (MIS) for an efficient professional management of the dairy animals for their genetic improvement. This has been designed to give the individual and farm wise daily activities, collection and update of phenotypic & genotypic information to improve the overall

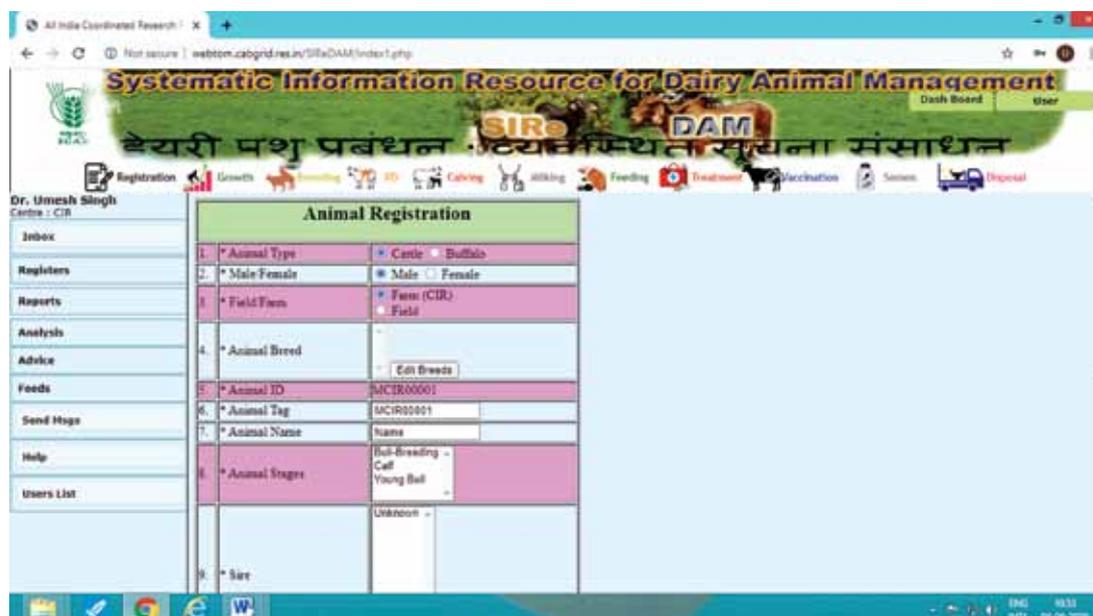
management of livestock production.

This web based application tool dictate to establish an effective and efficient integrated MIS based on the input of individual animal's phenotypic parameters, aggregated to all data to database. Information and Communication Technologies (ICT) are precisely explored to enabling implementation of this concept. Presently, the software is under validation and data entry has been started by the units.

Home page of the software



Registration form





Report generation



Genetic analysis of lactation persistency using random regression test day models

Information on first lactation daily milk yield records of 229 Gir and 204 Kankrej cattle were used to study the lactation persistency. Random regression analysis was carried out to estimate the genetic parameters and expected breeding values (EBVs) for different test day yields.

Additive genetic, permanent environmental, temporary environmental and phenotypic variances (kg²) of different fortnightly test day milk yields were estimated. Heritability estimates of different test day yields ranged from 0.218 (TD240) to 0.271 (TD150) in Gir cattle and 0.039 (TD240) to 0.126 (TD120 and TD135) in Kankrej cattle (Table 18). All the heritability estimates were statistically highly significant (P<0.01).

Table 18. Heritability estimates of fortnightly test day yields in Gir and Kankrej cattle

| Sl. No. | Test days | Gir cattle | Kankrej cattle |
|---------|-----------|-----------------|-----------------|
| 1 | 15 | 0.252** ± 0.003 | 0.119** ± 0.004 |
| 2 | 30 | 0.245** ± 0.003 | 0.117** ± 0.006 |
| 3 | 45 | 0.235** ± 0.004 | 0.114** ± 0.012 |
| 4 | 60 | 0.224** ± 0.006 | 0.111** ± 0.023 |
| 5 | 75 | 0.219** ± 0.007 | 0.111** ± 0.037 |
| 6 | 90 | 0.227** ± 0.008 | 0.117** ± 0.040 |
| 7 | 105 | 0.244** ± 0.008 | 0.123** ± 0.033 |

| | | | |
|----|-----|-----------------|-----------------|
| 8 | 120 | 0.258** ± 0.007 | 0.126** ± 0.026 |
| 9 | 135 | 0.266** ± 0.007 | 0.126** ± 0.021 |
| 10 | 150 | 0.271** ± 0.007 | 0.125** ± 0.020 |
| 11 | 165 | 0.272** ± 0.007 | 0.123** ± 0.020 |
| 12 | 180 | 0.269** ± 0.007 | 0.119** ± 0.023 |
| 13 | 195 | 0.261** ± 0.008 | 0.111** ± 0.029 |
| 14 | 210 | 0.245** ± 0.008 | 0.094** ± 0.043 |
| 15 | 225 | 0.226** ± 0.008 | 0.060** ± 0.069 |
| 16 | 240 | 0.218** ± 0.007 | 0.039** ± 0.074 |
| 17 | 255 | 0.225** ± 0.005 | 0.073** ± 0.038 |
| 18 | 270 | 0.235** ± 0.004 | 0.100** ± 0.016 |
| 19 | 285 | 0.243** ± 0.003 | 0.112** ± 0.008 |
| 20 | 300 | 0.249** ± 0.003 | 0.118** ± 0.004 |

** - Significant at 1% level (P<0.01)

The average EBVs of different test day yields ranged from -0.365 (TD300) to 0.123 (TD105 and TD120) in Gir cattle and -1.721 (TD15) to 0.31 (TD225 and TD240). The average EBV estimates were used to calculate nine different lactation persistency measures and the descriptive statistics are given in Table 19. Higher values of persistency measures indicate lower lactation persistency, except for PS5, where higher values indicate higher lactation persistency.

In general, the persistency measures were higher in Kankrej breed of cattle as compared to Gir cattle except for PS5, which was higher in Gir cattle.

As mentioned earlier, Gir cattle had comparatively higher estimate for PS5 and lower estimates for other persistency measures revealing its better persistency for first lactation milk production as compared to Kankrej cattle. The effectiveness of different lactation persistency measures was assessed by the rank correlation and the rank correlations were high and statistically highly significant ($P < 0.01$). Rank correlation estimates revealed similarities in ranking of animals based on the persistency measures estimated by different methods. Persual of Table 20 also

reveals that negative rank correlation of PS5 with other persistency measures, due to its definition of difference between the sum of EBVs of TD60 to TD279 with TD280 i.e. from the earlier test days to later test day while the rest eight PS measures are the difference between later test days to earlier test days. Thus higher estimate of PS5 and lower estimates of other persistency estimates indicate higher persistency and this fact justifies the negative rank correlations between PS5 and others persistency estimates.

Table 19. Descriptive statistics of persistency measures estimated in Gir, Kankrej cattle

| Methods | Gir cattle (N=223) | | | | Kankrej cattle (N=201) | | | |
|---------|--------------------|-----------|----------|----------------|------------------------|-----------|----------|----------------|
| | Average | Minimum | Maximum | Standard Error | Average | Minimum | Maximum | Standard Error |
| PS1 | -0.376 | -5.910 | 13.525 | 0.154 | 1.166 | -7.341 | 42.435 | 0.347 |
| PS2 | 0.746 | -124.174 | 138.776 | 2.756 | 118.628 | -693.870 | 4305.397 | 32.813 |
| PS3 | -25.044 | -423.266 | 973.932 | 11.295 | 128.961 | -792.840 | 4756.642 | 37.583 |
| PS4 | -16.998 | -440.802 | 843.912 | 10.533 | 223.883 | -1337.883 | 8198.064 | 63.345 |
| PS5 | 71.020 | -2321.992 | 1038.422 | 26.125 | -50.505 | -1788.619 | 449.801 | 19.381 |
| PS6 | -0.407 | -6.159 | 13.924 | 0.157 | 0.761 | -5.010 | 27.061 | 0.235 |
| PS7 | -0.313 | -5.015 | 11.543 | 0.132 | 1.158 | -7.218 | 42.365 | 0.341 |
| PS8 | -34.243 | -537.781 | 1230.797 | 14.025 | 115.176 | -713.446 | 4040.499 | 33.295 |
| PS9 | -25.651 | -560.061 | 1148.270 | 13.866 | 246.066 | -1479.235 | 8999.514 | 69.966 |

Table 20. Rank correlations between different persistency measures in Gir and Kankrej cattle

| Method | PS1 | PS2 | PS3 | PS4 | PS5 | PS6 | PS7 | PS8 | PS9 |
|--------|----------|----------|----------|----------|----------|---------|---------|---------|---------|
| PS1 | 1.000 | 0.645** | 0.995** | 0.946** | -0.989** | 0.997** | 0.999** | 1.000** | 0.970** |
| PS2 | 0.981** | 1.000 | 0.707** | 0.843** | -0.544** | 0.596** | 0.667** | .645** | 0.797** |
| PS3 | 0.996** | 0.993** | 1.000 | .972** | -.972** | .986** | .998** | 0.995** | 0.988** |
| PS4 | 0.989** | 0.999** | 0.997** | 1.000 | -.892** | .921** | .956** | .946** | .996** |
| PS5 | -0.931** | -0.852** | -0.900** | -0.873** | 1.000 | -.997** | -.984** | -.989** | -.927** |
| PS6 | 0.993** | 0.956** | 0.980** | 0.967** | -0.963** | 1.000 | .994** | .997** | .951** |
| PS7 | 0.999** | 0.987** | 0.998** | 0.993** | -0.919** | 0.988** | 1.000 | .999** | .977** |
| PS8 | 0.996** | 0.979** | 0.991** | 0.986** | -0.930** | 0.993** | 0.995** | 1.000 | .970** |
| PS9 | 0.991** | 0.997** | 0.998** | 1.000** | -0.880** | 0.971** | 0.995** | 0.988** | 1.000 |

PS- Persistency; Above diagonals: Rank correlations in Gir cattle; Below diagonal: Rank correlations in Kankrej cattle; ** - Significant at 1% level ($P < 0.01$)



B. Semen Production Performance

Germplasm production and performance of Frieswal bulls

The overall average semen volume (ml), sperm concentration (million/ml), initial progressive motility (%) and post thaw motility (%) were 5.14 ± 0.03 , 932.25 ± 7.65 , 53.43 ± 0.30 and 37.57 ± 0.32 , respectively in 4076 ejaculates collected from 112 Frieswal bulls during April-December, 2019. Out of these ejaculates, 1116 ejaculates passed CMU criteria of minimum semen volume (1.0 ml), sperm concentration (500 million/ml) and initial progressive motility (70%) for further processing. Total 309 semen samples from 55 bulls were frozen with more than 50% post-thaw motility. During the period, a total of 63147

semen doses were produced for future breeding use in different projects/ cattle developmental programmes.

In order to assess the semen quality parameters, these bulls were divided into 4 age groups (26-36, 37-48, 49-60, and more than 60 month) (Table 21). The younger bulls donated significantly least semen volume but with higher spermatozoa concentration. Middle age group bulls (age group 3) donated significantly highest semen volume but lower sperm concentration. Age had no significant effect on average initial sperm motility, however, post-thaw motility reduced significantly in bulls aged more than 60 m of age.

Table 21. Effect of age on semen quality parameters of Frieswal bulls

| Age group | Semen volume (ml) | Initial sperm motility (%) | Sperm concentration (million/ml) | Post-thaw motility (%) |
|------------|-------------------|----------------------------|----------------------------------|------------------------|
| 1 (26-36m) | 4.26 ± 0.08^d | 54.23 ± 0.80 | 1154.59 ± 23.54^a | 37.08 ± 0.86^a |
| 2 (37-48m) | 5.22 ± 0.04^b | 53.47 ± 0.43 | 905.79 ± 10.48^c | 37.94 ± 0.47^a |
| 3 (49-60m) | 5.36 ± 0.05^a | 53.52 ± 0.54 | 868.01 ± 12.89^d | 38.19 ± 0.52^a |
| 4 (>60m) | 4.85 ± 0.10^c | 52.11 ± 0.94 | 1068.53 ± 30.08^b | 32.96 ± 1.13^b |
| Overall | 5.14 ± 0.03 | 53.43 ± 0.30 | 932.25 ± 7.65 | 37.57 ± 0.32 |

Means bearing different superscripts differ significantly ($P < 0.05$)

A total of 70178 frozen semen doses including 42037 for Field Progeny Testing Project, 2940 for Military farms and 25201 for sale to various developmental agencies, para-vets and farmers for cattle improvement and experiments were made available to semen distribution centre of the institute.

Germplasm production and performance of Sahiwal bulls

The overall average semen volume (ml), sperm concentration (million/ml), initial motility (%) and post thaw motility (%) were 3.75 ± 0.09 , 825.26 ± 29.09 , 52.67 ± 1.24 and 36.31 ± 1.06 , respectively in 266 ejaculates collected from 4 Sahiwal bulls. Total 3051 semen doses were frozen during the reported period from the semen ejaculates of 3 bulls. A total of 1960 semen doses were disbursed to semen distribution centre for sale and for other purpose.

Delineating the effect of season and shelter management on scrotal thermal profile and semen quality in Frieswal bulls

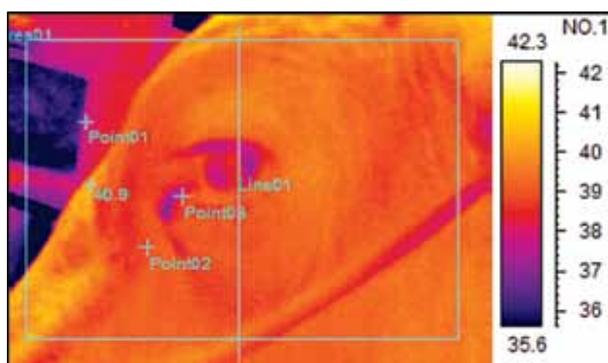
An experiment was conducted to study scrotal thermal profile and semen quality of Frieswal bulls managed under two different designs of bull sheds during hot and humid season. The experimental bulls were equally distributed (12 bulls in each) in East-West (EW) and North-South (NS) oriented individual bull pens. Scrotal surface and ocular temperature of each bull was recorded with infrared thermal imaging camera before semen collection in the morning and during afternoon on the same day at fortnightly interval during the study period (Figure 20). Thermal gradient of the testes was calculated based on the temperature difference between proximal and distal poles. Semen quality parameters viz. semen volume, sperm concentration, initial sperm motility, sperm morphology, acrosome integrity and PTM were

assessed at fortnightly interval.

During the study season (July to September, 2019), ambient shed temperature varied from 23 to 40.5°C. Maximum ambient temperature was lesser in NS sheds by 3°C than in the EW, which might be due to the open sides and higher ceiling height of such sheds. Accordingly, mean THI was significantly lower ($p < 0.05$) in NS than EW.



(A)



(B)

Figure 20. Infrared thermography image of scrotal (A) and orbital (B) surface

Table 22 depicts scrotal thermal gradients and ocular temperature of Frieswal bulls kept in both types of sheds. Scrotal thermal gradient was significantly higher ($p < 0.05$) in NS bulls than the EW bulls during afternoon period, however, no difference was observed between these bulls during morning period. Design of the shed had no significant effect on ocular temperature in the experimental bulls.

Table 22. Mean SE Scrotal thermal gradient and ocular temperature of Frieswal bulls

| Para-meters | Morning | | Afternoon | |
|--------------------------|------------|------------|-------------------------|-------------------------|
| | EW | NS | EW | NS |
| Scrotal thermal gradient | 2.29±0.20 | 2.58 ±0.18 | 0.91 ±0.14 ^b | 1.34 ±0.19 ^a |
| Ocular temp. (°C) | 36.89±0.42 | 36.05±0.26 | 39.35±0.34 | 38.99±0.40 |

Means bearing different superscripts differ significantly ($p < 0.05$)

Mean semen volume (5.41 ± 0.12 ml vs 4.22 ± 0.10 ml), sperm concentration/ml of semen (850.58 ± 30.62 million vs 763.33 ± 29.83 million) and initial sperm motility ($58.14 \pm 1.15\%$ vs $45.57 \pm 1.46\%$) were significantly ($p < 0.05$) higher in NS bulls than the EW bulls, respectively. However, no difference was observed for PTM values of frozen samples processed from these bulls probably because only good quality samples were processed from bulls of both sheds. Total sperm abnormalities including head, mid piece and tail were within the normal range without any difference between two groups.

Quality assessment of Frieswal bull semen

Frozen semen samples from 99 breeding bulls were evaluated for semen quality parameters like post thaw motility (PTM), incubation test, acrosome integrity, hypo osmotic swelling test (HOST), sperm concentration and microbial load (Figure 21). Post thaw semen quality was evaluated in randomly selected two cryopreserved straws per bull (0.25 ml, French mini), thawed at 37°C for 30 seconds. Two replicates per sample were made for evaluation of all quality parameters of spermatozoa. The per cent progressive motility following thawing at 0, 30 and 60 minutes of incubation at 37°C were 50.80 ± 0.27 , 42.52 ± 0.35 and 34.39 ± 0.48 , respectively. The plasma membrane integrity (%) as determined by HOST was 50.40 ± 3.07 , while acrosome integrity (%) was 72.29 ± 0.63 . The average sperm concentration per 0.25 ml straw was 20.79 ± 0.51 million. The mean bacterial load in the frozen semen samples was 419.15 ± 66.27 CFU/ml. Eighteen out of 99 samples (18.18%) were negative for bacterial growth. The bacterial counts of all the samples were below 5000 CFU/ml as prescribed by CMU for semen production.

Similarly, fresh semen samples from 25 newly introduced bulls were assessed for viability and morphology using eosin-nigrosin stain and acrosome integrity by Giemsa staining. The quality control parameters for viability and morphology of Frieswal bull (newly introduced and problem bulls) semen are presented in Table 23. Neat semen from 14 problems bulls with poor initial motility were also assessed for viability and morphology. It was found that the total abnormality (%) of sperms in both category bulls was higher than the CMU

criteria of maximum limit for passing of samples for further processing.

The microbial load examination of laminar air flow, pass boxes of AV preparation room and semen evaluation lab, buffer, distilled water, artificial vagina and semen straw did not show formation of bacterial colony in the measured area. However, microbial load in egg yolk, semen evaluation and processing laboratory was 175, 65 and 120 cfu/m³, respectively.

Table 23. Quality control parameters of sperm viability and morphology in neat semen of Frieswal bulls

| Semen quality parameter | New bulls (n=75 samples) | Problem bulls (n=14 samples) |
|-------------------------|--------------------------|------------------------------|
| Live (%) | 61.75±1.34 | 52.91±4.10 |
| Dead (%) | 38.25±1.34 | 47.09±4.10 |
| Abnormal head (%) | 12.64±1.25 | 17.18 ± 3.50 |
| Abnormal mid piece (%) | 7.46±0.53 | 12.70± 2.39 |
| Abnormal tail (%) | 3.59±0.50 | 7.14 ± 2.83 |
| Total abnormality (%) | 23.69±1.77 | 37.02±4.05 |
| Intact Acrosome (%) | 70.10±1.35 | - |



Intact Acrosome



Live & dead spermatozoa



HOS Test



Culture for microbial count

Figure 21. Estimation of frozen semen quality parameters

Development of antibiogram for quality semen production

The samples of fresh (13) and frozen semen (16) of Frieswal breeding bulls were collected for the analysis of semen quality parameters and microbial characteristics. The bacterial load was estimated by pour plate method and the colonies were counted with the help of a colony counter. The colonies from specific media were picked and sub-cultured for further confirmation of the isolates by

biochemical tests (Figure 22). After identification of isolate from the semen, samples were subjected to *in-vitro* antibiotic sensitivity tests against routinely used penicillin G, streptomycin and other available broad spectrum antibiotics suitable for the semen extender. The semen quality characteristics of fresh and frozen semen samples are presented in Table 24. The average values of all the semen quality parameters in frozen semen samples were within the CMU prescribed limits.

Table 24. Frozen and fresh semen quality parameters of experimental Frieswal bulls

| Semen Attributes | Frozen semen (n=16) | Fresh semen (n=13) |
|--|---------------------|--------------------|
| Microbial load (CFU/ml) | 883.12 ±179.17 | 7642.7±702.85 |
| Post thaw / initial sperm motility (%) | 50.62±0.63 | 67.69±2.57 |
| Motility after incubation for 30 min (%) | 42.81±0.78 | 59.61±2.68 |
| Motility after incubation for 60 min (%) | 35.31±1.06 | 50.76±2.82 |
| HOST (%) | 46.37±2.03 | 55.79±2.30 |
| Acrosome Integrity (%) | 72.57±1.19 | 80.26±1.59 |
| Sperm Concentration (million) | 20.48±0.89/straw | 939.46±118.35 /ml |
| Live sperm (%) | 65.42±2.02 | 75.69±3.12 |
| Abnormal head (%) | 7.91±1.78 | 9.74±3.24 |
| Abnormal mid piece (%) | 8.98±1.44 | 5.56±1.07 |
| Abnormal tail (%) | 2.53±0.38 | 1.53±1.58 |

Correlation analysis revealed that microbial load had significant negative correlation with HOST ($r=-0.753$, $p>0.01$), acrosome integrity ($r=-0.716$, $p>0.01$) and Live sperm concentration ($r=-0.759$, $p>0.01$) while positive correlation with sperm abnormalities ($r=0.618$, $p>0.05$).

Table 25. Correlation between microbial load and semen quality parameters

| | Microbial load | HOST | Acrosome | Sperm Concentration | Live | Sperm abnormalities |
|---------------------|----------------|----------|----------|---------------------|----------|---------------------|
| Microbial load | 1 | -0.763** | -0.728** | 0.171 | -0.742** | 0.615* |
| HOST | | 1 | 0.531* | -0.386 | 0.564* | -0.626** |
| Acrosome | | | 1 | -0.383 | 0.706** | -0.625** |
| Sperm Concentration | | | | 1 | -0.355 | 0.168 |
| Live | | | | | 1 | -0.752** |
| Sperm abnormalities | | | | | | 1 |

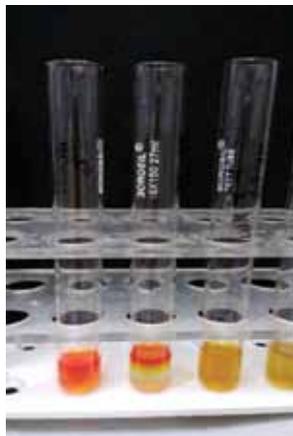
** $p<0.01$ level, * $P> 0.05$ level

The microbial load (cfu/ml) in frozen semen was lesser than in the fresh semen of the bulls under the study. In fresh semen samples, 3 samples had bacterial load below 5000 cfu/ml, 8 samples between 5000 -10000 while 2 samples had bacterial load above 10000 cfu/ml. Out of 16 frozen semen samples 5 samples had bacterial load below 500 cfu/ml, 5 samples between 500-1000 cfu/ml, 4 samples between 1000-2000 cfu/ml while 2 samples had bacterial load above 2000 cfu/ml. Different microorganisms belonging to *Staphylococcus aureus*, *Staphylococcus epidermidis*,

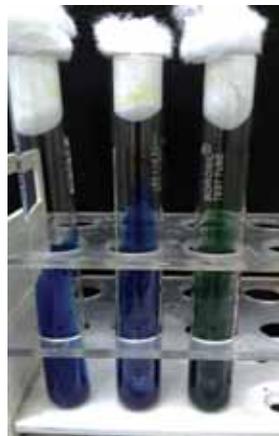
Proteus, *Klebsiella*, *Bacillus cereus*, *Bacillus subtilis*, and *Actinomyces* were identified in the semen samples (Figure 23). The antibiotic sensitivity testing of the bacterial isolates revealed that most of the isolates were found resistant to benzyl penicillin except *Proteus* and *Bacillus subtilis* which showed intermediate efficacy. Most of the isolates were found sensitive to Gentamicin. *Staphylococcus*, *Proteus* and *Bacillus* were sensitive to Ciprofloxacin while *Klebsiella* was found resistant (Table 26).

Table 26. Antibiotic sensitivity pattern of different microbes isolated from semen samples

| | Benzyl penicillin | Srepto-mycin | Genta-micin | Spectino-mycin | Linco-mycin | Tylosin | Cipro-floxacin |
|-------------------|-------------------|--------------|-------------|----------------|-------------|---------|----------------|
| Staph aureus | R | S | S | S | I | S | S |
| Staph epidermidis | R | I | S | S | I | S | S |
| Proteus | I | I | S | I | R | R | S |
| Klebsiella | R | I | S | I | R | R | R |
| Bacillus subtilis | I | S | S | S | I | R | S |
| Bacilus cereus | R | S | S | S | I | S | S |
| Actinomyces | R | R | S | S | S | S | - |



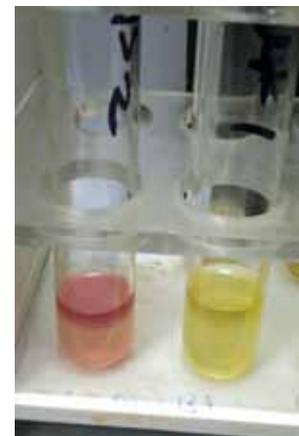
MR test



Citrate utilization test



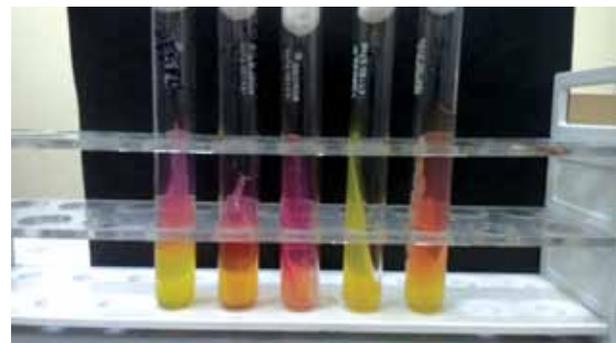
VP test



Indole test



Catalase test



Urease test

Figure 22: Biochemical tests performed for characterization of bacteria in semen

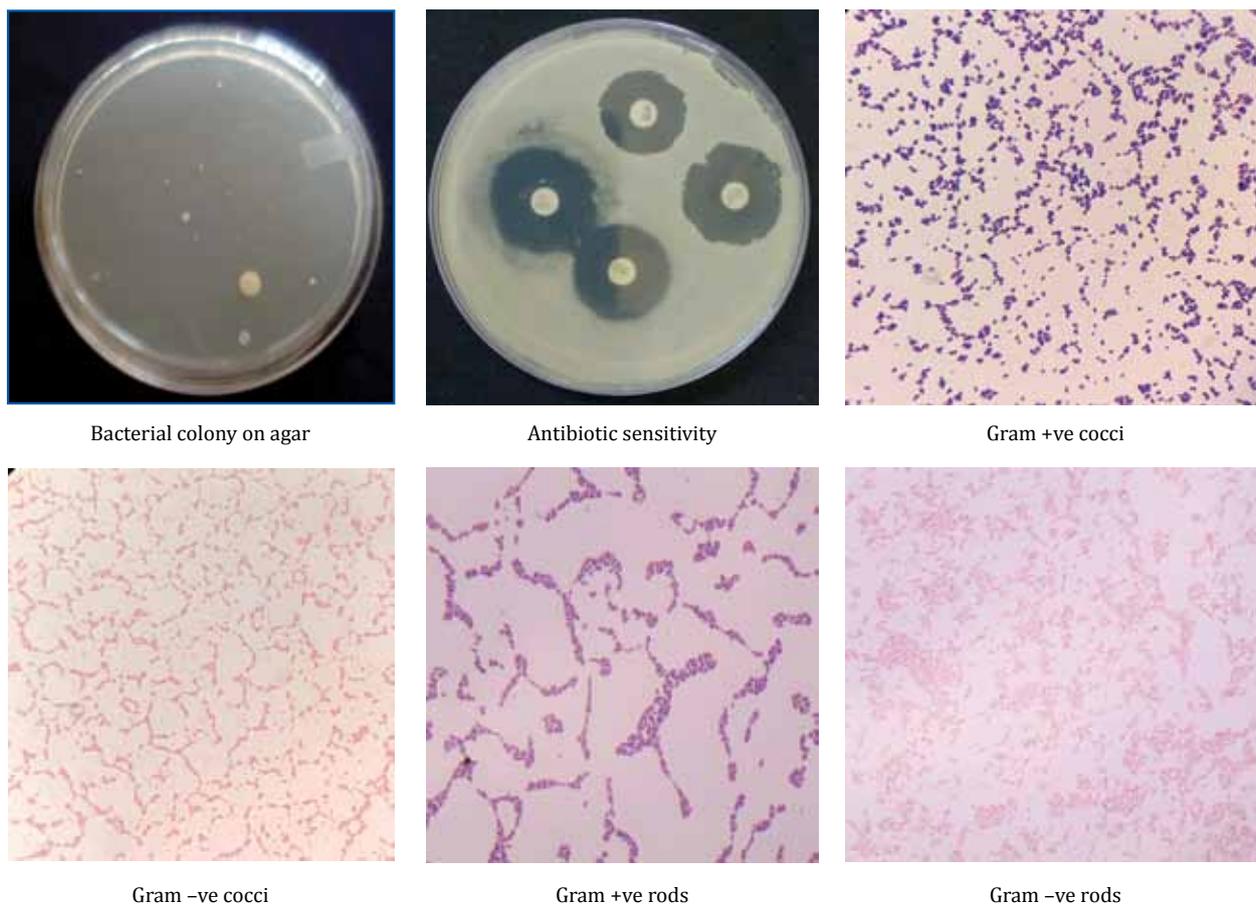


Figure 23. Culture and staining of bacteria present in semen samples

Mitigation of spermatozoa cryodamages and fertility assessment using different additives

Cryodamage to the spermatozoa occurs invariably during the process of cryopreservation of semen. In order to minimise such injuries during freezing, Glutathione (2.5, 5.0 and 10mM) and Alfa-Tocopherol (1.0, 3.0 and 5.0mM) were added as antioxidants in semen diluter and were compared with traditional diluter during post dilution (AD), post equilibration (AE) and Post Thaw (PT) stages. The results showed that Glutathione at 10 mM concentration had better

cryo-protection during freezing and thawing process with respect to sperm motility, HOST and Acrosome reactions. Whereas, Alfa-tocopherol at a conc. of 5.0 mM minimized the cryodamages during freezing and thawing process (Table 27). These antioxidants (Alfa tocopherol, Glutathione, BHT and Retinol) minimised the lipid peroxidation and scavenging ROS free radicals by protecting the plasma membrane of spermatozoa and stabilized the plasma membrane against ROS mediated cellular damage.

Table 27. Effect of Glutathione and Alfa Tocopherol on Semen Quality Parameters (SQP)

| Treatment | Stage | SQP (%) | C (control) | T ₁ (2.5 mM) | T ₂ (5.0 mM) | T ₃ (10 mM) |
|-------------|-------------------------|--------------------|-------------|-------------------------|-------------------------|------------------------|
| Glutathione | Post dilution (AD) | Motility | 72.64±8.58 | 70.23±10.14 | 68.15±10.12 | 72.10±10.56 |
| | Post equilibration (AE) | | 62.72±6.56 | 65.15±5.85 | 66.10±5.80 | 68.16±6.63 |
| | Post thaw (PT) | | 46.25±8.75 | 53.15±6.65 | 56.86±6.25 | 58.54±6.28 |
| | Post dilution (AD) | HOST | 62.18±7.57 | 65.25±6.68 | 66.26±7.25 | 65.25±7.76 |
| | Post equilibration (AE) | | 52.16±6.58 | 54.12±7.28 | 55.11±5.75 | 56.12±6.26 |
| | Post thaw (PT) | | 41.25±3.85 | 47.35±4.15 | 48.68±5.43 | 50.12±5.15 |
| | Post dilution (AD) | Acrosome integrity | 68.56±4.25 | 66.75±3.45 | 70.16±4.75 | 68.12±5.15 |



| | | | | | | |
|-----------------|-------------------------|--------------------|-------------|-----------------------|-----------------------|-----------------------|
| | Post equilibration (AE) | | 65.16±3.25 | 63.15±3.10 | 66.35±3.75 | 65.45±3.12 |
| | Post thaw (PT) | | 62.74±2.12 | 61.85±2.10 | 63.84±2.75 | 64.25±2.85 |
| | | | C (control) | T ₁ (1 mM) | T ₂ (3 mM) | T ₃ (5 mM) |
| | Post dilution (AD) | Motility | 68.23±7.58 | 70.15±9.14 | 69.25±8.75 | 71.25±10.14 |
| | Post equilibration (AE) | | 56.25±6.56 | 55.25±7.25 | 60.12±7.16 | 63.10±6.69 |
| | Post thaw (PT) | | 48.12±5.35 | 51.12±6.12 | 54.42±5.83 | 55.74±6.22 |
| | Post dilution (AD) | HOST | 63.15±6.62 | 62.14±6.87 | 64.18±7.14 | 63.75±6.15 |
| Alfa-Tocopherol | Post equilibration (AE) | | 53.18±7.35 | 55.54±6.87 | 58.16±7.25 | 57.16±5.15 |
| | Post thaw (PT) | | 43.75±5.75 | 48.16±6.25 | 53.11±5.75 | 54.35±4.75 |
| | Post dilution (AD) | Acrosome integrity | 66.25±6.10 | 68.14±5.83 | 67.15±6.20 | 68.14±6.25 |
| | Post equilibration (AE) | | 60.16±4.35 | 64.16±3.35 | 64.48±3.12 | 66.12±4.25 |
| | Post thaw (PT) | | 58.24±4.15 | 62.85±2.75 | 62.50±2.75 | 64.10±3.10 |

The beneficial effects of fortification of BHT and melatonin in semen diluent on cryoprotection during freezing process observed in earlier studies were assessed by fertility trials to evaluate conception rate in cattle (n=49). The conception

rate with BHT (5 mM) and melatonin (3 mM) treated frozen thawed semen was 50 and 46.66%, respectively as compared to control (43.75 %) as shown in Table 28.

Table 28. Effect of BHT and melatonin fortified semen on conception rate in cows

| Semen additives | No. of Inseminations | No. of cows conceived on NR basis | Confirmed pregnancies (%) |
|------------------------------|----------------------|-----------------------------------|---------------------------|
| BHT | 18 | 11 | 09 (50.00) |
| Melatonin | 15 | 08 | 07 (46.66) |
| Control (conventional semen) | 16 | 10 | 07 (43.75) |

Studies on seminal Heparin Binding Proteins among good and poor Frieswal bulls

The study aimed to investigate the heparin binding protein (HBP) profile in Frieswal and Sahiwal bull semen and its correlation with semen freezability. Fresh semen quality of good Frieswal bulls was significantly (P<0.05) higher than the

poor bulls. However, no significant difference in volume, acrosome integrity and total seminal plasma protein was observed among good and poor Frieswal bulls (Table 29). In case of Sahiwal bulls, initial progressive motility (IPM) was significantly (P<0.05) higher in good as compared to poor bulls, however no significant difference was recorded with respect to other seminal attributes.

Table 29. Fresh semen quality attributes of good and poor Frieswal bulls

| S. No. | Attributes | Frieswal bulls | | Sahiwal bulls | |
|--------|--------------------------|----------------------------|---------------------------|-------------------------|----------------------|
| | | Good bulls (n=21) | Poor bulls (n=24) | Good bulls (n=8) | Poor bulls (n=8) |
| 1 | Semen volume (ml) | 5.05±0.43 | 5.35±0.26 | 3.33±0.67 | 5.05±0.52 |
| 2 | Sperm Conc. (million/ml) | 1082.76±83.58 ^b | 782.42±94.32 ^a | 844.63±133.02 | 969.88±126.9 |
| 3 | IPM (%) | 66.67±1.44 ^b | 51.67±4.33 ^a | 66.25±1.83 ^b | 45±8.24 ^a |
| 4 | HOST (%) | 66.07±2.13 ^b | 50.62±3.83 ^a | 65.09±7.07 | 48.33±6.03 |

| | | | | | |
|----|--------------------------------------|-------------------------|-------------------------|------------|-------------|
| 5 | Acrosome Integrity (%) | 78.47±1.17 | 68.2±1.63 | 87.09±1.00 | 69.05±3.13 |
| 6 | Live sperm (%) | 66.17±3.4 ^b | 54.99±3.29 ^a | 55.95±4.12 | 48.35±5.06 |
| 7 | Head abnormality (%) | 7.31±1.27 ^a | 18.52±4.02 ^b | 9.64±1.61 | 21.72±7.08 |
| 8 | Mid piece abnormality (%) | 2.24±0.48 ^a | 5.71±1.08 ^b | 2.28±0.45 | 9.6±3.49 |
| 9 | Tail abnormality (%) | 2.32±0.45 ^a | 9.39±1.86 ^b | 4.24±2.59 | 6.22±2.88 |
| 10 | Total abnormality (%) | 11.87±1.61 ^a | 33.62±6.04 ^b | 16.16±3.06 | 37.53±12.02 |
| 11 | Total seminal plasma protein (mg/ml) | 106.18±1.22 | 104.81±1.39 | 97.39±1.93 | 98.34±2.03 |

Means bearing different superscripts (a, b) in rows under individual breed differ significantly (P<0.05)

C. Augmentation of reproductive efficiency

Fertility management

Fertility management of repeat breeding cows

The cows (n=34) with history of repeat breeding and apparently normal cycle with clear discharge were examined clinico-gynaecologically (for vaginitis, cervicitis, endometritis, cystic ovaries etc.) and were dewormed, supplemented with mineral mixture for 15 days, given GnRH (10 ug) and flushed with diluted povidone iodine (1:1) during oestrus. The oestrus was induced in all the cows using PG (500 ug) at day 7 followed by AI twice at 72 and 96 hrs of PG. The cows were divided into three groups with respect to GnRH/hCG administration at the time of AI. The cows of group G-I (n=16) were given injection of GnRH at 1st AI, G-II (n=12) injection of hCG (1500 IU) at 2nd AI, and G-III (n=6) without GnRH/hCG (control). The results revealed highest conception rate (58.33%) in G-II followed by G-I (50%) and G-III (33.33%).

Post-partum fertility management in bovines

Three different approaches for resumption of ovarian cyclicity and 1st service & 2nd service conception were evaluated in bovines with following groups:

G-I (n=12): Uterine wash with povidone iodine at day 30-50 and mineral supplementation for 15days.

G-II (n=10): Same as in G-I plus injection of buseralin acetate (10 ug) with Uterine flush

G-III (n=10): Same as in G-II with PG post 11-14 of Uterine flush

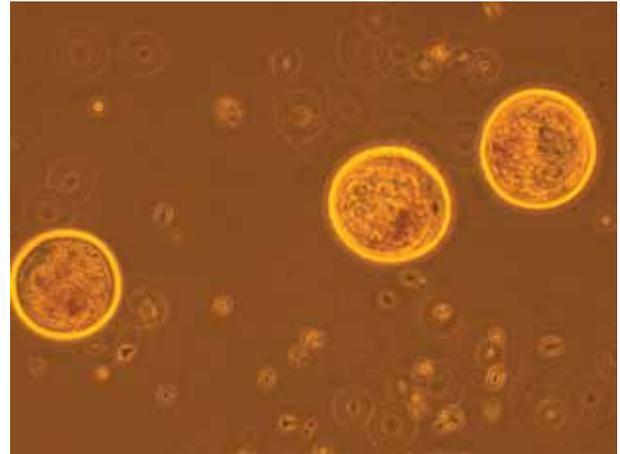
The resumption of cyclicity with oestrus induction was 41.66, 70.00 and 90.00% in G-I, G-II and G-III, respectively, whereas, highest conception rate up to two consecutive oestrus was recorded in G-III (Table 30).

Table 30. Post-partum fertility management in bovines at field level

| Groups | No. of animals | No. of animals resumed cyclicity by day 65 and expressed oestrus signs (%) | Intensity of oestrus | First service conception | Second service conception | Overall conception rate (%) |
|--------|----------------|--|----------------------|--------------------------|---------------------------|-----------------------------|
| G-I | 12 | 5 (41.66) | ++ | 01 | 01 | 02 (40.00) |
| G-II | 10 | 7 (70.00) | +++ | 02 | 01 | 03 (42.85) |
| G-III | 10 | 9 (90.00) | ++++ | 03 | 03 | 06 (66.66) |

Embryo Transfer Technology (ETT)

Attempts were made to disseminate ETT in field conditions. During the report period, two cows were superovulated following flushing from one animal. The flushing yielded 08 embryos, out of which 05 were transferred into 05 animals and one embryo was vitrified. The transfer of embryos resulted in 02 pregnancies.



Use of sex sorted semen

The sex sorted semen of Red Sindhi bull purchased under FFP programme was used to inseminate 02 heifers and 03 crossbred cows (first

& second parity). This resulted in confirmation of one pregnancy upon rectal examination on 70th day after insemination.

D. Improvement of cattle through nutritional manipulation

a) Institutional Project:

Performance of animals reared on low cost feeding system prevailing in Sardhana Tehsil of Meerut district.

Feeding of balanced ration ensures availability of adequate amount for sustaining the production potential of the animals. The feeding practice adopted by some of the dairy owners in Tehsil Sardhana of Meerut District was studied. Sugarcane juice scum, commonly known as crusher or kolhu ki maily (20.64% DM, 19.39% CP, 8.48% EE, 16.39% Ash and 12.39% AIA) with kutta, a brewery industry by-product (25.70% DM, 45.50% CP, 17.11% CF, 3.73% EE, 3.90% Ash and 1.43% AIA) a good source of protein and paddy straw in place of

wheat straw due to its cost effectiveness was used as belly filler. On observation, it appeared that the feeding system delivered balanced nutrition to the buffaloes and crossbred cows of pregnant and non-pregnant categories. The body condition of animals was maintained as usual. The feeding system was found to be economical compared to traditional rearing.

(b) Service Project

Improvement of productivity of livestock including hill cattle through different interventions for sustainable food security and livelihood

A survey of livestock farmers belonging to Village Bilkhet, Block Kaljikhhal of District Pauri

Garhwal was conducted to know the livestock farming scenario in that area. Target area is about 210 km away from the Institute near Satpuli in Pauri Garhwal district of Uttarakhand. A total 113 farm families reside there out of which 63 farm families belong to scheduled caste. These 63 farm families have 203 cattle heads including 73 milking cattle. The following findings were made:

- Farmers are facing severe shortage of fodder round the year
- Farmers are unaware of the balanced feeding of livestock
- Farmers are unaware about energy protein malnutrition in their cattle
- Farmers pay less attention to the vitamin and mineral feeding to their livestock
- Some of the nutritional interventions may be of great importance for ensuring adequate supply of nutrients to the livestock
- Improvement in housing management can significantly improve the productivity

- Interventions related with health and reproduction can improve productivity by reducing morbidity and mortality

On the basis of the above information it was felt that before executing any intervention in that area, the farmers must be educated about scientific rearing of livestock. To fulfil the need of human resource development a training programme of farmers was organized, during 29–31 August, 2019 wherein 20 farmers belonging to Scheduled Caste were trained on various aspects of dairy farming.

Analysis of feed samples

Feed analyses facilities are being extended to all the military farms on free of charge basis. A total of 141 feed samples from different military farms were analysed for different proximate parameters during Apr- Dec, 2019 (Table 31). The average values of proximate parameters are given in the Table 32. Few samples belonging to entrepreneurs/traders were also analysed.

Table 31. Description of feed ingredient samples from various Military Farms analysed during the year 2019 (Apr- Dec, 2019).

| | Name of Farm | Name of Feed Ingredient | | | | | | | TOTAL |
|-------|--------------|-------------------------|---------|-------------|---------|-------------|---------|------------|-------|
| | | CS Cake | GN Cake | Maize Whole | MO Cake | Rice Polish | Soy DOC | Wheat Bran | |
| 1 | BRU, Meerut | - | 4 | 6 | 3 | - | - | 6 | 19 |
| 2 | MF, Jhansi | - | - | 4 | 4 | - | - | 4 | 12 |
| 3 | MF, Meerut | 3 | 2 | 32 | 24 | 10 | 3 | 29 | 103 |
| 4 | MF, Sec'bad | - | - | - | 7 | - | - | - | 7 |
| TOTAL | | 3 | 6 | 42 | 38 | 10 | 3 | 39 | 141 |



Table 32. Proximate composition (Av. % DM basis) of feed ingredient samples from various Military Farms (analysed during Apr- Dec, 2019).

| Parameters | Name of Feed Ingredient | | | | | | |
|-----------------|-------------------------|---------|-------------|---------|-------------|----------|------------|
| | CS Cake | GN Cake | Maize Whole | MO Cake | Rice Polish | Soya DOC | Wheat Bran |
| | (n=3) | (n=6) | (n=42) | (n=38) | (n=10) | (n=3) | (n=39) |
| Moisture | | | | | | | |
| Mean | 8.78 | 8.54 | 11.03 | 8.98 | 8.25 | 7.69 | 10.15 |
| SE | 0.66 | 0.11 | 0.09 | 0.11 | 0.10 | 0.43 | 0.10 |
| Min | 7.73 | 8.18 | 9.74 | 7.63 | 7.71 | 7.06 | 8.75 |
| Max | 10.00 | 8.86 | 12.70 | 10.66 | 8.84 | 8.50 | 11.52 |
| CP | | | | | | | |
| Mean | 24.30 | 47.09 | - | 37.24 | 18.60 | 48.24 | 15.17 |
| SE | 0.43 | 0.11 | - | 0.11 | 0.21 | 0.28 | 0.09 |
| Min | 23.54 | 46.81 | - | 35.53 | 17.33 | 47.78 | 14.00 |
| Max | 25.03 | 47.51 | - | 38.24 | 19.80 | 48.74 | 16.10 |
| CF | | | | | | | |
| Mean | 22.16 | 9.11 | - | 9.09 | 7.19 | 5.17 | 10.67 |
| SE | 0.01 | 0.21 | - | 0.06 | 0.03 | 0.02 | 0.07 |
| Min | 22.14 | 8.26 | - | 8.19 | 7.03 | 5.13 | 9.84 |
| Max | 22.19 | 9.52 | - | 9.82 | 7.36 | 5.21 | 11.54 |
| EE | | | | | | | |
| Mean | 5.65 | 5.78 | - | 8.48 | - | - | - |
| SE | 0.13 | 0.17 | - | 0.08 | - | - | - |
| Min | 5.41 | 5.39 | - | 7.53 | - | - | - |
| Max | 5.86 | 6.38 | - | 9.27 | - | - | - |
| ASH | | | | | | | |
| Mean | 5.24 | 7.82 | - | 8.12 | 7.47 | 6.14 | 4.61 |
| SE | 0.15 | 0.09 | - | 0.08 | 0.29 | 0.49 | 0.05 |
| Min | 4.96 | 7.52 | - | 6.64 | 6.63 | 5.25 | 4.20 |
| Max | 5.47 | 8.12 | - | 8.84 | 8.92 | 6.92 | 5.34 |
| AIA | | | | | | | |
| Mean | 1.53 | 1.55 | - | 1.75 | 1.40 | 1.37 | 0.41 |
| SE | 0.08 | 0.05 | - | 0.02 | 0.04 | 0.05 | 0.02 |
| Min | 1.38 | 1.33 | - | 1.40 | 1.22 | 1.28 | 0.30 |
| Max | 1.64 | 1.67 | - | 1.96 | 1.64 | 1.45 | 0.66 |

III. Inter-Institutional Programmes

Cataloguing of miRNA transcripts during thermal stress and their crosstalk with heat shock protein 70 mRNA in cattle

Changes and differential expression of miRNA in Frieswal (Holstein Friesian x Sahiwal) crossbred dairy cattle which are distinctly adapted to environmental temperature stress were investigated. The results indicated that there was a significant variation in the physiological and biochemical indicators estimated under summer heat stress. Further stress response was characterized by identification of stress granules during heat stress. The differential expression of miRNA was observed under summer heat stress when compared to the normal winter season within each group of experimental animals (Figure 24-26). Out of total 420 miRNAs, 65 were differentially expressed during peak summer. Most of these miRNA were found to target heat shock responsive genes especially members of heat shock protein (HSP) family and network analysis revealed most of them having stress-mediated effects on signaling mechanisms. Being superior in their expression profile during peak summer, bta-miR-2898 was chosen for reporter assay to identify its effect on the target HSPB8 gene in stressed bovine PBMC cell cultured model.

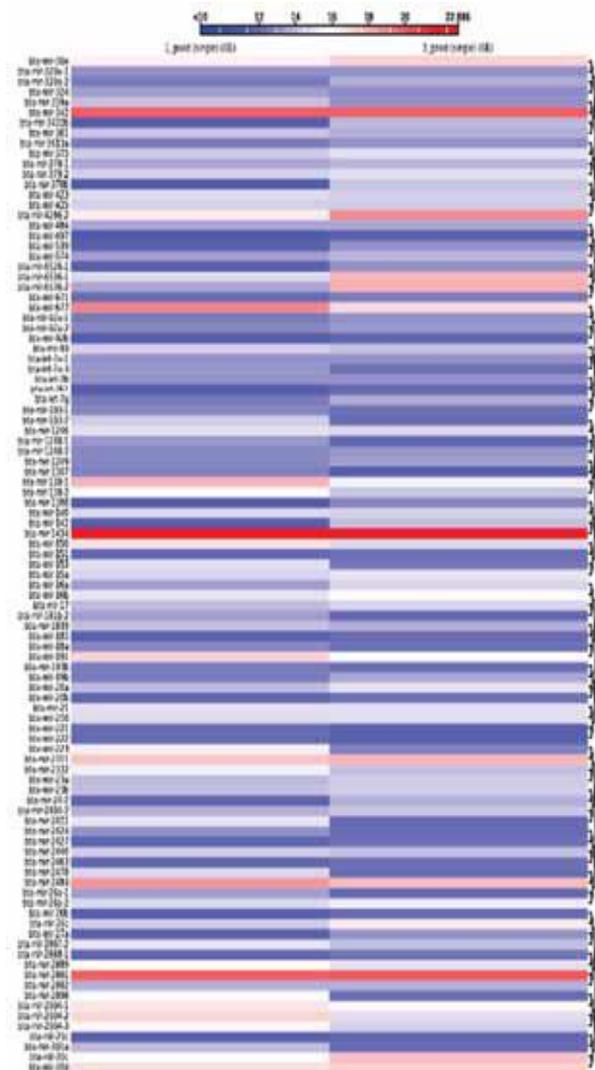


Figure 24. Heat map and the result of clustering to all MicroRNA detected. There are two specific groups. Column 1 represents normal groups and Column 3 represents heat stressed groups

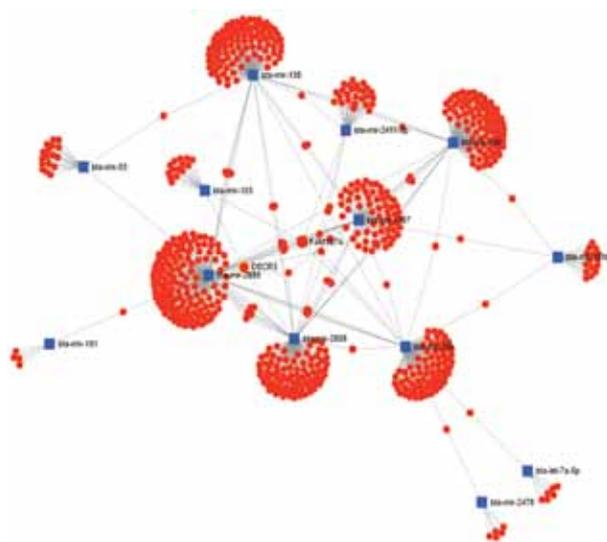
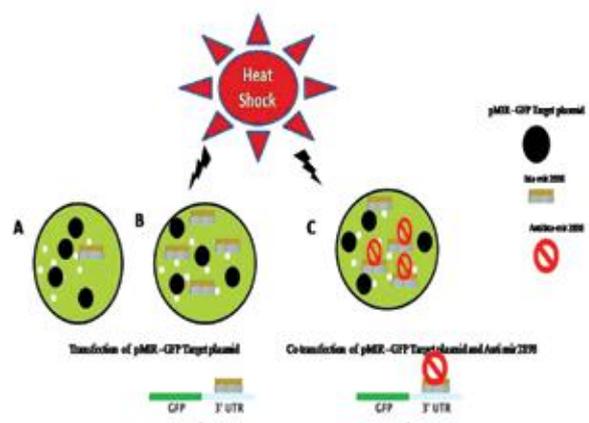


Figure 25. Interaction among different selected miRNAs with their predicted targets. Blue rectangular box: miRNAs and Orange circles: target genes



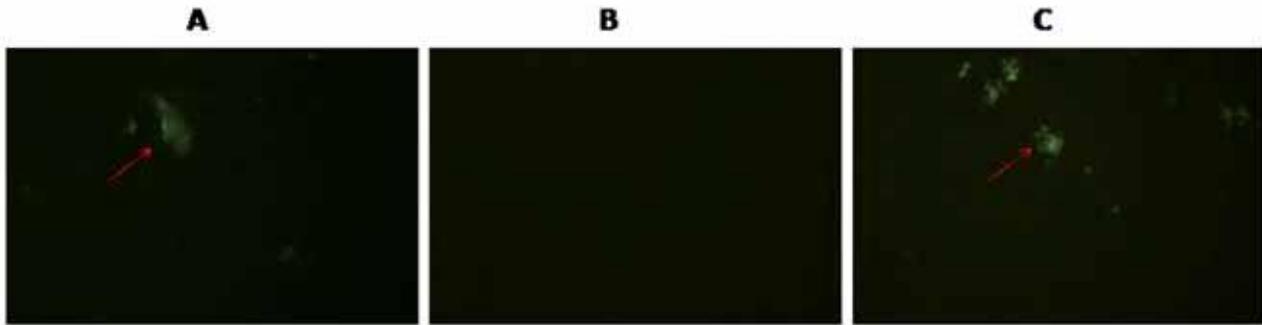


Figure 26: pMIR-GFP Reporter assay in bovine PBMC (heat shocked) for analysis the expression of GFP after cloning of bta-mir 2898 target region of bovine HSP gene at 3'UTR region. Upper panel depicted the experimental design and lower panel showed the level of GFP expression in different groups. A: Non heat shock group and transfected with pMIR-GFP Target construct; B: Heat shock group and transfected with pMIR-GFP Target construct; C: Heat shock group and co- transfected with pMIR-GFP Target construct and anti bta-mir 2898.

Dynamics of circulatory microRNA profile among motile and impaired bull spermatozoa: A novel approach to discover biomarkers

A study was designed to find out differentially expressed proteins in categorized crossbred (Holstein Friesian X Sahiwal) bull semen to serve as potential biomarkers for male infertility. Frozen crossbred bull semen with satisfactory phenotypic records were defined as “good” and “poor” based on their conception rates. A total of 1547 proteins were detected in bull spermatozoa using liquid chromatography-mass spectrometer (LC-MS/MS) analysis (Figure 27). Results revealed that 558 (36.1%) and 653 (42.2%) proteins

were expressed in good and poor quality bull spermatozoa, respectively (Figure 28). Nearly 336 proteins (21.7%) were unique for both good and poor quality bull semen and among the common proteins, 224 (66.7%) and 112 (33.3%) were up and down regulated in good and poor quality categorized bull semen, respectively. GO analysis of global proteomes identified different signaling pathways and most of them were related to cellular motility, immune systems as well as cellular metabolisms (Figure 29). The distinctive presence of some of the proteins may provide insight into the molecular mechanistic role played by these proteins in crossbred bull infertility.

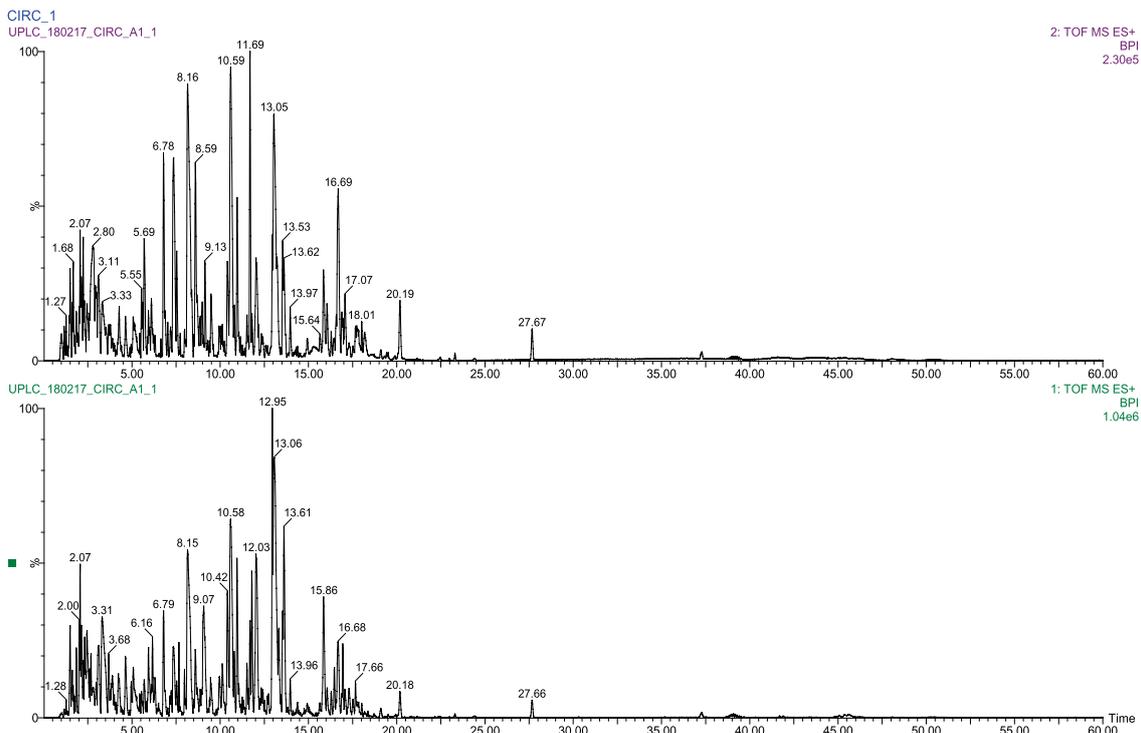


Figure 27. Representative LCMS-IT-TOF total ion chromatogram (TIC) of the identified proteins. X axis indicate relative intensity while Y axis indicates mass number/charge number

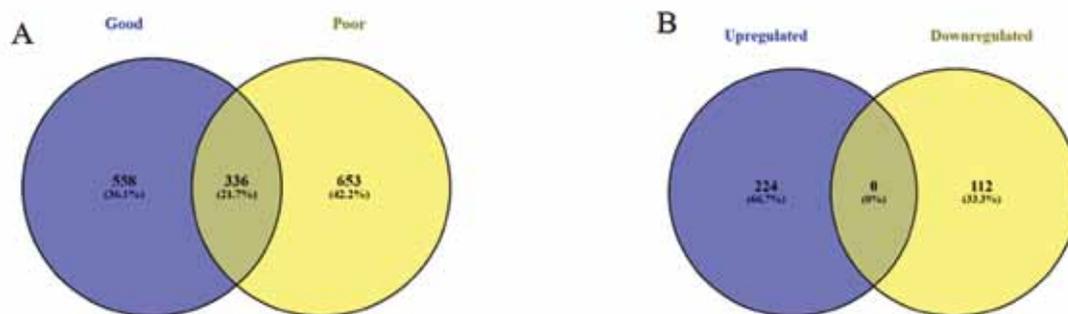


Figure 28. Distribution of proteins identified in good and low quality crossbred bull spermatozoa (A) and percentage of up or down regulated common proteins in good and poor quality samples (B)

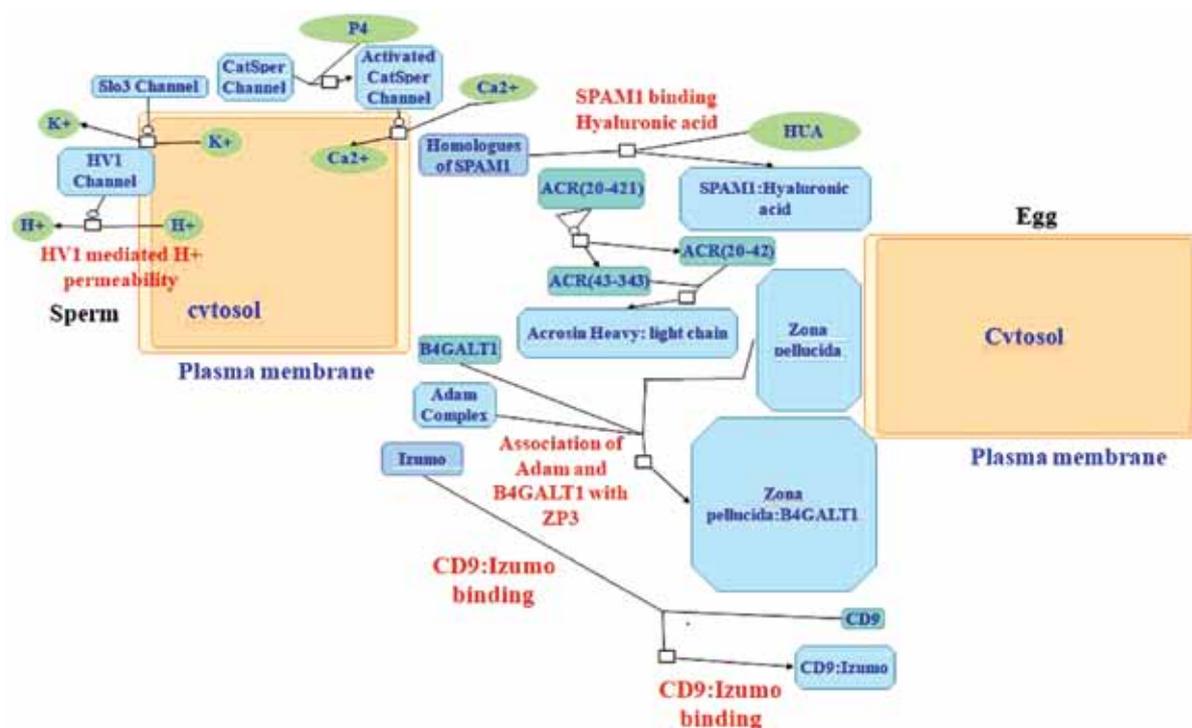


Figure 29. Different proteins and factors involved in sperm fertility and motility

Livelihood improvement through sustainable dairy farming using suitable interventions” (Farmer FIRST Programme of ICAR)

Different activities related to farmers’ field including reproduction management in dairy animals, prevention and control of mastitis, vermicomposting as waste management and demonstration of Integrated farming system were carried out under Farmer FIRST programme. Under integrated farming system approach involving cultivation of mustard followed by urad, vegetables, sunflower in small sized growing

mango orchard, Quality maize production, late sowing wheat variety(PBW 226) and honey bee keeping were demonstrated for additional income to the farmers. Farmer scientist interactions and kisan goshties were also organized under the programme.

A major event involving farmer-scientist interaction was held on 3rd November, 2019 commemorating foundation day of the institute during National Conference held at ICAR-CIRC, Meerut. A total of 194 farmers including progressive farmers and associated entrepreneurs



participated and actively interacted with Dr. T.K Mohapatra, Secretary (DARE) & DG (ICAR) and other dignitaries. On this occasion, 15 progressive farmers were felicitated and quality wheat seed (late variety), dewormer, feed supplements, and mineral mixture were also provided to the farmers.



Field activities under FFP/Mera Gaon Mera Gaurav scheme

During the report period, a total of 113 outreach visits were conducted covering 2263 animals belonging to 925 farmers through mobile ambulatory clinic services in FFP and MGGM adopted villages (Table 33). Apart from this 07 animal health and fertility Camps and kisan

goshties were also organised in different villages. The farmers (15) of programme also participated in Pusa Krishi Mela 2020 at New Delhi.

Table 33. Details of Common ailments /cases attended during MGGM / mobile ambulatory clinic services

| Sr. No. | Condition | No. of animals | (%) |
|---------|------------------------------------|----------------|-------|
| 1 | Anoestrous | 223 | 9.85 |
| 2 | Repeat breeding | 254 | 11.22 |
| 3 | Metritis/cervicitis/pyometra | 121 | 5.34 |
| 4 | Cystic ovaries | 65 | 2.87 |
| 5 | Pregnancy diagnosis | 174 | 7.68 |
| 6 | Oestrus/AI | 136 | 6.00 |
| 7 | Mastitis | 198 | 8.74 |
| 8 | Tick infestation / ectoparasites | 726 | 32.08 |
| 9 | Diarrhoea | 212 | 9.36 |
| 10 | Non-specific off feed/ indigestion | 81 | 3.57 |
| 11 | Other Miscellaneous | 73 | 3.22 |
| | Total | 2263 | 100 |

Impact assessment of Farmer-FIRST Programme

The Farmer FIRST Programme (FFP) was launched with the objective to improve livelihood of dairy farmers using suitable interventions in Jhitkari, Chhabadia and Chandna villages of Sardhana block in Meerut district.

Impact assessment of reproductive interventions in bovines

The impact of reproductive interventions was assessed in terms of decreased incidence of the reproductive problems, increase in the number of calvings, increase in milk production and reduction in calving interval (Table 34). Based on the anamnesis and diagnosis, nutritional, hormonal and other critical reproductive interventions like oestrous induction, oestrous synchronization, availability of quality semen, AI and other interventions like deworming, mineral supplementation including regular monitoring and organization of animal infertility-cum-health camps were done for the improvement of reproductive efficiency in the dairy animals in the selected villages. The data were analysed on the observations made through the organization of 23 infertility-cum-health camps and interventions in

reproduction, health and nutritional management of affected animals under the project from a breeding population of 6212 animals over a period of last three years.

The impact of reproductive interventions revealed 10% decrease in the incidence of the reproductive problems in bovine of three villages with 600 additional calvings and higher milk production. There was an economic benefit to the farmers of about Rs 1.0 lac per animal/ lactation on

account of average lactation yield of 2500 litre milk and selling (@ Rs 40/-per litre from the additional calvings. The managerial interventions helped in reduction of calving interval of dairy animals on an average by 70 days which in turn caused a saving of Rs 150/day on account of reduction in calving interval. Moreover, the farmers had additional number of calves in the form of an asset at their farms.

Table 34. Impact of different interventions on the reproductive performance of bovines

| S. No. | Attributes | Before intervention | After intervention | Impact |
|--------|--|---------------------|--------------------|--------|
| 1. | Anoestrus | 28% | 22% | -6% |
| 2. | Repeat breeding | 16% | 12% | -4% |
| 3. | Adoption of regular deworming schedule followed by mineral mixture incorporation in the diet of dairy animals by the farmers | 10% | 30% | 20% |
| 4. | Use of AI as preferred method of breeding | 30% | 45% | 15% |

Impact assessment of mastitis prevention and control in bovines

Apparently healthy lactating cows (220) were screened for sub-clinical mastitis (SCM) with California mastitis test (CMT) in the selected villages. Farmers were trained to diagnose SCM with the help of CMT and to use teat dips (Betadine + Glycerine) post milking for prevention of mastitis in dairy animals. The overall prevalence of SCM in lactating cows was 41.81%. The same animals

were again screened for subclinical mastitis by CMT after 3 months of practice/adoption of CMT and teat dipping (Table 35). The subclinical mastitis decreased up to 6.36% in these animals. Additionally, there was increase of 13.75% in milk yield after adoption of mastitis preventive and control strategies by the dairy farmers. The higher milk yield/ lactation caused an economic benefit of Rs 12000/-per animal in addition to a reduction in treatment cost of approximately Rs 3000/animal.

Table 35. Impact of adoption of CMT and teat dipping on prevalence of SCM and milk yield in cows of adopted villages

| Village | Occurrence of subclinical mastitis in adopted villages | | Milk Production(L/day) | | |
|-----------|--|----------------|------------------------|----------------|-----------|
| | Before adoption | After adoption | Before adoption | After adoption | %Increase |
| Jhitkari | 30/76 (39.47%) | 6/76 (7.89%) | 9.5 | 10.7 | 12.63 |
| Chandana | 26/64 (40.60%) | 2/64 (3.12%) | 9.3 | 10.3 | 10.75 |
| Chhabaria | 36/80 (45.0%) | 6/80 (7.5%) | 10.5 | 11.9 | 13.3 |
| Overall | 92/220 (41.81%) | 14/220 (6.36%) | 8.8 | 10.01 | 13.75 |

Water budgeting and enhancing water productivity in livestock based farming system

Water budgeting at Military Dairy Farm

A study was conducted to assess water budgeting in Frieswal and Sahiwal dairy cattle production system during summer season at Military Dairy Farm, Meerut. Buckets and water

meters (magnetic) were used for recording of observations on water usage inside the animal sheds. The observations were recorded on water utilization round the clock on different farm activities viz. drinking, floor cleaning, animal washing, etc. in the dairy farm. Average daily milk yield in Frieswal and Sahiwal cow was 12.32±1.19 and 7.60±1.16 litres/head. No significant

difference was observed in drinking water intake between Frieswal and Sahiwal lactating cows. The water utilized on floor cleaning in the animal shed and milking parlour was 61.07 and 09.22 L/animal/day, respectively. Average water utilized on washing (washed twice) of animals of both breeds was 203.11 litres/head/day. Average daily water intake was significantly higher ($p < 0.01$) in Frieswal (7.70 ± 0.09 litres) calves than Sahiwal (5.63 ± 0.02 litres) calves. The results revealed smaller direct water footprint for milk in Frieswal than in Sahiwal cows at Military Dairy Farm, Meerut.

Water utilization pattern on service water use at Bull Rearing Unit

The primary aim of the study was to compare the water utilization on washing of breeding bulls through hose pipe and customized animal washing system. The experimental bulls (24) were divided into two groups and were kept on pucca/cemented (OS) and pucca/cemented+kachcha (NS) flooring sheds (12 bulls in each group). The observations on washing of these bulls inside the shed with hose pipe and in animal washing system were recorded using water meters. The water utilized on washing of bulls of NS was significantly higher ($p < 0.05$) than the bulls of OS under hose pipe and animal washing system (Figure 30). The bulls of both the sheds were washed with significant ($p < 0.05$) lesser water quantity in animal washing system (130.50 ± 2.17 and 160.67 ± 2.26 L) than using hose pipe (208.83 ± 8.11 and 314.08 ± 9.22 L).

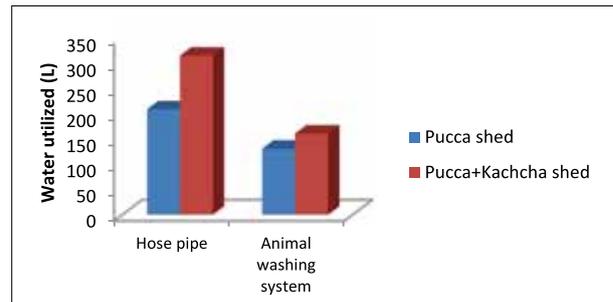


Figure 30. Water utilized on washing of Frieswal bulls under hose pipe and animal washing system

In one of the other studies, the utility of trigger shut off on floor cleaning of bull pen was assessed. It was observed that the use of trigger shut off reduced water requirement for floor cleaning significantly ($p < 0.05$) than cleaning with hose pipe. For cleaning of floor, average 195.05 ± 20.01 and 289.90 ± 22.76 L service water/bull/day was utilized with trigger shut off and hose pipe, respectively.



Cleaning of bull pen floor with trigger shut off on hose

TECHNOLOGIES/METHODOLOGIES/CONCEPTS

Release of Frieswal: A crossbred cattle Breed on 3rd November, 2019

Dr. Trilochan Mohapatra, Secretary (DARE) & DG (ICAR) released “Frieswal” a national milch crossbred cattle variety on 03-11-2019 during the inaugural function of National Conference on Livelihood Improvement through Sustainable Livestock Production & IV Annual Convention of Pashu Poshan Kalyan Samittee (PPKS) organized on the occasion of the 33rd Foundation day celebrations of ICAR-Central Institute for Research on Cattle, Meerut. Frieswal is one of the crossbred strains having 5/8 Holstein Friesian and 3/8 Sahiwal inheritance, developed by ICAR-Central Institute for Research on Cattle, Meerut, in collaboration with Military Farm, Ministry of Defence. The project was started in 1987 for the evolution of a new crossbred national milch breed: Frieswal - (Holstein-Sahiwal), yielding 4,000 kg of milk with 4% butter fat in a mature lactation of 300 days. Herd maintained by Military farms located in different parts of India were utilized for developing Frieswal. Large genetic variability were existed at beginning were reduced by breeding intervention and Frieswal herd was developed. The average milk production potential of Frieswal cows based on 300 day milk yield is more than 3335 kg. The mature lactation milk yield of Frieswal cows are 3628 kg. The average age at first calving of Frieswal cows are 970 days. The crossbred cattle in different agro-climatic region of the country are being improved through utilization of high quality germplasm of genetically superior Frieswal bulls under the Field Progeny Testing programme of the Institute. A total of 261 bulls have so far been introduced in 14 different sets and total 3,55,353 inseminations have been done in which 37,308 female progenies born. 1,00,234 have reached age at first calving with an overall conception rate of 43.5%. Through the intervention of Field progeny testing programme, the average first lactation 305 days milk yield of Frieswal progenies in adopted villages has increased by 40.6 % at Ludhiana, 39.0 % at Kerala, 11% in BAIF, Maharashtra and 19% in Pantnagar unit. The quality semen produced from bulls born out by mating of proven bulls and elite cows can be utilized in the field conditions to improve the production potential of crossbred population. Also, the proven bull semen is made available to the stakeholders for artificial

insemination of the elite animals in the progressive farmer herds. The male calves born through nominated mating are selected and further used as young bulls and sufficient quantity of frozen semen doses are started for future use.



Diagnostic Kits developed at ICAR-CIRC

CIRC-CATTLE BLAD diagnostic assay kit: (Inventors: R R Alyethodi, Rajib Deb, Umesh Singh, Sushil Kumar, Rani Alex, Sheetal Sharma, Gyanendra S Sengar, B Prakash) can be used for diagnosis of Bovine Leukocyte Adhesion Deficiency (BLAD) carrier bulls at their early stage of life based on identification of a SNP (D128G) in CD18 gene. Although prevalence rate of BLAD is 3-5%, as per the guidelines of Central Monitoring Unit (CMU) the bulls used for breeding should be tested for four genetic disorders including BLAD to avoid their in transmission to its progeny. The test described in the kit is earmarked with its Rapidity (can be completed within 2-3 hours), user friendliness (as it is easy to perform), Economical (because it does not need expensive equipments and reagents) and Specificity (as ensured by the deliberate mismatch introduced into the primers).

CIRC-COWCAM assay kit (Inventors: Rajib Deb, Amod Kumar, Gyanendra S Sengar, T V Raja, Umesh Singh, Sushil Kumar, N V Patil) is useful for detecting cow milk adulteration in camel milk and vice versa at a minimum level of 1%. The milk is considered as a functional food used as a natural remedy in many part of world for the management of a number of human diseases for which it's purity is important. The Prevention of Food Adulteration Act (PFA) stipulates the supply of pure milk to the consumers. Presently, due to high market demand and less supply of camel milk, it is being adulterated with cow milk. The kit is less expensive, user friendly, rapid and specific in detection of adulteration of camel milk with cow milk or vice-versa. The test described is in completed less than 4 hours. The stability of the reagents in both the kits can be more than six months in normal refrigerated temperature.

EXTENSION ACTIVITIES

ACTIVITIES UNDER SCSP

Improvement of productivity of livestock including hill cattle through different interventions for sustainable food security and livelihood (Project code: SCSP)

The activities under SCSP were initiated in

June 2019 and a preliminary survey was conducted during June 21-26, 2019 to know the problems of the livestock husbandry in and around village Bilkhet, Block Kaljikkhal, District Pauri Garhwal. The baseline information of survey conducted in Bilkhet, Dhuroli and Bunga villages under the programme are given in Table 36.

Table 36. Baseline survey of Bilkhet, Dhuroli and Bunga village under SCSP Programme

| S. No. | Particulars | Categories | Respondents (113) | |
|--------|---------------------------------|---|-------------------|-------|
| | | | Frequency | % |
| 1 | Age | Young (Upto 35) | 11 | 09.74 |
| | | Middle (36-50) | 41 | 36.28 |
| | | Old (Above 50) | 61 | 53.98 |
| 2 | Occupation | Agriculture +Dairying | 20 | 17.70 |
| | | Business + Dairying | 11 | 09.73 |
| | | Services + Dairying | 18 | 15.93 |
| | | Labourer + Dairying | 64 | 56.64 |
| 3 | Educational level of respondent | Illiterate | 14 | 12.39 |
| | | Primary | 31 | 27.43 |
| | | Junior HS | 26 | 23.01 |
| | | High School | 16 | 14.16 |
| | | Intermediate | 14 | 12.39 |
| | | Graduate & Above | 12 | 10.62 |
| 4 | Land holding (in Acre) | Landless | 05 | 04.42 |
| | | Marginal (Upto 2 acres) | 86 | 76.12 |
| | | Small (2.1 to 4 acres) | 13 | 11.50 |
| | | Medium (4.1 to 6 acres) | 05 | 04.42 |
| | | Large (Above 6 acres) | 04 | 03.54 |
| 5 | Herd size of milch cattle | Small (Up to 3) | 101 | 89.38 |
| | | Medium (4 - 6) | 12 | 10.62 |
| | | Large (Above 6) | 0 | 00.00 |
| 6 | Breeding methods | Natural | 106 | 93.81 |
| | | Artificial insemination | 07 | 06.19 |
| 7 | Methods of heat detection | Mucus discharge with frequent Bellowing | 88 | 77.88 |
| | | Mucus discharge | 11 | 9.73 |
| | | Teaser Bull | 14 | 12.39 |

| | | | | |
|----|-----------------------------------|---------|-----|-------|
| 8 | Milk production (kg)/ household | Upto 1 | 23 | 20.36 |
| | | 1-4 | 75 | 66.37 |
| | | Above 4 | 15 | 13.27 |
| 9 | Milk consumption (kg) / household | Upto 1 | 31 | 27.43 |
| | | 1-4 | 75 | 66.37 |
| | | Above 4 | 7 | 06.20 |
| 10 | Deworming | Yes | 68 | 60.18 |
| | | No | 45 | 39.82 |
| 11 | Vaccination | Yes | 99 | 87.61 |
| | | No | 14 | 12.39 |
| 12 | Feeding concentrates | Yes | 98 | 86.73 |
| | | No | 15 | 13.27 |
| 13 | Feeding of mineral mixture | Yes | 10 | 08.85 |
| | | No | 103 | 91.15 |
| 14 | Feeding of salt | Yes | 110 | 97.35 |
| | | No | 03 | 02.65 |



Preliminary Survey of Bilkhet Farmers under SCSP



Cattle housing management at Bilkhet

The salient findings of baseline survey are as follows:

- Majority of the farmers (53.98%) were above 50 years of age.
- The main occupation in the area was casual labour along with dairying.
- Most of the farmers were marginal farmers holding less than 2 acres of land with maximum 3 milch cows to support livelihood and nutritional security.
- Most of the cows were producing only 1-4 kg of milk.
- Most of the farmers were not offering mineral mixture supplements to their animals.
- Natural service was followed as the main method of breeding the animals in most of the cases.
- Almost 40% of the farmers were not deworming their dairy animals regularly and more than 90% farmers followed irregular schedule of deworming and vaccination that is only once a year.
- Farmers were selling their milk to neighbours and shops @ Rs. 40/- per Kg.
- A wide variety of tree fodder from different fodder trees like Bhimal, Sahtoot, Dhaura, Kathal, Kandwa, Khair, Maalu, Umar, Bore, Sandhan and Guriyal etc. were available to almost all the animals throughout the year except during summer months. Animals were being sent for grazing in hilly areas for about

5-6 hrs a day.

- Majority (75%) of the farmers were unaware of scientific fodder production.
- There is a lack of resources for fodder production.
- Most of the farmers were not having sufficient knowledge regarding scientific dairy farming and were interested to undergo training

Livestock holding of the farmers

Among the total cattle population in the selected villages were 50.75 and 32.82% dry and milch cows, respectively and rest comprises of bulls, heifers and calves (Table 37).

Table 37. Livestock composition in surveyed villages

| Cattle | Numbers |
|----------------------|------------|
| Milking Cows | 130 |
| Dry cows | 71 |
| Heifer (1-3yrs) | 50 |
| Calf (< 1yr) | 137 |
| Bulls | 08 |
| Total animals | 396 |

Identified problems faced by dairy farmers

Ectoparasitic infestation, endoparasites, calf mortality and mastitis were the major problems affecting the dairy animals in the region (Table 38).

Table 38. Health related problems in animals

| S. No. | Problems | Yes | | No | |
|--------|-----------------------|-----------|--------|-----------|--------|
| | | Frequency | % | Frequency | % |
| 1 | Anestrus | 3 | 02.65 | 110 | 97.35 |
| 2 | Repeat Breeding | 4 | 03.54 | 109 | 96.46 |
| 3 | Metritis | 1 | 00.88 | 112 | 99.12 |
| 4 | Retention of placenta | 0 | 00.00 | 113 | 100.00 |
| 5 | Genital Prolapse | 1 | 00.88 | 112 | 99.12 |
| 6 | Abortion | 1 | 00.88 | 112 | 99.12 |
| 7 | Mastitis | 13 | 11.50 | 100 | 88.50 |
| 8 | Endoparasites | 82 | 72.57 | 31 | 27.43 |
| 9 | Ectoparasites | 113 | 100.00 | 0 | 00.00 |
| 10 | Calf mortality | 48 | 42.48 | 65 | 57.52 |

Other administrative and managerial problems faced by the farmers include water and fodder scarcity, attack of wild animals on livestock, stray cattle destroying the farmers' field, lack of AI and poor veterinary services and improper disposal of carcass etc.

Interventions undertaken

To improve the nutritional status of the livestock in the area, it was decided that urea molasses mineral blocks will be distributed to the farmers. Before executing the intervention it was felt that trainings of the farmers must be conducted to impart them some scientific knowledge of livestock production.



UMMB supplementation to cows at Bilkhet

Off Farm training

A training programme for eighteen farmers belonging to the area was organized at ICAR-CIRC, Meerut Cantt during August 29-31, 2019.

The farmers were acquainted with feeding, breeding, management and health aspects of cattle production in this training programme.

Participation in Kisan Melas and exhibitions

The institute participated in following Kisan Melas and Exhibitions during the period under report:

| S. No. | Name of the Exhibition | Organised by | Venue | Duration |
|--------|---|--|---------------------------|---------------------|
| 1. | Pashu Arogya Mela | DUVASU, Mathura | DUVASU, Mathura | September 11, 2019 |
| 2. | Veteran Mela | Remount Veterinary Corps, Meerut Cantt | RVC Ground, Meerut | October 13, 2019 |
| 3. | All India Farmers' Fair and Agri-Industrial Exhibition 2019 | SVPUAT, Modipuram, Meerut | SVPUAT, Modipuram, Meerut | November 8-10, 2019 |



TV Talk

| S.No. | Title | Name of the Scientist | Date of Recording |
|-------|--|-----------------------|--------------------|
| 1 | भेटवार्ता : पशुओं में उन्नत नस्ल सुधार क्यों व कैसे? On DD KISAN | Dr. Umesh Singh | May 28, 2019 |
| 2. | Hello Kisan Live Doordarshan Channel on Pashuo Mein Nasl Sudhar | Dr. Sushil Kumar | July 04, 2019 |
| 3. | Hello Kisan Live Doordarshan Channel on बकरी पालन एवं बाजार व्यवस्था On DD KISAN | Dr. Umesh Singh | September 05, 2019 |
| 4. | Vichar Vimarsh programme on FMD and Dairy startup On DD KISAN | Dr. Umesh Singh | September 23, 2019 |

Radio Pathshala on AIR, Nazibabad

| S. No. | Title | Name of the scientist | Date of Recording | Date of Transmission |
|--------|--|-----------------------|-------------------|----------------------|
| 1 | गोवंश सुधार में संस्थान का योगदान | Dr. NV Patil | July 03, 2019 | July 03, 2019 |
| 2 | सफलतापूर्वक व्यवसायिक डेयरी स्थापना एवं संचालन कैसे करें | Dr. Ravindra Kumar | July 08, 2019 | July 10, 2019 |
| 3 | पशुओं में टीकाकरण का महत्व | Dr. Naimi Chand | July 08, 2019 | July 17, 2019 |
| 4 | गायों में मदहीनता के कारण एवं निवारण | Dr. Y K Soni | July 08, 2019 | July 24, 2019 |



| | | | | |
|----|---|--|--------------------|--------------------|
| 5 | फोन इन कार्यक्रम | Dr. Rajendra Prasad, Dr. Umesh Singh, Dr. Suresh Kumar Dhoop Singh | July 31, 2019 | July 31, 2019 |
| 6 | दुधारू गायों की प्रमुख नस्लें | Dr. Umesh Singh | July 31, 2019 | August 07, 2019 |
| 7 | वृद्धिशील ओसरो का भरण पोषण | Dr. Rajendra Prasad | July 31, 2019 | August 14, 2019 |
| 8 | गोवंश में बॉझपन की समस्या: कारण एवं निवारण | Dr. Suresh Kumar Dhoop Singh | July 31, 2019 | August 21, 2019 |
| 9 | फोन इन कार्यक्रम | Dr. S Tyagi, Dr. JK Singh, Dr. YK Soni | August 28, 2019 | August 28, 2019 |
| 10 | कृत्रिम गर्भाधान: लाभ एवं सावधानियां | Dr. S Tyagi | August 28, 2019 | September 04, 2019 |
| 11 | वातावरणीय कारकों का गोवंश पर प्रभाव | Dr. JK Singh | August 28, 2019 | September 11, 2019 |
| 12 | गायों में रिपीट ब्रीडिंग की समस्या एवं निवारण | Dr. YK Soni | August 28, 2019 | September 18, 2019 |
| 13 | फोन इन कार्यक्रम | Dr. Sushil Kumar, Dr. Pramod Singh, Dr. AS Sirohi | September 25, 2019 | September 25, 2019 |
| 14 | पशु पालन में स्वच्छ पानी की महत्ता एवं आवश्यकता | Dr. Pramod Singh | September 25, 2019 | October 02, 2019 |
| 15 | गोवंश से अधिक उत्पादन हेतु उचित आवासीय व्यवस्था | Dr. AS Sirohi | September 25, 2019 | October 09, 2019 |
| 16 | प्रजनन हेतु नर बछड़ों / सांडों का चयन | Dr. Sushil Kumar | September 25, 2019 | October 16, 2019 |
| 17 | देशी गायों की गर्मी सहन करने की क्षमता एवं उनका प्रबन्धन | Dr. Rajib Deb | October 14, 2019 | October 23, 2019 |
| 18 | फोन इन कार्यक्रम | Dr. Rajendra Prasad, Dr. AK Das and Dr. Naimi Chand | October 30, 2019 | October 30, 2019 |
| 19 | व्यस्क एवं दुधारू गायों का भरण पोषण | Dr. Rajendra Prasad | October 30, 2019 | November 06, 2019 |
| 20 | क्षेत्र संतति परीक्षण द्वारा गायों में आनुवांशिक सुधार एवं दुग्ध उत्पादन में वृद्धि | Dr. AK Das | October 30, 2019 | November 13, 2019 |
| 21 | दुधारू पशुओं में थनैला से बचाव एवं रोकथाम कैसे करें? | Dr. Naimi Chand | October 30, 2019 | November 20, 2019 |
| 22 | फोन इन कार्यक्रम | Dr. Umesh Singh, Dr. Pramod Singh and Dr. Amod Kumar | November 27, 2019 | November 27, 2019 |
| 23 | देशी गायों का आनुवांशिक सुधार एवं संरक्षण | Dr. Umesh Singh | November 27, 2019 | December 18, 2019 |
| 24 | यूरिया मोलेसस मिनिरल ब्लोक के बनाने का तरीका एवं उपयोग | Dr. Pramod Singh | November 27, 2019 | December 04, 2019 |
| 25 | डेयरी गोवंश के सुधार हेतु भारत सरकार द्वारा चलाई जाने वाली विभिन्न योजनाएँ | Dr. Amod Kumar | November 27, 2019 | December 11, 2019 |

HUMAN RESOURCE DEVELOPMENT AND CAPACITY BUILDING

The employees of ICAR-CIRC attended various training programmes / seminars / conferences / workshops / symposia / meetings organized by different organizations to update their knowledge and strengthen skills on different aspects including science & technology, administration and financial management. Moreover, the institute organized different training programmes / conference / meetings / workshops for various stakeholders.

The details of the training programmes attended by institute staff are given below:

| S. No. | Name of the employee | Particular of training | Duration | Venue |
|--------|--|--|---------------------------------------|---|
| 1 | Dr Rajib Deb | Training on "Fundamentals for a Technology Transfer Professional" | September 8-10, 2019 | Society for Technology Management, National Biopharma Mission, Department of Biotechnology, GOI, Pune |
| 2 | Dr Rajib Deb | Training on "Licensing and R&D Collaborations-Deep drive" | September 10-12, 2019 | Society for Technology Management, National Biopharma Mission, Department of Biotechnology, GOI, Pune |
| 3 | Dr Vinod Kumar Dr Pramod Singh Dr Ravinder Kumar Dr Naresh Prasad | पद्मश्री सुभाष पालेकर जी का एक दिवसीय प्राकृतिक खेती प्रशिक्षण शिविर | September 20, 2019 | CCS University, Meerut |
| 4 | Dr Shrikant Tyagi Dr A. S. Sirohi Dr Naimi Chand Sh. Omkar Singh Sh. Vir Mahendra Singh Sh. Mohan Chand | Orientation on Frozen Semen Technology | October 18, 2019 | DFS, Babugarh, Hapur |
| 5 | Dr Umesh Singh | Two days training workshop for Vigilance Officers of ICAR Institutes | October 31 to November 01, 2019 | NAARM, Hyderabad |
| 6 | Dr Naimi Chand | Capacity building programme towards a secure and Resilient Workplace in ICAR | November 25-27, 2019 | ICAR-CPRI, Shimla |
| 7 | Sh. Harish Ram | Improving Skills of Administrative Staff of ICAR dealing with court cases | November, 25-27, 2019 | ICAR-CAZRI, Jodhpur |
| 8 | Dr Naimi Chand | Advances in Molecular Epidemiology in Veterinary Research | December 10-19, 2019 | GADVASU, Ludhiana |
| 9. | Dr Y. K. Soni | Multiple ovulation and embryo transfer and OPU-IVF in Cattle | December 22, 2019 to January 11, 2020 | UKCDB, Dehradun |

Seminars / conference / workshop / Trainings organized

| S. No. | Name of the seminar / conference / training | Venue and date | Course Director / Organizing secretary |
|--------|---|---------------------------------------|--|
| 1 | A National Workshop on "Awareness on Intellectual Property Rights and its management" | ICAR-CIRC, Meerut July 23, 2019 | Dr Rajib Deb Dr Sushil Kumar |
| 2 | Organized One day workshop cum hands on training on "Prior art searching and Intellectual Property Rights (IPRs)" | ICAR-CIRC, Meerut October 19, 2019 | Dr Rajib Deb Dr Sushil Kumar |

| | | | |
|---|--|---------------------------------------|-----------------|
| 3 | National Conference on “Livelihood Improvement through Sustainable Livestock Production” & IV National Convention of Pashu Poshan Kalyan Samittee | ICAR-CIRC, Meerut November 3-4, 2019 | Dr N. V. Patil |
| 4 | Organized one day training program for the use of Web server for Phenotype and genotype analysis for cattle breeding management data- SIREDam software | ICAR-CIRC, Meerut November 05, 2019. | Dr Umesh Singh |
| 5 | MANAGE sponsored Certified Livestock Advisor Training programme on “Scientific Cattle production for sustainable Dairy Production” | ICAR-CIRC, Meerut December 3-17, 2019 | Dr Sushil Kumar |



Release of compendium on the occasion of inauguration of CLA training programme



Inaugural function of NCLISLP-2019

Conferences / seminars / symposia / meetings / workshops attended

| S. No. | Name of the employee | Particular of conference / seminar / symposia / workshop / meeting | Duration | Venue |
|--------|--|--|--------------------|---------------------|
| 1 | Dr Naresh Prasad Dr Rajib Deb Dr Amod Kumar | 1 st National Conference of NAMO Society | April 20-21, 2019 | SVPUAT, Meerut |
| 2 | Dr Umseh Singh Dr A. K. Das | XIV Annual Convention of ISAGB and National Symposium on “Exploring the potential for sustainable use of indigenous animal genetic resources for enhancing productivity and profitability” | May 29-30, 2019 | SKUAS&T, Jammu |
| 3 | All Scientists | XIX RAC meeting | June 03, 2019 | ICAR-CIRC, Meerut |
| 4 | All Scientists | IRC meeting of the Institute | June 7, 2019 | ICAR-CIRC, Meerut |
| 5 | Dr N. V. Patil Dr Rajendra Prasad Dr S. Tyagi Dr. Umesh Singh Dr Suresh Kumar D. S. Dr Pramod Singh Dr Sushil Kumar Dr A. K. Das Dr T. V. Raja | 5th QRT meeting | July 19, 2019 | ICAR-CIRC, Meerut |
| 6 | Sh Harish Ram | Hindi workshop on “भाकृअनुप में राजभाषा हिन्दी के बदलते आयाम” | August 30-31, 2019 | ICAR-CIAZH, Bikaner |

| | | | | |
|----|--|---|----------------------|--|
| 7 | Dr Umesh Singh | Meeting as an expert at Uttar Pradesh Livestock Development Board, Badshahbag, Lucknow to discuss the unrecognized animal populations to be registered as new breeds | September 27, 2019 | Uttar Pradesh Livestock Development Board, Badshahbag, Lucknow |
| 8 | Dr Ravinder Kumar | National Seminar on 4G Gandhi, Ganga, Gou, Gan | October 1-2, 2019 | Gandhian Study center, Ismile National Mahila (PG) College, Meerut |
| 9 | Dr Rajib Deb Dr Sushil Kumar | Workshop and Review meeting of National Agriculture Innovation Fund Scheme (NAIF) | October 4-5, 2019 | ICAR & NDRI, NASC, New Delhi |
| 10 | Dr N. V. Patil Dr Rajendra Prasad Dr Shrikant Tyagi Dr Umesh Singh Dr Suresh Kumar D. S. Dr Sushil Kumar Dr A K Das Dr Pramod Singh Dr S. K. Verma Dr A. S. Sirohi Dr Ravinder Kumar Dr T. V. Raja Dr Siddarth Saha Dr Naimi Chand Dr J. K. Singh Dr Rajib Deb Dr Rani Alex Dr S. K. Rathi Dr Y. K. Soni Dr Megha Pande Shri C. P. Singh Shri Rajiv Verma Shri Jitendra Kumar Shri S. K. Sharma Shri Suresjh Kumar Shri Y. P. Malhotra Shri Omkar Singh Shri Chhote Singh | National Conference on “Livelihood Improvement through Sustainable Livestock Production” & IV National Convention of Pashu Poshan Kalyan Samittee | November 3-4, 2019 | ICAR-CIRC, Meerut |
| 11 | Dr Umesh Singh Dr A. K. Das | Meeting with Director, Animal Husbandry, Punjab and Executive Members of Sahiwal and Indigenous Cattle Society and Farmers for formulating breeding programs for Punjab | November 30, 2019 | Mohali Chandigarh |
| 12 | Dr Umesh Singh | Brain storming session on “Livestock improvement through Artificial Insemination” | December 06, 2019 | NAAS, NASC Complex, New Delhi |
| 13 | Dr N. V. Patil Dr Pramod Singh Dr S. K. Verma | International Conference on Nutritional Strategies for Improving Farm Profitability and Clean Milk Production | December 17-19, 2019 | West Bengal University of Animal and Fisheries Sciences, Kolkata |
| 14 | Dr N. V. Patil Dr Pramod Singh Dr A. K. Das | National Workshop on Stray Cattle Economy | December 28, 2019 | ICAR- IVRI, Izatnagar |

Farmers' training / workshop/ meeting organized

| S. No. | Name of the training | Venue and date | Course Director / Organizing secretary |
|--------|---|---|--|
| 1 | Scientific Dairy Production | ICAR – CIRC, Meerut August 3- 6, 2019 | Dr S. K. Verma |
| 2 | Vaigyanik Vidhi Se Govansh Palan | ICAR – CIRC, Meerut August 29- 31, 2019 | Dr S. K. Verma |
| 3 | Scientific Management for Profitable Dairy Production | ICAR – CIRC, Meerut September 11- 13, 2019 | Dr S. K. Verma |
| 4 | XVIII Annual Review Meet of AICRP on Cattle | ICAR-CIRC, Meerut November 18-19, 2019. | Dr Umesh Singh |
| 5 | “पशुधन प्रबंधन में जल संरक्षण की उपयोगिता” | ICAR-CIRC, Meerut December 02, 2019 | Dr Ajayvir Singh Sirohi |



Off Farm training programme of Bilkhet farmers



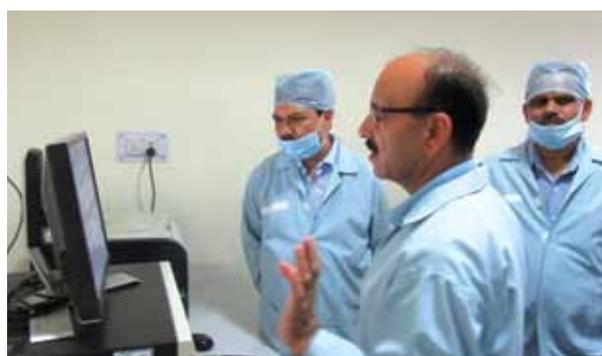
Training programme for farmers of SCSP adopted village under CRP on Water project

DISTINGUISHED VISITORS

| S. No. | Name of the Visitor | Date |
|--------|---|-------------------|
| 1 | Dr K. Alagusundaram, DDG (NRM), ICAR HQ | June 15, 2019 |
| 2 | Dr Joy Krushna Jena, DDG (AS), ICAR HQ | June 29, 2019 |
| 3 | Prof. Gaya Prasad, Hon'ble Vice-Chancellor, SVPUAT, Meerut | July 18, 2019 |
| 3 | Lieutenant General R. Gopal, QMG | August 10, 2019 |
| 4 | Dr Trilochan Mahapatra, Secretary (DARE), Govt. of India and Director General, ICAR | November 03, 2019 |
| 5 | Dr Joy Krushna Jena, DDG (Animal Science), ICAR HQ | November 03, 2019 |
| 6 | Dr H. Rahman, Ex DDG (AS) and Representative, ILRI, South East Asia | November 03, 2019 |
| 7. | Dr K. M. L. Pathak, Ex- Vice Chancellor, DUVASU, Mathura | December 03, 2019 |



Visit of Hon'ble Secretary (DARE), Govt. of India and Director General, ICAR



Visit of Hon'ble DDG (AS) to Semen Freezing Laboratory

LINKAGES AND COLLABORATION

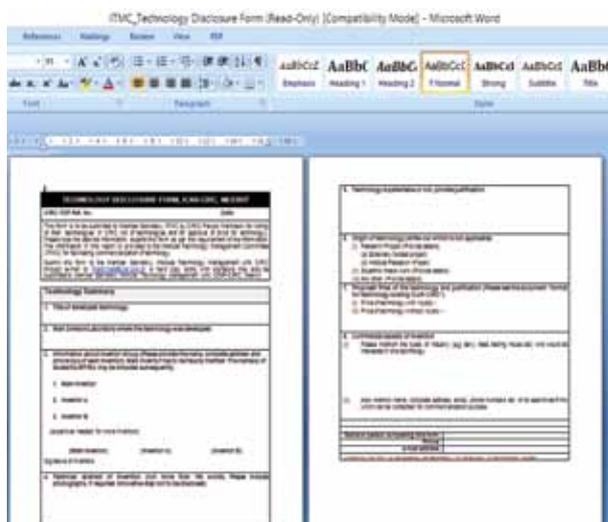
The Institute is well equipped with state of the art infrastructural facilities for conducting advance research in the field of Cattle Genetics and Breeding, Nutrition, Reproduction, Health and Management. The facilities available at the Institute were utilized by the students of institutions like SVPUAT, Meerut and MIET, Meerut for carrying out their dissertation works. The library facilities were extended during the period under report. Institute Technology Management Committee meetings were held to discuss the issues related with technology transfer to Agrinnovate Ltd. and to prepare diagnostic kits and routine works under the chairmanship of Director, ICAR-CIRC, Meerut. Faculty and students of local Institutions like

COAEHS, CCSU, Meerut etc visited the Institute to have an exposure to the applied aspects of cattle production, research and extension. The Institute is having link with various SAUs, SVUs and ICAR Institutions across the country. The Institute is having collaboration with State Animal Husbandry Department, NGOs, KVKs, SHUATS, Allahabad etc. This year Institute has developed the MoU with MPKV, Rahuri, Maharashtra; Rajasthan University of Veterinary and Animal Sciences, Bikaner; IIT, Roorkee; Chhattisgarh Kamdehenu University, Durg; ICAR-IISWC, Dehradun and Netaji Subhash Chandra Bose Educational Society (NSCBES), Dehradun for collaboration in the area of research, academic and extension work.

INSTITUTE TECHNOLOGY MANAGEMENT UNIT (ITMU)

A new CIRC technology disclosure form (TDF) was introduced for disclosing CIRC technologies by the inventors.

CIRC Technology Disclosure form



Five ITMC meetings were organized for filing patent, trademark, copyright, CIRC technologies price fixation and other general issues of ITMU section under the chairmanship of Director, ICAR-CIRC. Two Techno-Commercial Assessment and Expert Committee meetings were held at AGRINNOVATE INDIA LIMITED (AgIn), G-2, A Block, NASC Complex, DPS Marg, New Delhi for transferring four CIRC technologies.



Various Meetings of ITMC and Agri-innovate India Limited

Technology submitted to AGRINNOVATE INDIA

Four technologies viz. (i) CIRC-CATTLE BLAD DIAGNOSTIC ASSAY (Inventors: R. R. Alyethodi, Rajib Deb, Umesh Singh, Sushil Kumar, Rani Alex, Sheetal Sharma, Gyanendra S. Sengar, B. Prakash); (ii) CIRC-COWCAM ASSAY (Inventors: Rajib Deb, Amod Kumar, Gyanendra S. Sengar, T. V. Raja, Umesh Singh, Sushil Kumar, N. V. Patil); (iii) CIRC-ASSAY FOR DETECTING A1A2 MILK IN CATTLE AND BUFFALO (Inventors: Indrajit Ganguly, Umesh Singh, G. K. Gaur, Sushil Kumar, Rani Alex, Rajib Deb, Sunil Kumar, Sandeep Mann) and (iv) CIRC-CATTLE CVM ASSAY (Inventors: R. R. Alyethodi, Rajib Deb, Umesh Singh, Sushil Kumar, Rani Alex, Gyanendra S. Sengar, B. Prakash) were submitted to AGRINNOVATE INDIA LIMITED, New Delhi for transferring to stakeholders.

Management of IPs portfolio

- A National Biodiversity Act (NBA) application filed for "Identification of functional Internal ribosomal Entry site at bovine heat shock protein 90AA1" (Patent Application number: 201711042562) with registration number INBA3201901338, dated 24-06-2019.
- An Indian Patent filed for "Kit for differentiating cow and camel milk" with registration number 201911031389, dated 02-08-2019.
- A trademark filed for "Frieswal" with application number no.4361504, dated 28.11.2019
- A copyright filed for "COWCAM" with registration number 14986/2019-CO/L, dated 23-09-2019

Release of two scientific kits developed by ICAR-CIRC, Meerut on 3rd November, 2019



Release of CIRC-CATTLE BLAD DIAGNOSTIC assay kit on 03-11-2019



Release of CIRC-COWCAM assay kit on 03-11-2019



National Workshop on 'Awareness on Intellectual Property Rights and its management' held at ICAR-Central Institute for Research on Cattle (ICAR-CIRC), Meerut on 23rd July, 2019

- Student's Exposure visit for demonstration of ITMU activities at ICAR-CIRC, Meerut on 6th November, 2019 (Total Participants: 57).



Organized One day workshop cum hands on training on “Prior art searching and Intellectual Property Rights (IPRs)” at ICAR-CIRC, Meerut on 19th October, 2019 (Total Participants 114)



Conducting “Prior art searching” for students

RIGHT TO INFORMATION ACT 2005

सूचना का अधिकार अधिनियम-2005

दिनांक 01.04.2019 से 31.12.2019 तक की अवधि की जनसूचना अधिकार अधिनियम-2005 के अंतर्गत ऑनलाइन/ऑफलाइन माँगी गई सूचना का विवरण :-

| क्र. सं. | कुल प्राप्त ऑनलाइन/ऑफलाइन माँगी गई आर.टी.आई. सूचना | कॉलम 2 में से कुल प्राप्त ऑफलाइन माँगी गई आर.टी.आई. सूचना | भा.कृ.अ.प., नई दिल्ली के माध्यम से माँगी गई कुल प्राप्त ऑनलाईन आर.टी.आई. सूचना | कितनों के जवाब दिए गए / निपटान किया गया | संस्थान में प्राप्त ऑफलाइन आर.टी.आई. की आई.पी.ओ. के रूप में जमा फीस | कुल प्राप्त भा.कृ.अ.प., नई दिल्ली को भेजी गई ऑनलाइन/ऑफलाइन माँगी गई आर.टी.आई. सूचना की फीस |
|----------|--|---|--|---|---|--|
| 1 | 3 | 1 | 03 | 3 | रु. 10.00 (ऑफलाइन प्राप्त एक आर.टी.आई.) | रु. 10.00 |

Research Projects

The following research projects were in operation during the year 2019

| Project Type | S. No. | Project Title | Project ID (PIMS) | period | PI | Co-PIs |
|-----------------|--------|--|--|---------------------------|-----------------------|---|
| AICRP on Cattle | 1 | Studies on genetic aspects of Holstein Sahiwal crossbreds (Frieswal Project) | AGB/AICRP/IXX04334/SK(1/1/1987 31/3/2020) | (1/1/1987 To 31/3/2020) | Dr SUSHIL KUMAR | 1. Dr S. Tyagi 2. Dr Rajib Deb (up to 13.12.2019) 3. Dr A.S. Sirohi 4. Dr Rani Alex (up to 25.11.2019) 5. Dr N. Chand 6. Dr R. Prasad (Co-Opted) |
| | 2 | Genetic studies on the performance of important indigenous breeds and their improvement through selection (IBP) | AGB/AICRP/IXX04335/US(4/1/2011- 30/3/2020) | (4/1/2011 To 30/3/2020) | Dr UMESH SINGH | 1. Dr T.V. Raja 2. Dr Amod Kumar (up to 28.11.2019) |
| | 3 | Field recording of performance data for undertaking large scale progeny testing(FPT) | AGB/AICRP/IXX04379/AKD(1/7/1992- 31/3/2020) | (1/7/1992 To 31/3/2020) | Dr ACHINTYA KUMAR DAS | 1. Dr R. Kumar 2. Dr S.K. Rathee (up to 21.12.2019) |
| Institutional | 1 | Elucidating the genetic variation of Bovine Kisspeptin and neuropeptide Y genes among indigenous cattle breeds and its impact on certain reproductive parameters | AGB/IP/IXX13726/US/(1/10/2017 To 31/03/2020) | (1/10/2017 To 31/03/2020) | Dr UMESH SINGH | 1. Dr. Rajib Deb (up to 13.12.2019) 2. Dr K. S. Murthy -JAU 3. Dr B. S. Rathod- SDAU 4. Dr Rani Alex (Co-Opted) (up to 25.11.2019) |
| | 2 | Genetic variability of X and Y bearing spermatozoa to cryopreservation stress and its implication on their motility | AGB/IP/IXX13750/SK/(1/10/2017 To 31/03/2020) | (1/10/2017 To 31/03/2020) | Dr SUSHIL KUMAR | 1. Dr S. Tyagi 2. Dr Umesh Singh 3. Dr Sushil Kumar 4. Dr Rani Alex (up to 25.11.2019) |



| | | | | | |
|---|---|--|---------------------------|-----------------|---|
| 3 | Genetic analysis of lactation persistency using random regression test day models in Frieswal cattle | AGB/IP/IXX13749/TR/(1/10/2017 To 31/03/2020) | (1/10/2017 To 31/03/2020) | Dr T. V. RAJA | 1. Dr A. K. Das 2. Dr S. K. Rathee (up to 21.12.2019) |
| 4 | Effect of different levels of micro minerals on qualitative and quantitative attributes of semen in Frieswal bulls | AN/IP/IXX09737/PS/(10/10/2012- 31/3/2018) | (10/10/2012 To 31/3/2019) | Dr PRAMOD SINGH | 1. Dr R. Prasad |
| 5 | Effect of herbal feed supplements on sexual performance and semen quality in bulls | AN/IP/IXX13784/RP/(1/10/2017- 31/3/2020) | (1/10/2017 To 31/03/2020) | Dr R. Prasad | 1. Dr Pramod Singh (Co-Opted) 2. Dr S. K. Verma, Co-PI 3. Dr A. S. Sirohi(Co-Opt) |
| 6 | Evaluation of low cost feeding system (Sardhana Model) prevailing in the vicinity of Meerut, its economics and interventions to increase farmer's profitability | AN/IP/IXX13913/VK/(1/10/2017- 31/3/2020) | (1/10/2017 To 31/03/2020) | Dr VINOD KUMAR | 1. Dr. Rajendra Prasad (Co-Opted) |
| 7 | Studies on Heparin binding proteins in the semen of Frieswal and Indigenous bulls | AP/IP/IXX13727/YS/(1/10/2017- 31/03/2020) | (1/10/2017 To 31/03/2020) | Dr Y. K. SONI | 1. Dr Suresh Kumar (Co-Opted) 2. Dr. S. Saha (Co-Opted) 3. Dr Amod Kumar, CO-PI (up to 28.11.2019) 4. Dr A. S. Sirohi (Co-Opted) |
| 8 | Androgen and their relation with sexual behavior and seminal attributes in bulls at CIRC-BRU. | AP/IP/IXX15382/JK/(1/10/2017- 31/03/2020) | (1/10/2017 To 31/03/2020) | Dr J. K. SINGH | 1. Dr Suresh Kumar (Co-Opted) 2. Dr S. Saha (Co-Opted) 3. Dr Megha Pandey (Co-Opted) 4. Dr Naimi Chand (Co-Opted) 5. Dr Y. K. Soni (Co-opted) |

| | | | | | | |
|---------------------|----|---|--|--------------------------|-------------------------|---|
| | 9 | Studies on Cryodamages of Bull Spermatozoa and its Mitigation using different Additives | SFL/IP/IXX12296/SKDS/ (9/10/2015-30/3/2018) | (9/10/2015 To 30/9/2019) | Dr SURESH KUMAR D.S. | 1. Dr A. S. Sirohi |
| | 10 | Delineating the effect of season and shelter management on scrotal thermal profile and semen quality in Frieswal bulls | SFL/IP/IXX15234/ AS/1/6/2019 to 31/5/2021 | 1/6/2019 to 31/5/2020 | Dr A. S. Sirohi | 1. Dr Y. K. Soni |
| | 11 | Development of AntibioGram for quality semen production | SFL/IP/IXX15233/ NC/1/4/2019 to 31/3/2021 | 1/4/2019 to 31/3/2021 | Dr Naimi Chand | 1. Dr S. Tyagi 2. Dr Y. K. soni |
| Inter Institutional | 1 | Development of Web server for Phenotype and genotype analysis for cattle breeding management | AGB/IIP/IXX14915/ US/1/4/2018 to 31/3/2021 | 1/4/2018 to 31/3/2021 | Dr UMESH SINGH | 1. Dr. Sushsil Kumar 2. Dr. A.K. Das 3. Dr. T.V. Raja 4. Dr. Rani Alex |
| Externally funded | 1 | Livelihood Improvement through Sustainable Dairy Farming using Suitable Interventions (Farmer FIRST Programme) | APY/Ext- Funded/ OXX03793/SK/ (05/04/2017 To 31/03/2018) | 05/04/2017 To 31/03/2021 | Dr SURESH KUMAR D. S. | 1. Dr. S. Saha 2. Dr. Naresh Prasad 3. Dr. Naimi Chand 4. Dr. Yogesh Kumar Soni 5. Dr. JP Dabas |
| | 2 | Water budgeting and enhancing water productivity in livestock based farming system | SFL/EXTFUND/OXX03230 /AS / (3/8/2015 To 31/3/2018) | (3/8/2015 To 31/3/2021) | Dr AJAYVIR SINGH SIROHI | 1. Dr R. Prasad 2. Dr S. Saha |
| Service Project | 1 | Quality assessment of Frieswal bull semen | SFL/IP-SP/IXX10465/SKDS/ (1/6/2013 - 1/5/2016) | (1/6/2013 To 31/3/2020) | Dr NAIMI CHAND | |
| | 2 | Value addition in dung waste through Vermi culture | SFL/ISP/IXX13473/ SKV/06/07/15 to continuing) | 06-07-2015 to 31.3.2020 | Sh. C. P. Singh | 1. Sh. Rajeev Verma-Co-PI |
| | 3 | Improvement of productivity of livestock including hill cattle through different interventions for sustainable food security and livelihood | AN/IP/OXX04813/ SKV/1/7/2019 to 30/6/2020 | 1/7/2019 to 31/3/2021 | Dr S. K. Verma | 1. Dr N.V. Patil 2. Dr Pramod Singh 3. Dr S. Saha 4. Dr Y. K. Soni 5. Dr Naresh Prasad |

Publications

Research Papers:

International:

1. Singh R, Junghare V, Hazra S, Singh U, Singh G S, Raja T V, Kumar S, Tyagi S, Das A K, Kumar A, Koringa P, Jakhesara S, Joshi C J, Deb R. 2019. Database on spermatozoa transcriptogram of categorised Frieswal crossbred (Holstein Friesian X Sahiwal) bulls. *Theriogenology*, **129**: 130-145.
2. Verma N, Alyethodi R R., Kathuria A, Alex R, Hussain S, Singh U, Tyagi S, Sirohi A S, Kumar S, Deb R. 2019. Effect of heat stress on superoxide anion production in native and crossbred cattle Sengar G S, Raja T V and Prakash B. under *in vitro* whole blood culture model. *Journal of Thermal Biology. Elseiver* - doi: <https://doi.org/10.1016/j.jtherbio.2019.102457>.

National:

1. Chand N, Tyagi S, Prasad R, Dutta D, Sirohi A S, Sharma A and Tyagi R. 2019. Status of toxic heavy metals in seminal plasma and their effect on oxidative markers and semen quality parameters in HF crossbred breed bulls. *Indian Journal of Animal Sciences* **89(6)**: 632-636.
2. Pande M, Srivastava N, Kumar S, Soni Y K, Kumar M, Tyagi S, Sirohi A S, Chand N, Omerdin and Arya S. 2019. Greater potentiality of sperm membrane bound fertility associated antigen to withstand oxidative stress ensuing improved sperm function of cryopreserved bull spermatozoa. *Indian Journal of Animal Research*. **53(5)**. 572-577
3. Prasad N, Kumar S, Pande M, Soni Y K, Saha S, Chand N and Arya S. 2019. Socio-Economic Status and Problems Faced by Dairy farmers of sardhana block of meerut district. *International Journal of Livestock Research*. **9(4)**: 120-128.
4. Singh U, Raja T V, Alyethodi R R and Murthy K S. 2019. Genetic evaluation of Gir bulls under associated herd progeny testing programme. *Indian Journal of Animal Sciences*, **89(5)**:567-568.

5. Sirohi A S, Chand N, Tyagi S, Kumar S, Pande M and Sharma A. 2019. Impacts of shed orientation on behavioural pattern, physiological changes and semen quality in HF X Sahiwal bulls. *Indian Journal of Animal Production and Management*. **35(3-4)**: 109-114.

Invited Lecture/Lead paper:

1. Kumar S, Alex R, Raja T V and Deb R. 2019. Crossbreeding of cattle for improving milk production in India. In compendium of National Conference on Livelihood Improvement through Sustainable Livestock Production & IV National Convention of Pashu Poshan Kalyan Samittee, ICAR-CIRC, Meerut from Nov 03-04, pp: 78-90.
2. Kumar S. 2019. Dairy Cattle production. In Regional Kharif Gosthi for Meerut and Saharanpur Region. Meerut District held on 29th May 2019 at LLR Medical College, Meerut.
3. Singh P, Patil N V, Prasad R and Verma S K. 2019. Nutritional strategies for improved dairy production under Indian scenario. In: Souvenir of National conference on 'Livelihood Improvement through sustainable livestock production & IV convention of Pashu Poshan Kalyan Samittee' organized at ICAR-CIRC, Meerut Cantt. (UP), November 3-4, 2019. pp 18-26.
4. Singh U, Alex R and Raja T V. 2019. Gentic improvement of cattle through selection of bulls. National Conference on Livelihood Improvement through Sustainable Livestock Production & IV National Convention of Pashu Poshan Kalyan Samittee, ICAR-CIRC, Meerut from Nov 03-04, pp: 69-75.
5. Sirohi, A S. 2019. Basic and strategic research priorities for productivity enhancement of indigenous dairy cattle. In distinguished Lecture Series 2019-20 "on November 16, 2019 under NAHEP-CAAST sub-project at College of Veterinary Science & Animal Husbandry, NAU, Navsari.

6. Sirohi, A S. 2019. On-Farm record keeping and accounting procedure. In training programme at ICAR-IIFSR, Modipuram, Meerut on 19.09.2019.
7. Sirohi, A S. 2019. Dairy Cattle Management. In training programme on "Livestock development and AI and NLM for Veterinary Officers, Livestock Extension Officers, Paravets and progressive farmers" sponsored by UPLDB at vikas bhavan, Meerut on 26.08.2019.
8. Kumar R and Das A K. 2019. Mahatma Gandhi Ideology on Livestock for Food Security and Sustainability in Asian Countries. Resource Person for two-days National conference on "4G Gandhi, Ganga, Gou, Gaoun" organized by Gandhian Study Centre, Ismile National Mahila PG College (INMPG) Meerut during 01- 02 October, 2019.
9. Singh S K D. 2019. Diagnostic Approaches for Infertility in Bovines. World Veterinary Day. SDAU, S. K. Nagar, Gujarat. April 27, 2019
10. Soni Y K. 2019. Estrus detection and reproductive diagnostic techniques in dairy animals. Training program for master trainers on implementation of artificial insemination services. SVPUAT, Modipuram, Meerut. May 27-31, 2019.
11. Singh S K D. 2019. Minimum standards and standard operating procedure for A.I. services. Training program for master trainers on implementation of artificial insemination services. SVPUAT, Modipuram, Meerut. May 28, 2019.
12. Singh S K D. 2019. Semen handling and assessment of quality of frozen semen. Training program for master trainers on implementation of artificial insemination services. SVPUAT, Modipuram, Meerut. June 18, 2019.
13. Singh SKD. 2019. Oocyte Collection Techniques, Induction of Ovulation and Embryo Transfer in Bovines. A national training on "Latest advancement in upstream reproductive Physiological Techniques". JAU, Junagadh. September 16, 2019

The following scientists from ICAR-CIRC delivered expert lectures on cattle breeding, feeding, reproduction, health and management aspects in DGR, Min. of Defence, GoI sponsored dairy farm supervisor training programme for JCOs/ORs held during July and August, 2019 at

MSME-sports goods complex, Delhi road Meerut:

1. Dr Rajendra Prasad
2. Dr Suresh Kumar D S
3. Dr Pramod Singh
4. Dr Sanjeev Kumar Verma
5. Dr Ajayvir Singh Sirohi
6. Dr Ravinder Kumar
7. Dr Naimi Chand
8. Dr Naresh Prasad
9. Dr S. K. Rathee
10. Dr Y. K. Soni
11. Dr Amod Kumar

Patents & Trademarks:

1. Deb Rajib, Amod Kumar, Gyanendra Singh Sengar, T V Raja, Umesh Singh, Sushil Kumar, N V Patil. 2019. Detection of adulteration of Camel milk with Cow milk or vice-versa. A copyright filed for "COWCAM" with registration number 14986/2019-CO/L, dated 23-09-2019.
2. FRIESWAL (4361504) - Trade Marks Journal No: 1935, 06/01/2020, Class 31

Technical / Popular articles:

1. Chand N, Kumar S, Soni Y K, Pande M, Prasad N and Saha S. 2019. Prevalence, diagnosis and management of mastitis in dairy cattle under field conditions. *Indian farming*. **69 (06)**: 12-15.
2. Rathee S. K., A. K. Das, Ravinder Kumar, T. V. Raja, Rani Alex, Sushil Kumar, Umesh Singh, S Tyagi, B Prakash, K. Anilkumar. 2019. Field progeny testing programme of crossbred cattle a boon for genetic improvement of cattle under rural conditions. *Indian Farming*. **68 (12)**: 35-37
3. Soni Y K, Kumar S, Saha S, Chand N, Pande M and Prasad N. 2019. Mass oestrus synchronization programme in dairy animals: A field experience. *Indian farming*. **69(06)**: 09-11.

Book Chapters:

1. मयंक प्रमोद, गिरीश नारायण सिंह, प्रमोद सिंह एवं राजेन्द्र प्रसाद. 2019. पशुधन और एकीकृत खेती प्रणाली। 'सुरभि', राजभाषा पत्रिका (तृतीय अंक), ISBN : 978-81-943655-0-1, भाकृअनुप- केन्द्रीय गोवंश अनुसंधान संस्थान, मेरठ छावनी- 250 001। पृष्ठ सं. 68-71.
2. मयंक प्रमोद, प्रमोद सिंह एवं राजेन्द्र प्रसाद. 2019. डेयरी पशुओं के लिए गर्मी के मौसम में मक्का-लोबिया का उत्तम हरा चारा। 'सुरभि', राजभाषा पत्रिका (तृतीय अंक),



- ISBN : 978-81-943655-0-1, भाकृअनुप-केन्द्रीय गोवंश अनुसंधान संस्थान, मेरठ छावनी- 250 001। पृष्ठ सं. 43-44.
3. जितेन्द्र कुमार एवं रविन्द्र कुमार 2019. गोवंश अनुसंधान: किसानों के द्वार। 'सुरभि', राजभाषा पत्रिका (तृतीय अंक), ISBN : 978-81-943655-0-1, भाकृअनुप-केन्द्रीय गोवंश अनुसंधान संस्थान, मेरठ छावनी- 250 001। पृष्ठ सं. 105-106
 4. जितेन्द्र कुमार सिंह, सिद्धार्थ साहा, मेघा पांडे, एवं वाई.के. सोनी. 2019. जलवायु परिवर्तन का कृषि एवं पशुपालन पर प्रभाव। 'सुरभि', राजभाषा पत्रिका (तृतीय अंक), ISBN : 978-81-943655-0-1, भाकृअनुप-केन्द्रीय गोवंश अनुसंधान संस्थान, मेरठ छावनी- 250 001। पृष्ठ सं. 1-7.
 5. जितेन्द्र कुमार सिंह, सिद्धार्थ साहा, वाई.के. सोनी एवं सुरेश कुमार 2019. डेयरी पशुओं में बांझपन के उपचार में हॉर्मोन का महत्व। 'सुरभि', राजभाषा पत्रिका (तृतीय अंक), ISBN : 978-81-943655-0-1, भाकृअनुप-केन्द्रीय गोवंश अनुसंधान संस्थान, मेरठ छावनी- 250 001। पृष्ठ सं. 58-59.
 6. जितेन्द्र कुमार सिंह, नरेश प्रसाद, सिद्धार्थ साहा, वाई.के. सोनी एवं सुरेश कुमार 2019. वातावरणीय कारकों का गोवंश पर प्रभाव। 'सुरभि', राजभाषा पत्रिका (तृतीय अंक), ISBN : 978-81-943655-0-1, भाकृअनुप-केन्द्रीय गोवंश अनुसंधान संस्थान, मेरठ छावनी-250 001। पृष्ठ सं. 8-10
 7. जितेन्द्र कुमार सिंह, नरेश प्रसाद, सिद्धार्थ साहा, वाई.के. सोनी एवं सुरेश कुमार 2019. पशुपालन के लिए उपयोगी पारम्परिक ज्ञान। 'सुरभि', राजभाषा पत्रिका (तृतीय अंक), ISBN : 978-81-943655-0-1, भाकृअनुप-केन्द्रीय गोवंश अनुसंधान संस्थान, मेरठ छावनी- 250 001। पृष्ठ सं. 50-54.
 8. प्रमोद सिंह एवं राजेन्द्र प्रसाद. 2019. शीतकाल में दुधारु पशुओं हेतु संतुलित आहार प्रबंधन। 'सुरभि', राजभाषा पत्रिका (तृतीय अंक), ISBN : 978-81-943655-0-1, भाकृअनुप-केन्द्रीय गोवंश अनुसंधान संस्थान, मेरठ छावनी- 250 001। पृष्ठ सं. 40-42.
 9. प्रमोद सिंह. 2019. डेयरी पशुओं का उत्पादन सुधारने के लिए यूरिया मोलेसिस मिनरल ब्लॉक बनाने की विधि एवं प्रयोग। 'सुरभि', राजभाषा पत्रिका (तृतीय अंक), ISBN : 978-81-943655-0-1, भाकृअनुप-केन्द्रीय गोवंश अनुसंधान संस्थान, मेरठ छावनी- 250 001। पृष्ठ सं. 34-36.
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 11. प्रमोद सिंह, राजेन्द्र प्रसाद एवं एस.के. वर्मा. 2019. डेयरी पशुओं के लिए पीने के पानी की गुणवत्ता। 'सुरभि', राजभाषा पत्रिका (तृतीय अंक), ISBN : 978-81-943655-0-1, भाकृअनुप-केन्द्रीय गोवंश अनुसंधान संस्थान, मेरठ छावनी- 250 001। पृष्ठ सं. 31-33.
 12. प्रमोद सिंह, राजेन्द्र प्रसाद, नितिन वी. पाटिल एवं एस.के. वर्मा. 2019. गर्म मौसम में डेयरी पशुओं का आहार प्रबंधन। 'सुरभि', राजभाषा पत्रिका (तृतीय अंक), ISBN : 978-81-943655-0-1, भाकृअनुप-केन्द्रीय गोवंश अनुसंधान संस्थान, मेरठ छावनी- 250 001। पृष्ठ सं. 37-39.
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 14. राजिब देब, उमेश सिंह, सुशील कुमार एवं ज्ञानेन्द्र सिंह सेंगर 2019. भैंस के दूध में गाय के दूध की मिलावट का लैम्प विधि द्वारा एक सरल परीक्षण। 'सुरभि', राजभाषा पत्रिका (तृतीय अंक), ISBN : 978-81-943655-0-1, भाकृअनुप-केन्द्रीय गोवंश अनुसंधान संस्थान, मेरठ छावनी-250 001। पृष्ठ सं. 107
 15. राजेन्द्र प्रसाद, प्रमोद सिंह एवं आंचल शर्मा. 2019. पशुपोषण का गोवंश प्रजनन व उत्पादन में महत्व। 'सुरभि', राजभाषा पत्रिका (तृतीय अंक), ISBN : 978-81-943655-0-1, भाकृअनुप-केन्द्रीय गोवंश अनुसंधान संस्थान, मेरठ छावनी-250 001। पृष्ठ सं. 26-30.
 16. समेश आर्या, प्रभाकर मोर्य, सुरेश कुमार, अंकुर शर्मा एवं आंचल शर्मा 2019. कृत्रिम गर्भाधान में वीर्य की गुणवत्ता का महत्व। 'सुरभि', राजभाषा पत्रिका (तृतीय अंक), ISBN : 978-81-943655-0-1, भाकृअनुप-केन्द्रीय गोवंश अनुसंधान संस्थान, मेरठ छावनी- 250 001। पृष्ठ सं. 60-61
 17. सारिका, समेश आर्या, मेघा पाण्डे, सुरेश कुमार एवं रविन्द्र कुमार 2019. दैनिक जीवन में जैव प्रादौगिकी की उपयोगिता। 'सुरभि', राजभाषा पत्रिका (तृतीय अंक), ISBN : 978-81-943655-0-1, भाकृअनुप-केन्द्रीय गोवंश अनुसंधान संस्थान, मेरठ छावनी- 250 001। पृष्ठ सं. 99-101
 18. उमेश सिंह 2019. दूध उत्पादन बढ़ाने हेतु गोवंश का आनुवांशिक सुधार। 'सुरभि', राजभाषा पत्रिका (तृतीय अंक), ISBN : 978-81-943655-0-1, भाकृअनुप-केन्द्रीय गोवंश अनुसंधान संस्थान, मेरठ छावनी- 250 001। पृष्ठ सं. 11-14.
 19. नेमी चन्द, अजयवीर सिंह सिरोही, श्रीकांत त्यागी एवं नीरज श्रीवास्तव 2019. गोपशुओं के रक्त परजीवी जनित रोग: उपचार एवं बचाव। 'सुरभि', राजभाषा पत्रिका (तृतीय अंक), ISBN : 978-81-943655-0-1, भाकृअनुप-केन्द्रीय गोवंश अनुसंधान संस्थान, मेरठ छावनी- 250 001। पृष्ठ सं. 55-57.
 20. आंचल शर्मा, प्रमोद सिंह एवं नितिन वी. पाटिल. 2019. डेयरी पशु प्रबंधन में शारीरिक स्थिति सूचकांक की

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21. आँचल शर्मा, प्रमोद सिंह एवं राजेन्द्र प्रसाद. 2019. डेयरी पशुओं में पोषण-उपापचन सम्बन्धित विकार तथा स्वास्थ्य प्रबन्धन। 'सुरभि', राजभाषा पत्रिका (तृतीय अंक), ISBN : 978-81-943655-0-1, भाकृअनुप- केन्द्रीय गोवंश अनुसंधान संस्थान, मेरठ छावनी- 250 001। पृष्ठ सं. 45-49.
 22. अजयवीर सिंह सिरोही, नेमी चंद, श्रीकांत त्यागी एवं नीरज श्रीवास्तव 2019. गोपशुओं में असामान्य व्यवहार/आदतें। 'सुरभि', राजभाषा पत्रिका (तृतीय अंक), ISBN : 978-81-943655-0-1, भाकृअनुप- केन्द्रीय गोवंश अनुसंधान संस्थान, मेरठ छावनी- 250 001। पृष्ठ सं. 65-67
 23. Kumar R, Verma A K, Singh R and Das A K. 2019. Model Dairy Farming For Entrepreneurship Development. Book; Agri-Entrepreneurship: Challenges and Opportunities. (2019): 269-303. Published by Today and Tomorrow's Printers and Publishers, 4436/7, Ansari Road, Daryaganj, New Delhi - 110 002, ISBN 10: 81-7019-642-9, ISBN 13: 9788170196426

Book Published:

1. प्रमोद सिंह, ए. एस. सिरोही एवम् नेमी चन्द. 2019. 'सुरभि', राजभाषा पत्रिका (तृतीय अंक), ISBN : 978-81-943655-0-1, भाकृअनुप-केन्द्रीय गोवंश अनुसंधान संस्थान, मेरठ छावनी- 250 001 पृष्ठ 107.

Seminar Compendia/Training Manuals/News Letter:

1. Alex R, Raja T V, Patil N V, Saha S, Tyagi S, Sirohi A S, Kumar A, Deb R, Soni Y K and Verma S K. 2019. Compendium of abstracts. National Conference on Livelihood Improvement through Sustainable Livestock Production and IV Annual Convention of Pashu Poshan Kalyna Samittee held from November, 3-4, 2019 at ICAR-Central Institute for Research on Cattle, Meerut Cantt. Pp 1-150.
2. Raja T V, Alex R, Patil N V, Saha S, Tyagi S, Sirohi A S, Kumar A, Deb R, Soni Y K and Verma S K. 2019. Invited lectures. National Conference on Livelihood Improvement through Sustainable Livestock Production and IV Annual Convention

of Pashu Poshan Kalyna Samittee held from November, 3-4, 2019 at ICAR-Central Institute for Research on Cattle, Meerut Cantt. Pp 1-175.

3. Raja T V, Kumar S, Verma S K, Sirohi A S, Soni Y K, Prasad N and Rathee S K. 2019. Training manual of MANAGE sponsored training programme on Scientific cattle management for sustainable dairying production, December 3-17, 2019. Central Institute for Research on Cattle, Meerut. Pp 1-225.
4. Patil N V, Raja T V, Alex R and Saha S. 2019. Souvenir. National Conference on Livelihood Improvement through Sustainable Livestock Production and IV Annual Convention of Pashu Poshan Kalyna Samittee held from November, 3-4, 2019 at ICAR-Central Institute for Research on Cattle, Meerut Cantt. Pp 1-67.
5. Kamdhenu. 2019. News Letter. Editors: Kumar R, Raja T V, Prasad N and Deb R. ICAR-Central Institute for Research on Cattle, Meerut Cantt. Pp 1-12.

Folders/ Leaflets:

1. अजयवीर सिंह सिरोही, नेमी चंद, श्रीकांत त्यागी व योगेश कुमार सोनी. (2019). दन्त विन्यास के आधार पर गोपशुओं की आयु का आंकलन फोल्डर -भाकृअनुप-केन्द्रीय गोवंश अनुसंधान संस्थान, ग्रास फार्म रोड, मेरठ छावनी 250001.
2. Deb R, Raja T V, Alex R, Kumar A, Singh U, Kumar S, Sengar G S, Singh R, Ashish and Patil N V. 2019. Summer Stress Management in Dairy Cattle. (CIRC/2019/02), leaflet, pages - 08, published by ICAR-CIRC, Meerut.
3. Deb R, Kumar A, Sengar G S, Raja T V, Singh U, Kumar S and Patil N V. 2019. CIRC- COWCAM Assay KIT (CIRC Kit #02), leaflet, pages -04, published by ICAR-CIRC, Meerut

Kits Developed:

1. Deb R, Kumar A, Sengar S G, Raja T V, Singh U, Kumar S and Patil N V. 2020. CIRC-COWCAM ASSAY: A kit for detecting cow milk admixed with camel milk or vice versa. *Research Today* **2(3)**:36-37.
2. Alyethodi R R, Deb R, Singh U, Kumar S, Alex R, Sharma S, Sengar G S, Prakash B. *CIRC-CATTLE BLAD diagnostic assay kit*

Professional Recognitions

| S. No. | Name | Recognition | Name of event and date | Institute/society/org. |
|--------|---------------------|-----------------------|---|---|
| 1. | Dr Suresh Kumar D S | Guest of Honour | Training programme for state government veterinary officers on AI in farm animals June 21, 2019 | SVPUA & T, Modipuram, Meerut |
| 2. | Dr Suresh Kumar D S | Acted as expert/Judge | National Livestock Championship held at Batala | Department of Animal Husbandry, Punjab |
| 3 | Dr Ravinder Kumar | Sessional Chairman | National Seminar on 4G Ganghi, Ganga, Gou, Gaoun held during October 1-2, 2019 | Gandhian Study center, Ismile National Mahila (PG) College, Meerut. |
| 4 | Dr Y. K. Soni | Rapporteur | NCLISLP-2019 held during November 03-04, 2019 | ICAR-CIRC Meerut and Pashu Poshan Kalyan Samitee |
| 5 | Dr Ravinder Kumar | Judge | All India and Uttar Pradesh Animal Show in Akhil Bhartiya Kisan Mela-2019 duirng November 8-9, 2019 | SVP University of Agri. Tech., Meerut |
| 6 | Dr S. K. Verma | Sessional Co-Chairman | INCAN-2019 held during December, 17-19, 2019 | WBUAFS, Kolkata and Animal Nutrition Society of India |

Awards

| S. No. | Name | Award | Awarding event and date | Awarding institute/org. |
|--------|-------------------------|-------------------------------|------------------------------------|---|
| 1. | Dr Ajayvir Singh Sirohi | Third best paper presentation | NCLISLP-2019, November 03-04, 2019 | Pashu Poshan Kalyna Samittee and ICAR-Central Institute for Research on Cattle, Meerut Cantt. |
| 2. | Dr N. Chand | First oral presentation award | NCLISLP-2019, November 03-04, 2019 | Pashu Poshan Kalyna Samittee and ICAR-Central Institute for Research on Cattle, Meerut Cantt. |
| 3 | Dr Y. K. Soni | Third best oral presentation | NCLISLP-2019, November 03-04, 2019 | Pashu Poshan Kalyna Samittee and ICAR-Central Institute for Research on Cattle, Meerut Cantt. |

Important Committees and Meetings

RESEARCH ADVISORY COMMITTEE (RAC)

| S. No. | Name | Designation |
|--------|--|------------------|
| 1. | Prof. (Dr) Col. A. K. Gahlot Ex-vice chancellor, RAJUVAS, Bikaner (Rajasthan) | Chairman |
| 2. | Dr B. K. Joshi, Former Director, NBAGR, Karnal House No. 139, Sector -13 Urban Estate Karnal – 132 001 Haryana | Member |
| 3. | Prof. D. N. Kamra Former Head (AN) Indian Veterinary Research Institute Izatnagar, Bareilly – 243 122 (UP) | Member |
| 4. | Dr S. P. Tiwari Vice-chancellor, NDVSU, Jabalpur (M P) | Member |
| 5. | Dr Keshav Rao Former Professor & Head LPT, RGVC, Pondicherry Flat No. 706, E-Block, Vertex Sadguru Krupa Apartments, Nizam Pet Road, Kukatpalli, Hyderabad- 500 072 | Member |
| 6. | Dr Lal Krishna Former ADG, ICAR C-302, Exotica Elegance Ahinsa Khand II, Indirapuram Ghaziabad- 201 014 (UP) | Member |
| 7. | ADG (AP&B), Indian Council of Agricultural Research Krishi Bhawan, New Delhi | Member |
| 8. | Mrs. Sushma Singh, 2/524, Vineet Khand, Gomti Nagar Lucknow, U.P. | Member |
| 9. | Director, ICAR-Central Institute for Research on Cattle, Meerut, U.P. | Member |
| 10. | Dr Rajendra Prasad, Principal Scientist, ICAR-Central Institute for Research on Cattle, Meerut, U.P. | Member Secretary |

Institute Management Committee

| S. No. | Nominated Officers/Persons | Designation |
|--------|--|------------------|
| 1. | Director, ICAR-Central Institute for Research on Cattle, Meerut (UP) | Chairman |
| 2. | The Asstt. Director General (AP&B), Indian Council of Agricultural Research, Krishi Bhavan, New Delhi-110001 | Member |
| 3. | The Deputy Director (Animal Husbandry) Deptt. of Animal Husbandry, U.P.Govt., Abulane, Meerut Cantt.-250001 (UP) | Member |
| 4. | The Director, Animal Husbandry, Govt. of Uttrakhand, Dehradun, Uttrakhand | Member |
| 5. | The Dean, College of Vety. Sciences, SVBP Univ. of Agri. & Technology, Modipuram, Meerut-250110 (UP) | Member |
| 6. | Mrs. Sushma Singh, 2/524, VineetKhand, Gomti Nagar, Lucknow-226010 (UP) | Member |
| 7. | Finance & Accounts Officer, ICAR-Indian Institute of Farming System Research, Modipuram, Meerut-250110 (UP) | Member |
| 8. | Dr P. K. Singh, Principal Scientist (AG&B), ICAR-National Bureau of Animal Genetics Resources, Karnal-132001 (Haryana) | Member |
| 9. | Dr S. S. Dahiya, Principal Scientist (Animal Nutrition), ICAR-Central Institute for Research on Buffaloes, Hisar-125004 (Haryana) | Member |
| 10. | Dr Arun Kumar Tomar, Head (AG&B), ICAR-CSWRI, Avikanagar, P.O. & Tehsil-Malpura, Distt. Tonk-304501, (Rajasthan) | Member |
| 11. | Dr P. K. Rout, Principal Scientist (AG&B), ICAR – Central Institute for Research on Goats, Makhdoom, P.O.-Farah, Mathura-281122 (UP) | Member |
| 12. | Dr T. K. Datta, Principal Scientist (Animal Nutrition), ICAR-National Dairy Research Institute, Karnal-132001 (Haryana) | Member |
| 13. | Administrative Officer, ICAR-Central Institute for Research on Cattle, Grass Farm Road, Meerut Cantt.-250001 (UP) | Member Secretary |

INSTITUTE JOINT STAFF COUNCIL (IJSC):

OFFICE SIDE

1. Dr N. V. Patil, Director : Chairman
2. Dr Umesh Singh, Principal Scientist : Member
3. Dr A. S. Sirohi, Principal Scientist : Member
4. Dr Rajib Deb, Scientist (SS) : Member
5. Sh. D. S. Verma, AF&AO : Member
6. Sh. Harish Ram, Admn. Officer : Member Secy. (Office)

STAFF SIDE

1. Sh. N. S. Saini, Asstt. Admin. Officer : Member
2. Sh. S. K. Sharma, Sr. Technical Officer : Member (CJSC)
3. Sh. Chhotey Singh, Technical Officer : Member
4. Sh. Vikas Kumar, UDC : Member Secy. (Staff)
5. Sh. Dungar Singh, Skilled Supporting Staff : Member
6. Sh. Veer Pal Singh, Skilled Supporting Staff : Member

Important Meetings

Quinquennial Review Team (QRT)

Quinquennial Review Team (QRT) for ICAR-Central Institute for Research on Cattle, Meerut was constituted vide ICAR letter No. F. No. AS 19/3/10-IA-I dated 21.8.2017 to review the work done by the Institute during the period April 2012 to March 2017. The team comprised of Dr V. K. Taneja as Chairman, Dr. R.K. Sethi, Dr C. S. Prasad, Dr S. K. Agarwal and Dr K. S. Risam as members and Dr S. Tyagi, as member secretary. The progress of work done during the above period was assessed based on the (i) review of the projects on the basis of background papers, reports and other publications that were prepared and provided by ICAR-CIRC, Meerut (ii) holding meetings and discussions with project scientists, technical/administrative/supporting staff, resource persons connected with the Project, and ICAR Head Quarter and (iii) Field Visits to Junagadh/ Dantiwada unit of Indigenous breeds project and BAIF unit of Field progeny testing project for reviewing the performance. Four meetings were conducted of which the third meeting was predominantly the field visit by two different teams, one team visited the Gir unit at Junagadh and the other at BAIF, Pune unit of field Progeny testing of Frieswal project. On the basis of discussions held with scientists, technical, administrative, financial and supporting staff and visit to different laboratories/ field units, the committee has drawn a comprehensive report highlighting major observations and recommendations and submitted final report to DG, ICAR on 04.9.2019.



19th RAC Meeting of ICAR-CIRC, Meerut

The 19th RAC meeting of ICAR-CIRC, Meerut was conducted on 3 June 2019 under the chairmanship of Dr A. K. Gahlot, Ex Vice Chancellor RAJUVAS, Bikaner. The RAC members viz., Dr Lal Krishna, Former ADG (AH); Dr. D. N. Kamra, Former Head Division of Animal Nutrition, IVRI, Izatnagar; Dr S. P. Tiwari, Dean college of Vet. Sci. and Anim. Husb., Anjora, Durg, Mrs. Sushma, Singh, person representing rural interest, Dr N. V. Patil, Director CIRC and Dr. Rajendra Prasad, Member Secretary, RAC ICAR-CIRC attended the meeting.

In his opening address chairman Dr A. K. Gahlot emphasised the importance of indigenous cattle breeds which can survive and produce well even in adverse environment. The chairman also stressed the importance of animal rearing which is contributing well to the GDP as compared to crops. He also emphasised about the importance of AICRP on cattle and its relevance in the society. The chairman also highlighted the importance of indigenous cattle which is picking up fast with the farming community. The chairman highlighted the importance of sexed semen in the changing socio agricultural scenario where the importance of male animals has dwindled. He also stressed to take up collaborative projects and activities with different SAUs. Member Secretary, RAC presented the action taken report on the last year RAC recommendations. In his concluding remarks, the Chairman RAC appreciated the efforts of all the Scientists and progress of the Institute. He also emphasized that farmers want ready to use and applicable methodologies for cattle production. The projects of the institute may be fine-tuned in line with RAC discussions.

Institute management committee (IMC)

The Institute management committee meeting was held on September 12, 2019 to discuss emergent issues related with management of the institute.

Institute Research Committee (IRC)

IRC meeting for the year 2018-19 held on 07th June, 2019 under the chairmanship of Dr N. V. Patil, Director. Dr Vineet Bhasin, Principal Scientist, ICAR Headquarter also attended the meeting. The meeting started with welcome by Dr Sushil Kumar, Principal Scientist and I/c PME. Chairman of the IRC stressed that IRC is one of the most important meeting of the institute in which the long and short term and service projects are discussed in detail so as to formulate and undertake need based research programmes to modify the existing technologies or to develop new technologies useful to farmers. Dr Vineet Bhasin emphasized that the project proposals submitted by the Scientist should be in the mandated line of the institute as recommended by RAC. A total of 27 projects were presented before IRC. In addition to this, 5 new projects were discussed. The IRC meeting concluded with remarks of the chairman who appreciated all Scientists for their sincere efforts.



XVIII Annual Review Meeting of AICRP on Cattle

The XVIII Annual Review Meet of AICRP on Cattle was held at ICAR-CIRC, Meerut from November 18-19, 2019. This meeting was chaired by Dr R. S. Gandhi, ADG (AP&B), ICAR, New Delhi. Dr N.V. Patil, Director of the Institute delivered welcome address and Col. D. S. Rathore, OIC, Military Farm, Meerut presented the current status of Frieswal animals. Dr Umesh Singh, Principal Scientist and Incharge, AICRP on Cattle presented the Action Taken Report on the recommendations of last review meet. The Principal Investigators/ Co-PIs of the projects and units presented the progress report of their units.

Institutional Bio safety Committee Meeting

The IBSC meeting was held in the committee room of Central Institute for Research on Cattle (CIRC) Meerut on 04.09.2019 at 11.0 AM. Three research projects were examined and discussed for any biosafety issue by the committee and approved accordingly. The medical surveillance report submitted by the scientists and technical officers involved in the laboratory work were evaluated by Biosafety officer and found satisfactory.

Institutional Animal Ethics Committee Meeting

The meeting of IAEC of ICAR-Central Institute for Research on Cattle, Meerut was held on 07-09-2019 in which, four new research proposals were discussed and approved by the committee. Chairman, informed the committee that all these projects were presented, discussed and approved by the competent authority in the annual Institute Research Committee meeting. The committee also inspected different animal houses and laboratories of the institute and found that all the facilities are satisfactory and in accordance with the guidelines of CPCSEA.



Institute Activities

| S.No. | Institute Activities/ Days Celebrated/ Sports etc. | Date |
|-------|---|----------------------------------|
| 1 | World Veterinary Day | April 27, 2019 |
| 2 | World Milk Day | June 01, 2019 |
| 3 | Workshop to develop entrepreneurship in the farming community | June 12, 2019 |
| 4 | International Yoga Day | June 21, 2019 |
| 5 | Second Meeting to form Farmer Producer Organizations | June 29, 2019 |
| 6 | Third Meeting to form Farmer Producer Organizations | July 12, 2019 |
| 7 | Independence Day | August 15, 2019 |
| 8 | Congress Grass Eradication Week | August 16 – 22, 2019 |
| 9 | Hindi Saptah | September 9 – 16, 2019 |
| 10 | Swachchhta Abhiyan | September 11 to October 02, 2019 |
| 11 | Mahatma Gandhi Birth Anniversary | September 27 to October 02, 2019 |
| 12 | Vigilance Awareness Week | October 28 November 02, 2019 |
| 13 | Institute Foundation Day | November 03, 2019 |
| 14 | National Conference on Livelihood Improvement through Sustainable Livestock | November 03- 04, 2019 |
| 15 | Constitution Day | November 26, 2019 |
| 16 | Swachchhta Pakhwada | December 16-31, 2019 |



Celebration of World Milk Day



Swachchhta Abhiyan

Independence Day celebration

15th August, 2019 was celebrated as Independence Day of the country. On this occasion, Dr N. V. Patil, Director (Acting) hoisted National flag, remembered all those who sacrificed their lives for this dream come true and paid tribute to them. He wished the staff and their families for a brighter future.

हिन्दी सप्ताह - 2019

संस्थान में हिन्दी सप्ताह-2019 का आयोजन दिनांक 09.09.2019 से 16.09.2019 तक किया गया जिसके कार्यक्रमों एवं पुरस्कार विजेताओं का विवरण निम्न है:-



| क.सं. | अधिकारी/कर्मचारी का नाम | पुरस्कार |
|---|--|--------------------|
| हिन्दी निबंध लेखन प्रतियोगिता (दिनांक 09.09.2019) | | |
| वैज्ञानिक एवं तकनीकी वर्ग | | |
| 1 | डॉ. संजीव कुमार वर्मा, प्रधान वैज्ञा. | प्रथम |
| 2 | डॉ. जे. के. सिंह, वरि.वैज्ञा. | द्वितीय |
| 3 | श्री ज्ञानेंद्र सेंगर, आर.ए. | तृतीय |
| 4 | श्री शुभम आर्य, एस.आर.एफ. | सान्त्वना पुरस्कार |
| 5 | श्री हरजीत सिंह, एस.आर.एफ. | सान्त्वना पुरस्कार |
| प्रशासनिक एवं तकनीकी वर्ग | | |
| 1 | श्रीमति नीरजा जोशी, कु. सहा. कर्मचारी | प्रथम |
| 2 | श्रीमति पुष्पा, वैयक्तिक सहायक | द्वितीय |
| 3 | श्रीमति अनीता जैन, निजी सचिव | तृतीय |
| 4 | श्रीमति सोनम सैनी, कनि.लिपिक | सान्त्वना पुरस्कार |
| 5 | कु. प्रेणीता सिरोही, वाई.पी.-1 | सान्त्वना पुरस्कार |
| हिन्दी श्रुतलेखन प्रतियोगिता (दिनांक 11.09.2019) | | |
| वैज्ञानिक एवं तकनीकी वर्ग | | |
| 1 | श्री ज्ञानेंद्र सेंगर, आर.ए. | प्रथम |
| 2 | डॉ. नेमी चन्द, प्रधान वैज्ञा. | द्वितीय |
| 3 | श्रीमति शर्मश आर्य, एस.आर.एफ. | तृतीय |
| 4 | श्री सौरभ यादव, एस.आर.एफ. | सान्त्वना पुरस्कार |
| 5 | डॉ. अमोद कुमार, वैज्ञा. | सान्त्वना पुरस्कार |
| प्रशासनिक एवं तकनीकी वर्ग | | |
| 1 | श्रीमति पूनम शर्मा, अनुबंधित कर्मचारी | प्रथम |
| 2 | कु. निशा रानी, अनुबंधित कर्मचारी | द्वितीय |
| 3 | श्री शरद कपिल, अनुबंधित कर्मचारी | तृतीय |
| 4 | कु. प्रेणीता सिरोही, वाई.पी.-1 | सान्त्वना पुरस्कार |
| 5 | श्रीमति अनीता जैन, निजी सचिव | सान्त्वना पुरस्कार |
| हिन्दी शब्दार्थ प्रतियोगिता (सभी वर्ग) (दिनांक 12.09.2019) | | |
| 1 | डॉ. जे. के. सिंह, वरि.वैज्ञा. | प्रथम |
| 2 | डॉ. अजयवीर सिंह सिरोही, प्रधान वैज्ञा. | द्वितीय |
| 3 | डॉ. नेमी चन्द, प्रधान वैज्ञा. | तृतीय |
| 4 | डॉ. संजीव कुमार वर्मा, प्रधान वैज्ञा. | सान्त्वना पुरस्कार |
| 5 | श्री एन. एस. सैनी, सहा.प्रशा.अधिकारी | सान्त्वना पुरस्कार |
| हिन्दी आशुभाषण प्रतियोगिता (सभी वर्ग) (दिनांक 13.09.2019) | | |
| 1 | डॉ. अजयवीर सिंह सिरोही, प्रधान वैज्ञा. | प्रथम |
| 2 | श्री शुभम आर्य, एस.आर.एफ. | द्वितीय |
| 3 | कु. प्रेणीता सिरोही, वाई.पी.-1 | तृतीय |



| | | |
|--|---|--------------------|
| 4 | डॉ. संजीव कुमार वर्मा, प्रधान वैज्ञा. | सान्त्वना पुरस्कार |
| 5 | डॉ. रविन्द्र कुमार, प्रधान वैज्ञा. | सान्त्वना पुरस्कार |
| हिन्दी प्रश्नमंच प्रतियोगिता (दिनांक 16.09.2019) | | |
| प्रथम विजेता- Team-C | | |
| 1 | डॉ. जे. के. सिंह, वरि.वैज्ञा. | प्रथम |
| 2 | श्री राजीव वर्मा, सहा.मुख्य.तक.अधि. | |
| 3 | श्रीमति पुष्पा, वैयक्तिक सहायक | |
| 4 | श्रीमति सर्मेश आर्य, एस.आर.एफ. | |
| 5 | श्री संदीप कुमार, एफ.ए. | |
| द्वितीय विजेता-Team-B | | |
| 1 | डॉ. नेमी चन्द, प्रधान वैज्ञा. | द्वितीय |
| 2 | श्री सुरेश चन्द, तक.अधि. | |
| 3 | श्रीमति सारिका, वाई.पी.-2 | |
| 4 | श्रीमति नीरजा जोशी, कुशल सहा.कर्मचारी | |
| 5 | कु. निशा रानी, अनुबंधित कर्मचारी | |
| तृतीय विजेता -Team-D | | |
| 1 | डॉ. राजेंद्र प्रसाद, प्रधान वैज्ञा. | तृतीय |
| 2 | श्री जितेन्द्र कुमार, सहा.मुख्य.तक.अधि. | |
| 3 | श्री आशीष कुमार, वाई.पी.-2 | |
| 4 | श्री शरद कपिल, अनुबंधित कर्मचारी | |
| 5 | श्री आशीष मलिक, एफ.ए. | |
| पूरे वर्ष प्रतिदिन हिन्दी में आज का शब्द लेखन हेतु सराहनीय योगदान हेतु विशेष प्रोत्साहन पुरस्कार | | |
| 1 | श्री वीरपाल सिंह | पुरस्कार |

संस्थान की राजभाषा कार्यान्वयन समिति की बैठकों का आयोजन

- माह जून, 2019 को समाप्त तिमाही की 71 वीं तिमाही बैठक दिनांक 03.08.2019 को।
- माह सितम्बर, 2019 को समाप्त तिमाही की 72 वीं तिमाही बैठक दिनांक 27.09.2019 को।
- माह दिसम्बर, 2019 को समाप्त तिमाही की 73 वीं तिमाही बैठक दिनांक 31.12.2019 को।

नगर राजभाषा कार्यान्वयन समिति, मेरठ की बैठकों का आयोजन एवं समीक्षा:-

- नगर राजभाषा कार्यान्वयन समिति, मेरठ के स्थानीय 80 सदस्य केन्द्रीय/उपक्रम/निगम/बैंक/बीमा कार्यालयों की दिनांक 01.10.2018 से 31.03.2019 तक की छमाही समीक्षा बैठक दिनांक 30.05.2019 को

आयोजित हुई जिसमें संस्थान की ओर से श्री हरीश राम, प्रशासनिक अधिकारी एवं श्री शंकर कश्यप, आशुलिपिक ने भाग लिया।

- नगर राजभाषा कार्यान्वयन समिति, मेरठ के स्थानीय 80 सदस्य केन्द्रीय/उपक्रम/निगम/बैंक/बीमा कार्यालयों की दिनांक 01.04.2019 से 30.09.2019 तक की छमाही समीक्षा बैठक दिनांक 23.10.2019 को आयोजित हुई जिसमें संस्थान की ओर से श्री हरीश राम, प्रशासनिक अधिकारी एवं श्री शंकर कश्यप, आशुलिपिक ने भाग लिया।

Organization of National Conference commemorating institutes' foundation day

On the occasion of foundation day celebrations on 3rd November, the ICAR-Central Institute for Research on Cattle, Meerut organized the National Conference on "Livelihood Improvement through

Sustainable Livestock Production” during November 03-04, 2019. The conference was organized in collaboration with the Pashu Poshan Kalyan Samittee (PPKS), Bareilly. Dr. N.V. Patil, Director ICAR-CIRC and Organizing Secretary of the Conference narrated the importance of the conference and the significant achievements made by the Institute. The Chief Guest, Dr. Trilochan Mohapatra, Secretary (DARE) and Director General (ICAR) inaugurated the function in which more than 300 participants including progressive farmers, NGOs along with their elite indigenous cattle from the various parts of the country participated in the conference. He appreciated the cattle germplasm maintained in pure form and emphasized that there a need to multiply superior gemplasm so that more and more farmers may be benefitted. The progressive farmers were honoured for their zeal towards livestock rearing especially indigenous cattle.



He urged to make the livestock an integral part of diversified farming involving horticulture and crop farming for doubling the farmer's income. He stressed on the joint efforts by the State Agricultural Universities, ICAR-Krishi Vigyan Kendras and State Departments for realizing the vision. He also applauded the scientists' initiative to develop the National Crossbred Milch Cattle "Frieswal" having production level of about 3,400 Kg and the progress of Gir, Sahiwal and Kankrej cattle under the Indigenous Breeds Project.

Dr. Joykrushna Jena, Deputy Director General (Animal Sciences), ICAR along with the Guests of Honor Dr. H. Rahman, Regional Representative, International Livestock Research Institute, South Asia; Dr. R.K. Mittal, Vice-Chancellor, Sardar Vallabhbhai Patel University of Agriculture & Technology, Meerut; Dr. M.L. Madan, Former Deputy Director General, ICAR; Dr. Ashok Kumar, ADG (AH), ICAR along with other dignitaries were also present on the occasion.

Two kits - ICAR-CIRC - CATTLE BLAD Diagnostic Assay Kit for detection of carrier bulls

of Bovine Leukocyte Adhesion Deficiency (BLAD), a genetic disease and ICAR-CIRC - COWCAM Assay Kit to detect the adulteration of cow milk even at 1% level with camel milk or vice-versa were also released during the occasion.

Swachhhta Abhiyan

Swachhhta Hi Sewa activities with main theme on awareness against hazards of single use plastics to save the environment were organized from 11th September to 2nd October 2019. During this programme, slogans were displayed within the premises of the institute and presentations were made on nature and hazards of plastics, deformities caused by plastics in human and animals and their effect on cellular and molecular level; and disposal of plastics especially through biodegradation methods and frontier research being conducted in this area. The other activities involved an essay competition on "Role of animal rearing on agriculture" for students of SVPUAT, Meerut, a drawing competition on "Cattle rearing and human life" for students of Central School, Dogra Lines, Meerut and a presentation on "Gandhian Philosophy and Agriculture" by Dr. Ritesh Sharma, Principal Scientist, Basmati Export Development Foundation, Meerut.

Swachhhta Pakhwada was organized during December 16-31, 2019. A series of lectures on "water and crop residue management", "basic maintenance and weeding of official records" and "protection from zoonotic diseases" and plantations were organized during the programme. The interactions with students and teachers along with drawing competitions for students were also organized at Rastriya Kisan Uchchar Madhyamik Vidyalay, Dourala and Chheda Lal Memorial Inter College, Jani.

Different programmes were conducted to aware farmers of Bahadurpur, Dabathua and Bhalsona villages of district Meerut about waste management, preparation of vermi-compost, clean milk production organic farming and problems faced in animal farming and their amelioration in proper manner. Similarly, an awareness program on water availability, water conservation and cleanliness was organized at village Batjewra. Kisan Samman Diwas was celebrated on 23rd December, 2019. Scientists-Farmers interaction was organized in the institute for discussion on the problems and solutions related with animal husbandry. The progressive farmers from adjoining villages participated in this meet.

Staff Details

List of officers / employees of the institute as on 31.12.2019

| S. No. | Name of officer / employee | Designation |
|--|----------------------------|---|
| Scientific personnel | | |
| | Dr Nitin Vasant Patil | Principal Scientist & Director (Acting) |
| Cattle Genetics and Breeding Division | | |
| 1. | Dr Umesh Singh | Principal Scientist & Head |
| 2. | Dr Sushil Kumar | Principal Scientist |
| 3. | Dr Achintya Kumar Das | Principal Scientist |
| 4. | Dr Ravinder Kumar | Principal Scientist |
| 5. | Dr T.V. Raja | Principal Scientist |
| 6. | Dr Rajib Deb | Scientist (SS) (Up to 13.12.2019) |
| 7. | Dr (Mrs) Rani Alex | Scientist (Up to 25.11.2019) |
| 8. | Dr Satish Kumar Rathee | Scientist (Up to 21.12.2019) |
| 9. | Dr Amod Kumar | Scientist (Up to 28.11.2019) |
| Cattle Nutrition and Management Division | | |
| 1. | Dr Rajendra Prasad | Principal Scientist & Head |
| 2. | Dr Vinod Kumar | Principal Scientist |
| 3. | Dr Pramod Singh | Principal Scientist |
| 4. | Dr Sanjeev Kumar Verma | Principal Scientist |
| 5. | Dr (Mrs) Indu Devi | Scientist (wef..) 02-12-2019 |
| Cattle Physiology and Reproduction Division | | |
| 1. | Dr Shrikant Tyagi | Principal Scientist & Head |
| 2. | Dr Suresh Kumar D. S. | Principal Scientist |
| 3. | Dr Ajayvir Singh Sirohi | Principal Scientist |
| 4. | Dr Naimi Chand | Principal Scientist |
| 5. | Dr Siddhartha Saha | Principal Scientist |
| 6. | Dr Jitendra Kumar Singh | Senior Scientist |
| 7. | Dr Yogesh Kumar Soni | Scientist |
| 8. | Dr (Mrs) Megha Pande | Scientist |
| 9. | Dr Sumit Mahajan | Scientist (wef..) 03-12-2019 |
| Extension Section | | |
| | Dr Naresh Prasad | Scientist (SS) |

| Technical Officers / Technicians | | |
|---|---------------------|--|
| 1. | Sh. C. P. Singh | Chief Technical Officer |
| 2. | Sh. Rajeev Verma | Assistant Chief Technical Officer |
| 3. | Sh. Jitender Kumar | Assistant Chief Technical Officer |
| 4. | Sh. Y. P. Malhotra | Technical Officer (upto 31-12-2019) |
| 5. | Sh. S. K. Sharma | Technical Officer |
| 6. | Sh. Suresh Chand | Technical Officer |
| 7. | Sh. Omkar Singh | Technical Officer |
| 8. | Sh. Chhotey Singh | Technical Officer |
| Administrative Personnel | | |
| 1. | Sh. Harish Ram | Administrative Officer |
| 2. | Sh. D. S. Verma | Finance & Accounts Officer |
| 3. | Sh. N. S. Saini | Assistant Administrative Officer |
| 4. | Sh. Rajnish Kumar | Junior Accounts Officer (up to 15.05.2019) |
| 5. | Smt. Anita Jain | Personal Secretary |
| 6. | Sh. O. P. Agarwal | Assistant |
| 7. | Sh. Manoj Nehra | Assistant |
| 8. | Smt. Pushpa | Personal Assistant |
| 9. | Sh. Shanker Kashyap | Steno (Hindi) |
| 10. | Sh. Vikas Kumar | Upper Divisional Clerk |
| 11. | Smt. Sonam Saini | Lower Divisional Clerk |
| Skilled Supporting Staff | | |
| 1. | Sh. Veer Mahendra | Skilled Supporting Staff |
| 2. | Sh. Kailash | Skilled Supporting Staff |
| 3. | Sh. Dungar Singh | Skilled Supporting Staff |
| 4. | Sh. Jitender Giri | Skilled Supporting Staff |
| 5. | Sh. Mohan Chand | Skilled Supporting Staff |
| 6. | Sh. Umesh Kaushik | Skilled Supporting Staff |
| 7. | Sh. Veer Pal Singh | Skilled Supporting Staff |
| 8. | Sh. Sunil Kumar | Skilled Supporting Staff |
| 9. | Smt. Neerja Joshi | Skilled Supporting Staff |

Personal Milestones

PROMOTION

1. Dr Yogesh Kumar Soni, Scientist (AR&G) has been promoted to the post of Scientist (Senior Scale) w.e.f. 28-07-2018 under CAS.

NEW JOININGS

1. Dr Indu Devi, Scientist (LPM), ICAR-CSWRI, Avikanagar (Rajasthan) joined the same post on transfer at ICAR-CIRC, Meerut on 02-12-2019 (F/N).
2. Dr Sumit Mahajan, Scientist (Vety. Medicine), ICAR-IVRI, Izatnagar (Bareilly) joined the same post on transfer at ICAR-CIRC, Meerut on 03-12-2019 (F/N).

TRANSFERS

1. Sh. Rajnish Kumar, Junior Account Officer has been transferred on promotion to the post of Assistant Finance & Account Officer at ICAR-IARI, New Delhi on 15-05-2019 (A/N).
2. Dr Rani Alex, Scientist (Animal Genetics & Breeding) transferred on the same post to ICAR-NDRI, Karnal (Haryana) on Inter-Institutional Transfer Basis after having been relieved on 25.11.2019 (A/N) from ICAR-CIRC, Meerut.

3. Dr Amod Kumar, Scientist (Animal Genetics & Breeding) transferred on the same post to ICAR-NBAGR, Karnal (Haryana) on Inter-Institutional Transfer Basis after having been relieved on 28.11.2019 (A/N) from ICAR-CIRC, Meerut.
4. Dr Rajib Deb, Scientist (Animal Biotechnology) transferred on the same post to ICAR-NRC on Pig, Guwahati (Assam) on Inter-Institutional Transfer Basis after having been relieved on 13.12.2019 (A/N) from ICAR-CIRC, Meerut.
5. Dr Satish Kumar Rathee, Scientist (Animal Genetics & Breeding) transferred on the same post to ICAR-NDRI, Karnal (Haryana) on Inter-Institutional Transfer Basis after having been relieved on 21.12.2019 (A/N) from ICAR-CIRC, Meerut.

RETIREMENT

1. Sh. Yashpal Malhotra, ICAR-CIRC, Meerut Technical Officer, upon attaining the age of superannuation, retired from Council's service and relieved from ICAR-CIRC, Meerut in the afternoon of 31.12.2019.

Standing Institutional Committees

Works Committee:

- | | |
|--|------------------|
| 1. Dr A. S. Sirohi, Principal Scientist | Chairman |
| 2. Shri Rajiv Verma, ACTO | Member Secretary |
| 3. Shri Krishan Kumar, STO IIFSR, Modipuram, Meerut | Member |
| 4. Asstt. Fin. & Accounts Officer | Member |
| 5. I/C. Estate | Member |
| 6. Administrative Officer | Member |

Printing and Publication Committee:

- | | |
|---|------------------|
| 1. Incharge, PME | Chairman |
| 2. Dr Pramod Singh, Principal Scientist | Member |
| 3. Dr T. V. Raja, Principal Scientist | Member |
| 4. Dr Naimi Chand, Principal Scientist | Member Secretary |
| 5. Dr Amod Kumar, Scientist | Member |

PME Cell:

- | | |
|---|------------------|
| 1. Dr Sushil Kumar, Principal Scientist | Chairman |
| 2. Dr Pramod Singh, Principal Scientist | Member |
| 3. Dr T.V. Raja, Principal Scientist | Member |
| 4. Dr (Mrs.) Rani Alex, Scientist (SS) | Member |
| 5. Dr Y. K. Soni, Scientist | Member Secretary |

Tender Opening & Financial Evaluation Committee:

- | | |
|--|------------------|
| 1. Dr Rajendra Prasad, Principal Scientist | Chairman |
| 2. Dr Pramod Singh, Principal Scientist | Member |
| 3. Dr S. Saha, Principal Scientist | Member Secretary |
| 4. Administrative Officer | Member |
| 5. Asstt. Fin. & Accounts Officer | Member |

Local Purchase Committee:

- | | |
|-------------------------------------|------------------|
| 1. Dr. S. Saha, Principal Scientist | Chairman |
| 2. Dr Amod Kumar, Scientist | Member |
| 3. Administrative Officer | Member Secretary |
| 4. Indenting Officer | Member |
| 5. Asstt. Fin. & Accounts Officer | Member |

Tender Technical Evaluation Committee:

- | | |
|---|----------|
| 1. Dr Rajendra Prasad, Principal Scientist | Chairman |
| 2. Dr Suresh Kumar D. S., Principal Scientist | Member |



- | | |
|-----------------------------------|------------------|
| 3. Administrative Officer | Member |
| 4. Indenting Officer | Member |
| 5. Incharge Purchase | Member Secretary |
| 6. Asstt. Fin. & Accounts Officer | Member |

Repair, Maintenance & AMC Committee:

- | | |
|---|------------------|
| 1. Dr Pramod Singh, Principal Scientist | Chairman |
| 2. Dr S. K. Rathee, Scientist | Member |
| 3. Administrative Officer | Member |
| 4. Shri Rajiv Verma, ACTO | Member Secretary |
| 5. Asstt. Fin. & Accounts Officer | Member |
| 6. Indenting Officer | Member |
| 7. Incharge Purchase | Member |
| 8. I/C, Estate | Member |

Women Complaint Committee:

- | | |
|--|------------------|
| 1. Director, ICAR-CIRC | Chairman |
| 2. Dr (Mrs.) Rani Alex, Scientist (SS) | Member |
| 2. Dr (Mrs.) Megha Pande, Scientist | Member |
| 3. Administrative Officer | Member |
| 4. Shri Vijay Pandit, Chief Functionary, Green Care Society (NGO) | Member |
| 5. Smt. Anita Jain, Private Secretary | Member Secretary |

Library Advisory Committee:

- | | |
|--|------------------|
| 1. Director, ICAR-CIRC | Chairman |
| 2. Dr Shrikant Tyagi, Principal Scientist | Member |
| 3. Dr Umesh Singh, Principal Scientist | Member |
| 4. Dr Suresh Kumar D. S., Principal Scientist | Member |
| 5. Dr S. K. Verma, Principal Scientist | Member |
| 6. Dr S. Saha, Pr. Sci. & I/C. Library | Member |
| 7. Dr Naimi Chand, Principal Scientist | Member |
| 8. Dr (Mrs.) Megha Pande, Scientist | Member |
| 9. Administrative Officer | Member |
| 10. Asstt. Fin. & Accounts Officer | Member |
| 11. Sh. S. K. Sharma, Senior Technical Officer | Member Secretary |

Rajbhasha Committee:

- | | |
|---|--------------------------|
| 1. Director, ICAR-CIRC | Chairman |
| 2. Dr Vinod Kumar, Principal Scientist | Member |
| 3. Dr S. K. Verma, Principal Scientist | Member (upto 17-06-2019) |
| 4. Dr A. S. Sirohi, Principal Scientist | Member |
| 5. Dr Ravinder Kumar, Principal Scientist | Member |
| 6. Dr J. K. Singh, Senior Scientist | Member |
| 7. Dr Rajib Deb, Scientist (SS) | Member |
| 8. Administrative Officer | Member Secretary |

Institutional Animals Ethics Committee (IAEC):

- | | |
|--|------------------|
| 1. Dr Rajendra Prasad, Principal Scientist | Chairman |
| 2. Dr Sushil Kumar, Principal Scientist | Member |
| 3. Dr Naimi Chand, Principal Scientist | Member |
| 4. Dr (Mrs.) Megha Pande, Scientist | Member |
| 5. Dr Y.K. Soni, Scientist | Member Secretary |

Institute Deputation Committee:

- | | |
|---|------------------|
| 1. Director, ICAR-CIRC | Chairman |
| 2. Dr Umesh Singh, Principal Scientist | Member |
| 3. Dr Suresh Kumar D. S., Principal Scientist | Member |
| 4. Dr Pramod Singh, Principal Scientist | Member Secretary |

Institute Technology Management Unit (ITMU):

- | | |
|---|------------------|
| 1. Director, ICAR-CIRC | Chairman |
| 2. I/C, PME | Member |
| 3. Dr Rajib Deb, Scientist (SS) & I/C, ITMU | Member Secretary |

Data Cell:

- | | |
|--------------------------------------|------------------|
| 1. PI, Frieswal Project | Chairman |
| 2. PI, Indigenous Breeds Project | Member |
| 3. PI, Field Progeny Testing Project | Member |
| 4. HoD, CP&R Div. | Member |
| 5. I/C, ITMU | Member Secretary |

Institutional Bio-Safety Committee (IBSC)

- | | |
|---|--------------------------|
| 1. Dr Suresh Kumar D. S., Principal Scientist | Chairman |
| 2. Dr Pushpendra Kumar, Principal Scientist DBT Nominee, IVRI, Izatnagar | Member |
| 3. Dr Naimi Chand, Principal Scientist | Member Secretary |
| 4. Dr Saket Niranjana, Principal Scientist NBAGR, Karnal | Outside Expert/Member |
| 5. Dr. Monika Sharma, Asso. Prof. & Head, Deptt. of Pharmacology LLRM Medical College, Meerut | Biosafety Officer/Member |
| 6. Dr Sushil Kumar, Principal Scientist | Internal Expert/Member |
| 7. Dr Rajib Deb, Scientist (SS) | Internal Expert/Member |
| 8. Dr (Mrs.) Rani Alex, Scientist (SS) | Internal Expert/Member |

**Staff Welfare Committee:**

- | | |
|--|------------------|
| 1. Dr Umesh Singh, Principal Scientist & HoD, CG&B Div. | Chairman |
| 2. Dr A.S.Sirohi, Principal Scientist | Member |
| 3. Administrative Officer | Member |
| 4. Asstt. Fin. & Accts. Officer | Member |
| 5. Smt. Anita Jain, Pvt. Secy. | Member |
| 6. Secretary (Staff Side), IJSC | Member |
| 7. Sh. Dungar Singh, Skilled Supp.Staff | Member |
| 8. Asstt. Administrative Officer | Member Secretary |

Institute Technology Management Committee (ITMC):

- | | |
|---|------------------|
| 1. Director, ICAR-CIRC | Chairman |
| 2. Dr Shrikant Tyagi, PS/ HoD, CP&R Division | Member |
| 3. Dr Umesh Singh, PS/HoD, CG&B Division | Member |
| 4. Dr Rajan Sharma, PS Dairy Chem.Div., NDRI, Karnal | Member |
| 3. Dr Rajib Deb, Scientist (SS) & I/C, ITMU | Member Secretary |

Frozen Semen Stock Purchase/Sale Committee

- | | |
|--|------------------|
| 1. Dr Shrikant Tyagi, PS/ HoD, CP&R Division | Chairman |
| 2. Dr Umesh Singh, PS/HoD, CG&B Division | Member |
| 3. Dr Sushil Kumar, PS | Member |
| 4. Shri D.S. Verma, AF&AO | Member |
| 5. Shri Harish Ram, Admn. Officer | Member Secretary |

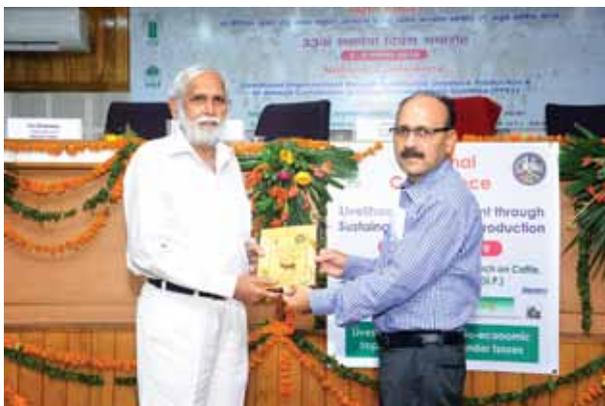
Nodal Officers

- Dr Umesh Singh, Principal Scientist,
 - ♦ Implementation of e-publishing of tender details on the Central Public Procurement Portal.
 - ♦ Vigilance Officer and Right to Information Act-2005.
 - ♦ Monitoring and providing the research and technical information of different activities related to Agriculture and Animal Husbandry conducted and organized by the ICAR, New Delhi.
- Dr Pramod Singh, Principal Scientist for HRD (Training).
- Dr Sanjeev Kumar Verma, Principal Scientist for SCSP/TSP Scheme-Govt.of India
- Dr Siddhartha Saha, Principal Scientist for IMS/FMS, INFLIBNET and CeRA.
- Dr J. K. Singh, Sr. Scientist for CPGRAMS.
- Dr Y. K. Soni, Scientist for sending weekly report to ICAR HQ.
- Sh. Harish Ram, Admn. Officer for PERMISNET-IRS-FMS, PMS Database, CPIO for Right to Information Act-2005.
- Sh. Suresh Chand, Technical Officer for Aadhaar Enabled Biometric Attendance System (AEBAS).

Glimpses of different programmes

NCLISLP-2019







Institutional programmes







हर कदम, हर डगर
किसानों का हमसफर
भारतीय कृषि अनुसंधान परिषद

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ICAR-Central Institute for Research on Cattle
Grass Farm Road, Meerut Cantt - 250 001 (U.P.), India