

वार्षिक प्रतिवेदन ANNUAL REPORT 2018-19



भारत-केन्द्रीय गोवंश अनुसंधान संस्थान

ग्रास फार्म रोड, पोस्ट बॉक्स सं.-17, मेरठ छावनी 250 001 (उ.प्र.), भारत

ICAR-CENTRAL INSTITUTE FOR RESEARCH ON CATTLE

Grass Farm Road, Post Box No. 17, Meerut Cantt.- 250 001 (U.P.), India

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Annual Report 2018-19

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PREFACE



It gives me immense pleasure and pride to present the Annual Report of ICAR-Central Institute for Research on Cattle (ICAR-CIRC), Meerut for the year 2018-19. Cattle being one among the important species of livestock in India and ICAR-CIRC being the nodal Institute for cattle research, the institute is striving hard to fulfill its mandate of improving the cattle productivity and production through basic and strategic research and development of need based innovative technologies, designs, processes, products, software, database etc., with their proper extension to the stakeholders and farmers.

For the genetic improvement of cattle population of the country, since its establishment, institute implemented All India Co-ordinated Research Programme (AICRP) on cattle under three major projects viz., 1) Frieswal project 2) Indigenous Breeds Project (IBP) and 3) Field Progeny Testing Project (FPT). Accordingly, the large population of crossbred owned by the Military Dairy Farms (MDFs) was used as a base and with dedicated efforts of the scientists in last 30 years, a national milch breed "Frieswal" a crossbred having 5/8 Holstein Friesian and 3/8 Sahiwal inheritance has been evolved to almost attain the milk production level up to 4113 kg in 300 days of lactation and meeting reproductive performance of AFC (32 months), service period (160 days), dry period (115 days) and calving interval of 442 days. However, the Cabinet Committee's decision to close down all the MDFs has seriously jolted the progress of the project, as a result all the Frieswal animals including the elite cows used as bull mothers for production of young male calves have been disposed off. The use of presently available 204 Frieswal bulls at BRU also need to be planned. The future improvement of large HF crossbred population produced so far seems to be gloomy.

Further, the Field Progeny Testing (FPT) programme to test the genetic merit of Frieswal bulls under four different agro-climatic zones of the

country involving farmer herds and NGOs which has indicated better progress in performance of daughters of the bulls used in different sets (6-15 nos.) with increase in standard lactation yield (SLY) by nearly 1140 kg from first to current set and reaching the first SLY of 3837 kg and reduction in AFC of up to 860 days. But in present situation, the closure of Military Farms will seriously affect the bull evaluation programme due to disposal of elite Frieswal cows.

Fortunately, the Indigenous Breeds Project aiming the genetic improvement of important indigenous cattle breeds of the country is also implemented by CIRC with good success in Gir, Kankrej and Sahiwal breeds at the farmer herds at their respective native tracts. Three sets of bulls have been inducted. With the suggestion of ICAR, the objective of ICAR-CIRC has been expanded to include more number of Indigenous cattle breeds by extending its collaboration with more SAUs/SVUs/ NGOs to utilize the animal farm facilities available with them. Further, the herds maintained by farmers and Gaushalas will also be included in the project for expanding the genetic improvement. Under this project, the genetic superiority of identified high yielding indigenous bulls is propagated extensively to the field animals through supply of semen doses of such superior bulls.

Although the country has 43 recognized indigenous cattle breeds, majority of the indigenous cattle are still to be characterized and recognized for exploiting their economic utility. Therefore, special efforts need to be taken up for their improvement. The upgrading of non-descript cattle has to be carried out exhaustively with the semen of bulls of recognized breeds of the respective regions. Efforts will also be taken for the application of Assisted Reproductive Technologies and other advanced biotechnological tools for the dissemination of superior female and male germplasm. The problem of non-availability of

breeding bulls for semen collection and artificial insemination (AI) in Indigenous animals will be taken care of and so more number of females will be covered under AI programme for improving the genetic potential for increased milk production.

During the reporting year (2018-19), ICAR-CIRC has excelled in many aspects of its functioning and this report highlights such salient research achievements, new technologies/ methodologies developed, extension activities performed, knowledge acquired and human resource development activities made etc. Some of the remarkable achievements are development of a web-server online data entry software SIREdAM for management of AICRP data, bicistronic expression vector P^{bhsp90IRES} by utilizing bovine heat shock protein 90 Internal Ribosomal entry site and "Coowler", an international collaborative mobile app for summer stress management in cattle. I hope this report will act as a useful reference

material to the scientists, professionals, teachers, farmers, students, other government and non-governmental agencies and policy makers who are actively involved in cattle production.

At this juncture, I would like to appreciate all the employees of ICAR-CIRC, Meerut including scientists, technical personnel, administrative, finance and other staff for their sincere efforts in fulfilling the mandate of the Institute. I also express my sincere gratitude and acknowledgement to the Secretary, DARE and Director General, ICAR, the Deputy Director General (Animal Science) and their team at the ICAR HQ for their valuable guidance and support. The Support given by Director, Frieswal Project and all the PIs of the co-operating centres of AICRP are thankfully acknowledged. Finally, I record my sincere acknowledgment and appreciation for the efforts made by core committee of the Institute which has actively involved in preparing this document.



(N.V. PATIL)
Director

ICAR-CIRC: AN INTRODUCTION

The Central Institute for Research on Cattle (CIRC) 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. Since then the Directorate was actively collaborating with the Military Farms, Ministry of Defence to evolve a national milch breed of crossbred cattle “Frieswal” by crossing the 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 and Kankrej. 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 during 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 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 taken 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

Basic and strategic research on productivity and production enhancement of cattle including indigenous cattle.

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, urine, dung, panchgavya 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 13 Military Farms 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.org.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

Print version of four foreign Journals namely Andrology, Journal of Dairy Science, Animal (An International Journal of Animal Bioscience) and Reproduction in Domestic Animals were subscribed during the year 2018-19. During this period, library procured 89 scientific books on different subjects making a total of 2293 on its roll. Three (03) Hindi and two (02) English newspapers along with (17) literary magazines and Hindi, English employment newspapers are also made available to the readers. Library facilities are also made available to sister organizations and students of Sardar Vallabh Bhai Patel University of Agriculture & Technology, Meerut, MIET, Meerut and participants of different trainings organized by ICAR-CIRC, Meerut. Library organized one book exhibition cum fair during the period.

Semen Distribution Centre

During the period, the centre has sold 41327, 831, 3571 and 9868 doses of Frieswal, Kankrej, Gir and Sahiwal, respectively to farmers and stakeholders from which a revenue of Rs 9,01,435 was generated.

EXECUTIVE SUMMARY

कार्यकारी सारांश

अखिल भारतीय समन्वित गोवंश परियोजना

संस्थान में अखिल भारतीय समन्वित गोवंश परियोजना (एआईसीआरपी ऑन कैटल) के अन्तर्गत अग्रलिखित तीन उप-परियोजनाओं पर कार्य निष्पादन किया गया— (1) गोवंश की 'फ्रीजवाल' संकर नस्ल का विकास (होलस्टीन-साहीवाल संकर का आनुवंशिकीय अध्ययन) अथवा फ्रीजवाल परियोजना, (2) संकर गोवंश का क्षेत्र संतति परीक्षण विधि द्वारा क्षेत्र में आनुवंशिक सुधार अथवा एफ.पी.टी. परियोजना, तथा (3) स्वदेशी गोवंशीय नस्लों का संतति परीक्षण विधि द्वारा क्षेत्र में आनुवंशिक सुधार अथवा आई.बी. परियोजना।

फ्रीजवाल परियोजना

फ्रीजवाल परियोजना के अन्तर्गत विभिन्न सैन्य फार्मों पर उपलब्ध फ्रीजवाल गायों के जननद्रव्य का रखरखाव व संरक्षण, उच्च श्रेणी (इलाइट) गायों की पहचान कर उनके बछड़ों का भविष्य में प्रजनन हेतु चयन कर सॉड पालन इकाई (बी.आर.यू.) मेरठ में पालन व विभिन्न स्थानों पर गोवंशीय विकास हेतु उनके हिमीकृत वीर्य का उत्पादन के उद्देश्य से किए गए।

इस अवधि में विभिन्न जलवायु में स्थित 13 सैन्य फार्मों पर 5182 व्यस्क, 2251 युवा तथा 766 बछड़ियों सहित कुल 8199 फ्रीजवाल गोवंश मौजूद थे। सर्वाधिक 660 मादाएं मेरठ स्थित फार्म पर उपलब्ध रहीं, इसके बाद 519 तथा 483 मादाएं क्रमशः जम्मू तथा देवलाली सैन्य फार्म पर उपलब्ध रहीं।

बी.आर.यू., मेरठ पर फ्रीजवाल नस्ल के 170 व्यस्क, 33 युवा व एक बछड़े सहित कुल 204 नर गोवंश तथा साहीवाल नस्ल के 7 व्यस्क तथा एक युवा सॉड/नर गोवंश मौजूद रहे। बी.आर.यू. पर वर्ष के दौरान कुल 73 बछड़े उपलब्ध करवाए गए जिसमें सर्वाधिक 18 बछड़े मेरठ सैन्य फार्म से प्राप्त हुए तत्पश्चात् अम्बाला तथा जम्मू स्थित प्रत्येक सैन्य फार्म से 12 बछड़े प्राप्त हुए।

वर्ष के दौरान फ्रीजवाल सॉड के वीर्य से 46628 मात्राएं तैयार की गईं तथा दिनांक 31.03.2019 को वीर्य की कुल 20,24,717 मात्राएं उपलब्ध थीं। सैन्य फार्मों को 40169, एफ.पी.टी. परियोजना को 15706 तथा अन्य एजेन्सी जैसे पैरावेट्स, राज्य पशुपालन विभाग, पशु

All India Coordinated Research Project on cattle

Under All India Coordinated Research Project on cattle three projects have been undertaken viz. 1. Studies on genetic aspects of Holstein-Sahiwal crossbreds-Frieswal project, 2. Genetic improvement of crossbred cattle under field conditions- Field Progeny Testing Project and 3. Genetic Improvement of Indigenous Cattle Breeds through Progeny Testing - Indigenous Breeds Project.

Frieswal Project

The major activities of Frieswal Project included maintenance of germplasm of Frieswal cows at Military dairy farms (MDFs), identification of best elite dams for selection of their male calves as young bulls for further breeding, their rearing at Bull rearing unit (BRU) at Meerut, collection and processing of semen from the selected bulls for improvement programme at MDFs and also at other locations like SAUs, State AH departments, NGOs or farmer's herds/animals.

During the year 2018-19, the total population of Frieswal females maintained at 13 Military Dairy Farms located in various agro-climatic regions of the country was 8199 including 5182 adult cows, 2251 young stock and 766 calves. Maximum number of Frieswal females were maintained at MF Meerut (660) followed by Jammu (519) and Deolali (483).

At Bull rearing unit, Meerut 204 Frieswal bulls (including 170 adult and 33 young stock and 1 calf) and 7 Sahiwal adult bulls and 1 Sahiwal young stock were maintained whereas of total 73 bull calves received, highest number of male calves were supplied by MF, Meerut (18) followed by Ambala (12) and Jammu (12).

During the year, 46628 doses of Frieswal bull semen were produced thus total stock of 20,24,717 doses was available as on 31.03.2019. The distribution of semen doses was done to Military farms (40169), FPT project (15706) and to other agencies (41327) like para vets, state Animal Husbandry Departments, Livestock Development Boards, State Agriculture Universities and a revenue of Rs. 6,16,035/- was generated.



विकास परिषद व कृषि विश्वविद्यालय आदि को वीर्य की 41327 मात्राएं उपलब्ध करवायी गयीं, इससे कुल रु 616035/- का राजस्व प्राप्त हुआ।

फ्रीजवाल गायों में फार्म व जन्म वर्ष के सार्थक प्रभाव के साथ प्रथम ब्यांत के समय औसत आयु (ए.एफ.सी.) 970.7 दिन पायी गयी। 300 दिन के मानक दुग्ध उत्पादन (एस.एल.वाई.) सम्पूर्ण दुग्ध उत्पादन (टी.एल.वाई.) तथा सर्वोच्च दुग्ध उत्पादन (पी.वाई.) औसतन (एन.-55462) क्रमशः 3335.82, 3346.17 तथा 15.21 किग्रा. पाये गये जबकि औसत दुग्धकाल 325.90 दिन पाया गया। इन सभी पहलुओं पर फार्म, ब्यांत संख्या, ब्यांत वर्ष एवं मौसम का सार्थक प्रभाव पाया गया।

संकर नस्ल के गोवंश का क्षेत्रीय स्थितियों में आनुवंशिक सुधार

संकर नस्ल के गोवंश का क्षेत्र परिस्थितियों में आनुवंशिक सुधार हेतु गुरु अंगद देव पशु चिकित्सा एवं पशु विज्ञान विश्वविद्यालय., लुधियाना, के.वी.ए.एस.यू., त्रिशूर, बैफ, पुणे तथा गोविन्द बल्लभ पन्त कृषि एवं प्रौद्योगिकी विश्वविद्यालय., पंतनगर स्थित केन्द्रों पर परियोजना का संचालन किया गया। इस परियोजना के तहत विभिन्न क्षेत्रों में फ्रीजवाल नस्ल के वीर्य के उपयोग से विद्यमान गोवंश के आनुवंशिक विकास हेतु कार्य किया गया, साथ ही इससे उत्पन्न बछड़ियों के प्रथम ब्यांत की उत्पादकता के अनुसार प्रयुक्त सांडों का मूल्यांकन भी किया गया।

परियोजना के आरम्भ से विभिन्न क्षेत्रों में 309 सांडों के 14 समूह, 292 सांडों के 15 समूह, 286 सांडों के 13 समूह तथा 98 सांडों के 6 समूहों का क्रमशः लुधियाना, त्रिशूर, पंतनगर तथा पुणे स्थित केन्द्रों पर उपयोग किया गया। इन केन्द्रों पर क्रमशः 1.48, 1.23, 1.21 एवं 0.29 लाख कृत्रिम गर्भाधान (ए.आई.) किये गये जिनसे कुल 19862, 9982, 15009 एवं 5384 बछड़ियाँ पैदा हुईं। उपरोक्त में से क्रमशः 6153, 2451, 5180 एवं 949 बछड़ियों ने प्रथम प्रसव की आयु प्राप्त की। वर्ष के दौरान लुधियाना, त्रिशूर, पंतनगर व पुणे स्थित केन्द्रों पर क्रमशः 5376, 5450, 6799 एवं 5074 ए.आई. की गयीं जिसकी गर्भाधान दर 47, 45.8, 42.5 एवं 56.9 प्रतिशत रही।

संततियों की प्रथम ब्यांत में 305 दिनों का दूध उत्पादन (किग्रा.) एवं प्रथम ब्यांत आयु (दिन) उपरोक्त केन्द्रों पर क्रमशः 3780 व 1042.5, 3066.3 व 1054.0, 3216 व 958.6 एवं 3235.3 व 1092 पाये गये। उक्त केन्द्रों पर ऑकड़ों की कुल हानि क्रमशः 24.2, 3094, 32.7 एवं 19.5 प्रतिशत रही और ऐसा मुख्यतः गायों की बिक्री के कारण पाया गया।

As regards performance of the herds, it was observed that overall mean age at first calving (AFC) was 970.65 days (31.92 months) with significant effects of farm and year of birth. The overall means for standard lactation yield (SLY) and total lactation yield (TLY) (n-33238), peak yield (PY) and lactation length (n-55462) were 3335.82 kg, 3346.17 kg, 15.21 kg and 325.90 days, respectively with significant effects of farm, parity, season and year of calving. The performance of MF Allahabad was best followed by Kanpur and Lucknow for SLY and TLY. The overall averages for service period (SP), dry period (DP) and calving interval (CI) were 159.95, 115.36 and 441.96 days, respectively which were also significantly influenced by farm, parity and season and year of calving and regression on AFC.

Field Progeny Testing Project

The Field Progeny Testing (FTP) Project is being operated at 4 main 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 main objective of the project is to undertake progeny testing of Frieswal bulls on a large scale for genetic improvement of cattle in the field. The activities at these centres were initiated with the supply of semen of Frieswal bulls under different sets and determine the genetic merit of bulls based on the production performance of daughter's born at the organized farm and /or at the farmers' field.

Since inception of the project, 309 bulls in 14 sets, 292 bulls in 15 sets, 286 bulls in 13 sets and 98 bulls in 6 sets were inducted at GADVASU, KVASU, BAIF and GBPUA&T units, respectively. At all these centres since inception, the number of inseminations performed (lakhs) were 1.48, 1.23, 1.21 and 0.29, the number of female progenies born were 19862, 9982, 15009 and 5384 and number of female progenies reached AFC were 6153, 2451, 5180 and 949, respectively. Whereas during the year, for all these centres the total numbers of Artificial inseminations (AI) done (n) and conception rates (%) observed were 5376 and 47.0, 5450 and 45.8, 6799 and 42.5 and 5074 and 56.9, respectively. The performance of daughters recorded for their first lactation as average Standard lactation yield (SLY) of 305 days (Kg) and its AFC (days) in all the centres was 3780.5 & 1042.5, 3066.28 & 1053.98, 3216.0 & 956.8 and 3235.3 & 1092.0, respectively. The overall loss of data at above centres was 24.2, 3.94, 32.7 and 19.5%, respectively, mainly because



उक्त केन्द्रों पर क्रमशः 4451, 1947, 3719 एवं 712 संततियों ने अपना प्रथम ब्यांत काल पूर्ण किया। उक्त केन्द्रों पर सॉडों के प्रथम समूह से लेकर वर्तमान समूह के उपयोग से संततियों के दुग्ध उत्पादन में सुधार क्रमशः 2697.8–3836.5 (42.4प्र), 1958.4–3109.8 (60.1प्र), 2930.3–3109.8 (6.12प्र), तथा 2494.8–3271.3 (31.1प्र) किग्रा. पाया गया। इसी प्रकार उक्त केन्द्रों पर संततियों की औसत प्रथम ब्यांत आयु (दिन) में क्रमशः 1192–855 (25.7प्र), 1136.4–987.1 (13.1प्र), 976.5–863.7 (11.5प्र) तथा 1149–1023 (10.9प्र) की कमी पायी गई।

स्वदेशी गोवंश की नस्लों का संतति परीक्षण द्वारा आनुवंशिक विकास-

विभिन्न जननद्रव्य इकाई (जी.पी.यू.) तथा अन्य सहयोगी गोसमूहों पर उपलब्ध उत्कृष्ट प्रदर्शन वाले स्वदेशी गोवंश के उपयोग से जी.पी.यू.- संतति परीक्षण विधि द्वारा गिर (जी.पी.यू.- कृषि वि.वि., जूनागढ़), कॉकरेज (जी. पी.यू.- स.कृ.न. दांतेवाड़ा कृषि वि.वि., एस.के.नगर) तथा साहीवाल (जी.पी.यू.- रा.डे.अनु. संस्थान, करनाल) नस्लों का जी.पी.यू.- में आनुवंशिक सुधार किया जा रहा है।

दिनांक 31.12.2018 को, जूनागढ़ में 144 मादा व 42 नर के साथ कुल 183 गिर नस्ल के गोवंश उपलब्ध थे। 171 मादा व 62 नर के साथ कुल 233 कॉकरेज गोवंश एस.के.नगर तथा 330 मादा व 69 नर साहीवाल गोवंश करनाल स्थित जी.पी.यू. पर उपलब्ध थे। विभिन्न जी.पी.यू. पर वर्ष के दौरान क्रमशः कुल 34, 65 एवं 129 बछड़ों का जन्म 50:50, 43:57 एवं 45:55 के नर-मादा के लैंगिक अनुपात के अनुसार पाया गया। उक्त इकाईयों पर प्रजनन योग्य 106 गिर मादा (दुधारू-47, बिनादूध की-33 तथा 2) वर्ष से अधिक उम्र की बछड़ियों-26), 118 कांकरेज (दुधारू-56, बिनादूध की-25, 2) वर्ष से अधिक उम्र की बछड़ियों-37) तथा 204 साहीवाल (3 वर्ष से अधिक उम्र) गोवंश उपलब्ध थे।

परियोजना के आरम्भ से गिर नस्ल के 28 सॉड कुल चार (6, 9, 9 एवं 4), कॉकरेज नस्ल के 26 सॉड तीन (8, 9 एवं 9) तथा साहीवाल नस्ल के 25 सॉड तीन (8, 7 एवं 10) समूहों में उपयोग किये गये। अबतक जूनागढ़, एस.के.नगर व करनाल स्थित जी.पी.यू. पर वीर्य की क्रमशः 219823, 71436 एवं 174172 मात्राएं तैयार की गयीं, जबकि वीर्य की क्रमशः 59115, 34500 एवं 85530 मात्राएं उपयोग की गयीं तथा वर्तमान में कुल 160708, 71436 एवं 88642 मात्राएं उपलब्ध पायी गयीं। गत वर्ष में कुल वीर्य की 19240, 6995 एवं 7860 मात्रा हिमीकृत की गयीं तथा 10125, 9679 एवं 4636 मात्राएं क्रमशः उक्त जी.पी.यू. पर प्रयोग की गयीं।

of sale of animals. In all these centres about 4451, 1947, 3719 and 712 daughters have completed their first lactation and overall progress in production performance in SLY (Kg) of their daughters from initial to the current set bulls was from 2697.80 to 3836.50 kg, 1958.40 to 3109.77 kg, 2930.30 to 3109.77 kg and 2494.80 to 3271.30 kg, showing an impressive SLY (Kg & %) improvement of 1138.70 & 42.20, 1178.15 & 60.10, 179.43 & 6.12 and 776.50 & 31.10. Similarly the improvement in reduction of AFC from 1st to current set of bulls (days) & (per cent) was 1192.00 to 885.00 & 25.70, 1136.40 to 987.08 & 13.10, 976.50 to 863.70 & 11.50 and 1149 to 1023 & 10.90, respectively in all the centres. Thus, the use of Frieswal bulls in different sets has shown improvement in the productive and reproductive performance of crossbred animals under field conditions.

Indigenous Breeds Project

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.

As on 31st December, 2018, the total herd strength of GP unit of Gir was 183 comprising of 141 females and 42 males, of Kankrej was 233 comprising of 171 females and 62 males and of Sahiwal was 399 including 330 females and 69 males. During the year, addition at respective units due to calf birth (n) and its male to female ratio was 34 (50:50), 65 (43:57) and 129 (45:55). The closing herd strength for breedable females was 106 consisting of 47 milch cows, 33 dry cows and 26 heifers of more than 2 ½ years of age in Gir, 118 including of 56 milch, 25 dry and 37 heifers of more than 2 ½ years of age in Kankrej and 204 breedable females above three years of age in Sahiwal unit.

Since inception of the project, 28 Gir bulls in first four sets (6, 9, 9 and 4), 26 Kankrej bulls in first three sets (8, 9, 9) and 25 Sahiwal bulls in first three sets (8, 7 and 10) were inducted. Total numbers of semen doses produced during project period were 219823, 71436 and 174172 for respective centres of JAU, SDAU and NDRI. The number of doses utilized till date and balance available were 59115 and 160708 for Gir, 34500 and 71436 for Kankrej



परियोजना के आरम्भ से अब तक 26764 (गिर), 1584 (कॉकरेज) और 5972 (साहीवाल) कृत्रिम गर्भाधान किए गए। इनकी गर्भधारण संख्या व गर्भधारण दर क्रमशः गिर में 112853 व 48.0%, कॉकरेज में 7533 व 47.6% एवं साहीवाल में 2265 व 37.9% पायी गयी। इस अवधि में 449, 423 एवं 144 बछड़ियों क्रमशः गिर, कॉकरेज एवं साहीवाल नस्लों की पैदा हुई।

गोवंश के आनुवंशिकीय पहलुओं पर अध्ययन

बोवाइन हीट शॉक प्रोटीन-90 (एच.एस.पी.-90) के आन्तरिक राइबोसोमल प्रवेश स्थान के प्रयोग से, एक अनुपम बाई सिस्ट्रेनिक प्रदर्शन वेक्टर पी.एल.एस.पी.-90 आर.ई.एस. का विकास किया गया। इसका भारतीय पेटेंट (राजस्व अधिकार) पाने के लिए आवेदन किया गया (द पेटेंट्स जर्नल सं. 02/2019 दिनांक 11.01.2019 पृष्ठ संख्या 1129)।

कॉकरेज नस्ल की गाय में (एन.-100) किस्पेप्टीन जीन का पी.सी.आर.-एस.एस.सी.पी. विधि से अभिव्यक्त कराया। इस जीन के एक्सान-1 में अभिव्यक्त तीन समूह सी.सी.-39%, सी.टी. 66% व टी.टी.15%, तथा एक्सान-2 में केवल दो समूह सी.टी.-66% तथा सी.सी.-34% ही पाये गये।

हीट शॉक प्रोटीन-70 (एच.एस.पी.-70) की ऑशिक श्रंखला का वृहदीकरण उपरान्त पी.टी.जेड-57/आर. में प्रतिरूपित करके श्रंखलाकरण किया गया। इसके बाद शेष अमीनो एसिड श्रंखला के प्रयोग से प्रोटीन का ढाँचा विकसित किया गया।

साहीवाल (बॉस इन्डिकस) गायों में विभिन्न वातावरणीय तापमान पर एम.आई.-आर.एन.ए. के एक विभेदी प्रदर्शित समूह की पहचान की गयी। उक्त समूह का भारतीय नस्ल की गायों में तापमान नियन्त्रण प्रणाली पर महत्वपूर्ण संबंध हो सकता है।

उच्च एवं निम्न श्रेणी के वीर्य के शुक्राणुओं को आर. एन.ए. की गहन श्रंखलाकरण विधि से कुल 1546561 तथा 1019308 संख्या से श्रंखलाकरण किया गया। इनमें से अधिकतर ट्रान्सक्रिप्ट्स का शुक्राणुओं के क्रिया-कार्य, भ्रूणीय विकास व निषेचन से संबंध था।

अखिल भारतीय समन्वित गोवंश परियोजना में विभिन्न प्रकार के ऑकड़ों के त्वरित आवागमन हेतु 'सायर डैम' वैबपोर्टल साफ्टवेयर विकसित किया गया।

वीर्य उत्पादन

उन्चास सॉडों के 50% से अधिक विगलन पश्चात गतिशीलता (पी.टी.एम.) वाले 235 नमूनों से वीर्य की कुल 46628 मात्राएं तैयार की गयीं। इस अवधि में

and 85530 and 88642 for Sahiwal breed. Whereas during the year, the number of semen doses frozen and utilized were 19240 & 10125, 6995 & 9679 and 7680 & 4636 for Gir, Kankrej and Sahiwal, respectively.

Since inception of the project, total number of inseminations carried out, number of pregnancies confirmed and conception rates obtained were 26764, 12853 and 48.02% for Gir, 15840, 7533 and 47.55% for Kankrej and 5972, 2265 and 37.93% in Sahiwal herds. Whereas during the year the total number of inseminations carried out, pregnancies confirmed, conception rate (%) and number of daughters born were 2145, 1023, 47.69% and 449 for Gir, 2466, 1110, 45.01 and 423 for Kankrej and 836, 341, 40.78% and 141 in Sahiwal herd.

Studies on Genetic aspects of cattle

Development of a novel **bicistronic expression vector P^{bhsp90IRES}** by utilizing bovine heat shock protein 90 Internal Ribosomal entry site (IRES) for which an Indian Patent has been filed and published.

Genotyping of Kankrej and Gir breeds of cattle for the Kisspeptin gene by PCR-SSCP methodologies revealed three genotypes at Exon-1 as AA-39%, AB-46% and BB- 15% and two genotypes at Exon-2 as AB- 66% and BB - 34% with the absence of AA genotype.

Amplification of a partial sequence of heat shock protein 70 (Hsp70) followed by its cloning in pTZ57/R and sequencing was done. Further, the deduced amino acid sequences were subjected for obtaining protein structures.

Identified a set of differentially expressed miRNAs at different environmental temperatures in Sahiwal (*Bos indicus*) cattle which may be important in thermo-regulatory mechanisms of indigenous cattle.

Identified 1546561 and 1019308 numbers of transcripts among good and poor quality bull spermatozoa based on their conception rate by RNA deep sequencing. Most of the identified transcripts were related to spermatozoa functions, embryonic development and other functional aspects of fertilization.

Developed a web portal named **SIRedAM** for collection of real time primary data from various AICRP units. The portal has in-built analysis and visualization tools with high computing and data processing facility.



फ्रीजवाल नस्ल के 127 सॉडों से वीर्य स्खलन के कुल 3452 नमूनों का ऑकलन किया गया जिसमें औसत आयतन-4.69 मि.ली., शुक्राणु सान्द्रता-897.5 मिलियन/मि.ली., आरंभिक गतिशीलता 57% तथा विगलन पश्चात गतिशीलता-33.5% पायी गयी।

साहीवाल नस्ल के चार सॉडों से प्राप्त 264 वीर्य स्खलन के नमूनों का औसत आयतन-3.76 मिली, शुक्राणु सॉन्द्रता-953.8 मिलियन/मिली, आरंभिक गतिशीलता-59.1% तथा विगलन पश्चात गतिशीलता-40.57 % पायी गयी। इस अवधि में साहीवाल नस्ल के तीन सॉडों से वीर्य की 10073 मात्राएं तैयार की गयीं।

शुक्राणुओं की आरंभिक गतिशीलता पर सॉडों की आयु का कोई विशेष प्रभाव नहीं पाया गया, पर मध्यम आयु वर्ग (37-48 महीने) के सॉडों से उत्पन्न वीर्य का आयतन युवा (15-36 महीने) व अधिक आयु (>48 महीने) से सार्थक रूप से अधिक पाया गया। अधिक आयु के सॉडों के वीर्य में विगलन पश्चात् शुक्राणु गतिशीलता सार्थक रूप से कम हुई परन्तु शुक्राणु सॉन्द्रता बढ़ी हुई पायी गई।

फ्रीजवाल सॉडों के रक्त के सभी नमूने (187) ब्रूसेलोसिस से मुक्त पाये गये जबकि कुछ नमूने (29) बोवाइन राइनोट्रेकाइटिस (आई.बी.आर.) ग्रसित पाये गये। शिशु गुहा के प्रक्षालन के सभी नमूने (150) ट्राइकोमोनिएसिस तथा विब्रियोसिस से मुक्त पाये गये। हिमीकृत वीर्य के 171 नमूनों में सिर्फ तीन नमूने आई.बी.आर. से ग्रसित पाये गये।

हिमीकृत वीर्य के नमूनों (79) की विगलन पश्चात गतिशीलता 37°C से. पर 0, 30 एवं 60 मिनट उपरान्त 50.6, 43.6 एवं 35 % पायी गयी। शुक्राणुओं की प्लाज्मा झिल्ली व एक्रोसोम की अखण्डता क्रमशः 49.9 व 72.5% पायी गयी। औसत शुक्राणु सॉन्द्रता प्रति स्ट्रॉ (0.25 मि.ली.) 21.3 मिलियन पायी गयी।

हिमीकृत वीर्य के 79 नमूनों में औसत कुल जीवाणु भार 404.4 सी.एफ.यू. प्रति मि.ली. पाया गया। सभी नमूनों का जीवाणु भार 5000 सी.एफ.यू. प्रति मि.ली. से कम पाया गया तथा 22 नमूनों में जीवाणुओं की वृद्धि नहीं पायी गयी।

शुक्राणुओं की क्रियाशीलता व बनावट के अनुसार नये सॉडों (47) का वीर्य संतोषजनक पाया गया। औसत जीवित शुक्राणु 72.5% पाए गए जबकि सिर, मध्य भाग व पूँछ संबंधित विकृतियाँ क्रमशः 7.5, 5.3 व 3.7 % पायी गयी।

Total 235 semen samples with more than 50% post-thaw motility were frozen to produce 46628 semen doses from 49 bulls. The semen quality evaluation of 3452 ejaculates collected from 127 Frieswal bulls had averages for semen volume (ml), sperm concentration (million/ml), initial motility (%) and post-thaw motility (%) as 4.69, 897.51, 57.01 and 33.46, respectively.

The semen quality parameters for 264 ejaculates collected from 4 Sahiwal bulls for mean semen volume (ml), sperm concentration (million/ml), initial motility (%) and post thaw motility (%) were 3.76, 953.83, 59.13 and 40.57, respectively. Total 10073 semen doses were frozen during the reported period from the semen ejaculates of 3 Sahiwal bulls.

Age had no significant effect on average initial sperm motility in the bulls but semen volume in middle age group bulls (37-48 months) was significantly higher than younger (15-36 months) and older bulls (>48 months). In older bulls although the post-thaw motility was reduced, spermatozoa concentration increased significantly.

All the Serum samples of 187 Frieswal bulls tested were found negative for Brucellosis but 29 samples were found sero-positive for Infectious Bovine Rhinotracheitis (IBR). The samples of preputial wash of 150 bulls tested for Trichomoniasis and Vibriosis were found negative. Of the 171 frozen semen samples tested for IBR, only 3 samples were found positive.

Evaluation of quality of frozen semen samples (n-79) indicated per cent progressive motility following thawing at 0, 30 and 60 minutes of incubation at 37°C as 50.64, 43.84 and 35.00, respectively. The plasma membrane integrity (%) and acrosome integrity (%) were 49.85 and 72.45, respectively. The average sperm concentration per 0.25 ml straw was 21.27 million.

Out of 79 frozen semen samples tested, the mean bacterial load per ml was 406.44 CFU and none of the samples had bacterial load of more than 5000 CFU/ml. Twenty-two out of 79 samples (27.84%) were negative for bacterial growth.

The neat semen of 47 newly introduced bulls was found satisfactory for viability and morphology and average per cent live sperms and per cent abnormalities of the head, mid piece and tail were 72.46, 7.45, 5.34 and 3.68, respectively.



प्रजननशील सॉडों में विटामिन-ई व सिलेनियम अनुपूरण से एम.डी.ए. में कमी तथा एस.ओ.डी. व केटालेज क्रियात्मकता में बढ़ोतरी होने से वीर्य गुणवत्ता पर लाभकारी प्रभाव देखे गए।

जल बजट

दुग्ध उत्पादन के लिए देशी गायों की अपेक्षा संकर नस्ल में जल की खपत अधिक पायी गयी। फर्श की धुलाई के लिए दोनों नस्लों के लिए जल समान मात्रा में खर्च हुआ जबकि संकर नस्ल की तुलना में देशी नस्ल की गायों को नहलाने में जल की खपत कम पायी गई।

गर्मी के मौसम में प्रभावी शीतलन हेतु पानी की फुहार, बौछार से किफायती पायी गयी। साथ ही फ्रीजवाल सॉडों के बाड़े में तापमान व नमी दोनों के नियन्त्रण में फुहार प्रणाली अधिक प्रभावी पायी गयी।

बढ़वार व वीर्य की गुणवत्ता सुधार हेतु पोषकीय बदलाव-

फ्रीजवाल नस्ल के उच्च तथा निम्न श्रेणी के सॉडों के आधारभूत आहार में उपस्थित सूक्ष्म खनिज तत्वों (तॉबा-12.5 पी.पी.एम., मैंगनीज़-55 पी.पी.एम. तथा जिंक-40 पी.पी.एम.) की अधिक मात्रा में मिश्रित अनुपूरण द्वारा शारीरिक भार वृद्धि अथवा विभिन्न पोषक तत्वों की उपयोगिता पर सार्थक प्रभाव नहीं पाया गया, जबकि अतिरिक्त मिश्रित अनुपूरण द्वारा शुक्राणु सान्द्रता 752.4 से बढ़कर 814.4 मिलियन प्रति मिली. हो गयी, साथ ही आरम्भिक गतिशीलता में सुधार व शुक्राणु विकृतियों में कमी आने से अनुपूरण के लाभदायक प्रभाव पाए गए।

मेरठ जनपद की सरधना तहसील में कई स्थानों पर धान की पुआल, चोकर, मैली (गुड़ उद्योग का उपोत्पाद, 20.6% ड्राईमैटर व 19.4 % क्रूड प्रोटीन) व जौ के कुट्टे (शराब उद्योग का उपोत्पाद, 25.7% ड्राईमैटर व 45.5% क्रूड प्रोटीन) पर आधारित पशुआहार पद्धति प्रचलित है। इससे प्रतीत होता है कि मैली व जौ कुट्टा का दुधारू पशुओं के आहार में वैकल्पिक आहारिय स्रोत की तरह लाभकारी उपयोग किया जा सकता है, हालाँकि ऐसे आहारिय स्रोतों को पशुआहार में सम्मिलित करने से पहले पशुओं में जैव-रासायनिक प्रभावों का उचित मूल्यांकन करना आवश्यक है।

Supplementation of vitamin E and selenium to breeding bulls lowered MDA and increased SOD and catalase activities. Supplementations also improved the semen volume, sperm concentration, initial sperm motility, hypo osmotic swelling test and percentage of live sperm than the un-supplemented bulls.

Water budgeting

Assessment of water footprint indicated that water footprint for milk production was larger in crossbred than indigenous cattle. Although same quantity of water was utilized for floor cleaning in both the genetic groups, for animal washing indigenous cattle required comparatively less quantity of water.

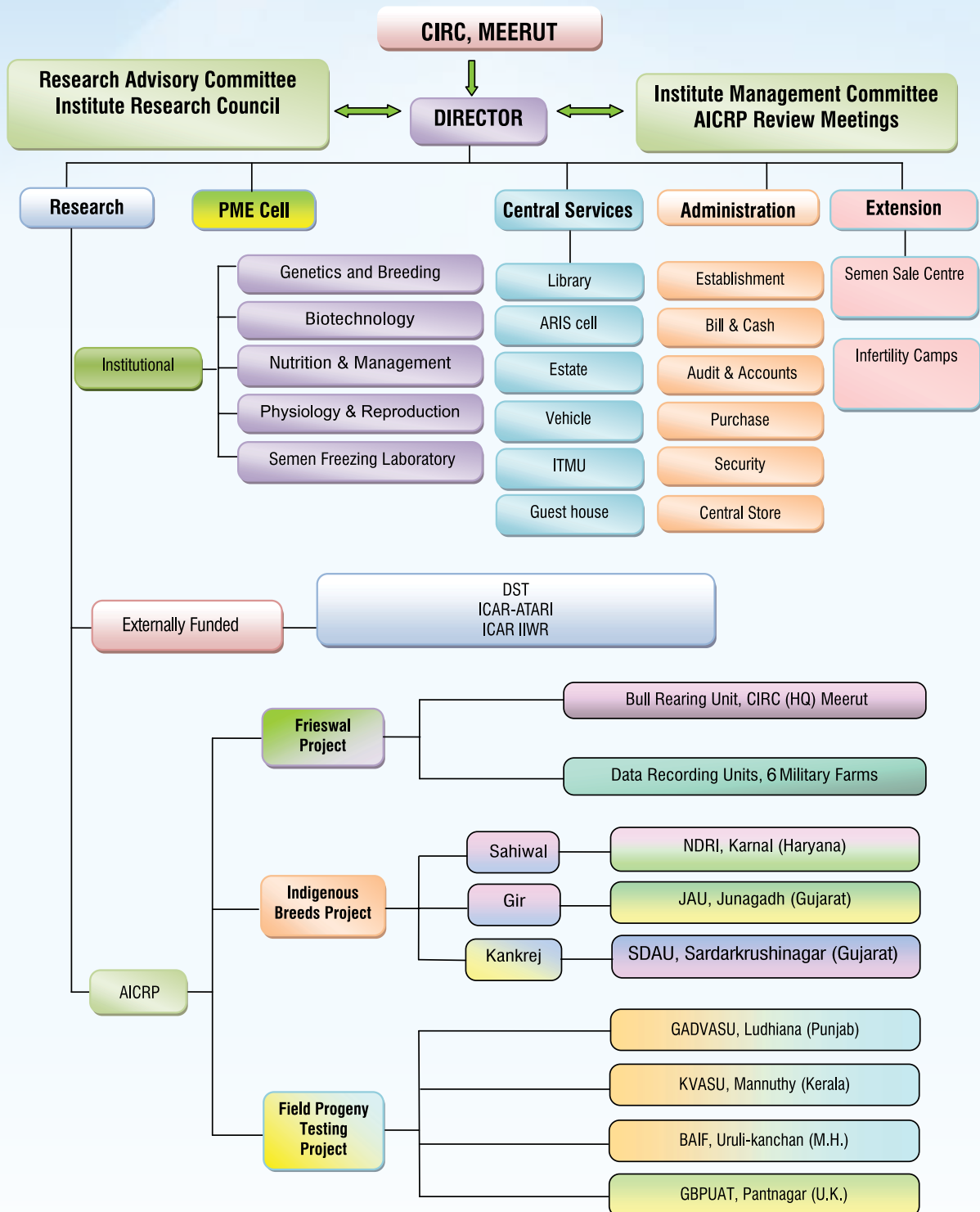
On use of water as effective cooling strategy during summer, it was found that foggers were economical than showers as regards required quantity (35.67 vs 243.83 L) and it was effective for temperature and humidity regulation in Frieswal breeding bull sheds.

Nutritional manipulations for enhanced growth & semen quality

The combined dietary supplementations of micro-minerals of more than the basal level diet having 12.5 ppm Cu, 55 ppm Mn and 40 ppm Zn were not found beneficial for growth or nutrient utilization and hence is not recommended for breeding bulls of poor and good quality. However increased level of dietary supplementation with combination of Cu, Mn & Zn in the bulls during six month feeding had significantly improved the overall sperm concentration (millions/ml) from 752.4 to 814.4 in supplemented group bulls and also improved percent motility and reduced the extent of total sperm abnormalities.

The feeding system in Sardhana tehsil of Meerut district based on paddy straw, wheat bran, *mailly* (a by-product from the jaggery production with 20.64% DM, 19.39% CP) and *kutta* (a brewery industry by-product with 25.7% DM, 45.5% CP) was found beneficial and could be alternate feed resource for feeding the lactating animals. However, the same be evaluated for biochemical change if any, in the animals fed on this resource.

ORGANOGRAM





STAFF POSITION

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	10	09	01
	Total	71	51	20

Budget Information & Revenue Receipt for 2018-19 for ICAR Schemes

ICAR-Central Institute for Research on Cattle, Meerut (Main Scheme)

Head	Budget (Rs.)	Expenditure (Rs.)
Grant in Aid-Capital	5316000	4331089
Grant in Aid-Salaries	94537000	94366247
Grant in Aid- General		
(i) Pension & Retirement Benefits	15500000	13891154
(ii) Other Contingency Expenditure	28487000	28446881
Grand Total	143840000	141035371
TSP - Equipment's(Capital)	758000	-
SCSP(Operation Expenses)	2487000	2487000
Swachh Bharat Mission Expenditure		2707000
Loans and Advances	300000	99900
Revenue Receipt		1369820

AICRP on Cattle Scheme

Head	Budget (Rs.)	Expenditure (Rs.)
Grant in Aid-Capital	2984000	2984000
Grant in Aid-Salaries	17103000	17103000
Grant in Aid- General	56012000	56012000
Grand Total	76099000	76099000
TSP (Capital)	284000	284000
SCSP (General)	4712000	4712000

ITMU Project (ICAR HQ)

Head	Budget (Rs.)	Expenditure (Rs.)
Grant in Aid-Capital	77625	77625.00
Grant in Aid- General(Operation Cost)	250000	127784
Grand Total	327625	205409


CRP on Water, IIWM, Bhuwaneshwar

Head	Budget (Rs.)	Expenditure (Rs.)
TA	67500	63958
Research Expenses	200000	196783
Operation Expenses	450000	436731
Other Miscellaneous	10000	9750
Grant- in-aid-General (SCSP)	98000	-
Total	825500	707222

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

Head	Budget (Rs.)	Expenditure (Rs.)
Grant in Aid-Capital	150000	134070
Grant in Aid- General		
TA	50000	49679
HRD	100000	99883
Research & Operational	2000000	1978735
Administrative Expenses	50000	24505
Grand Total	2350000	2286872

Budget Information for 2018-19 for Sponsored Projects/Schemes
Science & Engineering Research Board (SERB), Dept. of Sci. & Technology, Govt. of India, New Delhi

Head	Budget (Rs.)	Expenditure (Rs.)
Manpower	150237	150096
Consumables	56688	56446
TA	11046	3060
Contingency/Other cost	43441	25786
Total	261412	235388

Short Term Training Course on "Post genomic phenomic approach and methodologies for upgrading livestock production" by DBT, Ministry of Science & Technology, Govt of India, CGO Complex, New Delhi

Head	Budget (Rs.)	Expenditure (Rs.)
Grant in Aid- General	32497	32497



Project entitled “Dynamics of circulatory microRNA profile among motile and impaired bull spermatozoa : a novel approach to discover biomarkers” by Science & Engineering Research Board (SERB), Dept. of Sci. & Technology, Govt. of India, New Delhi

Head	Budget (Rs.)	Expenditure (Rs.)
Manpower Cost	645000	597672
Consumables	299759	267114
TA	65000	44890
Contingencies/Other costs	42498	36247
Overhead Expenses	100000	88879
Total	1152257	1034802

MANAGE, Hyderabad Training

Head	Budget	Expenditure
Operational Expenses	410000	361509
TA	8500	2600
Contingencies	15000	14980
Total	433500	379089

RESEARCH ACHIEVEMENTS

I. ALL INDIA COORDINATED RESEARCH PROJECT ON CATTLE

A. STUDIES ON GENETIC ASPECTS OF HOLSTEIN-SAHIWAL CROSSBREDS-FRIESWAL PROJECT

The Frieswal project envisages evolving a National Milch Breed “Frieswal”, a Holstein (5/8) - Sahiwal (3/8) cross, yielding 4000 kg of milk with 4% butter fat in a mature lactation of 300 days. The project is implemented by ICAR-Central Institute for Research on Cattle, Meerut, in collaboration with Ministry of Defence by utilizing the existing crossbred herds available at 13 Military Farms (MF) located in various agro-climatic regions of the country.

Herd Strength

The total population as on 31st March 2019 of Frieswal females at 13 Military Farms located in various agro-climatic regions of the country was 8199 including 5182 adult cows, 2251 young stocks and 766 calves. The number of Frieswal females was highest at MF Meerut (660) followed by Jammu (519) and Deolali (483). A total of 204 Frieswal bulls, seven Sahiwal adult and one young stock are being maintained at Bull Rearing Unit, Meerut. A total of 451 elite cows are being maintained at Military Farms for nominated mating with ranked Frieswal bulls for production of male calves to be reared as young bulls for testing. A total of 219 adult Frieswal cows have been selected for rearing as ICAR-CIRC herd.

Since inception, a total of 1619 male calves, born out by mating of elite cows with proven bulls and based on breed characteristics and physical conformity at 29 Military Farms in different years were received/available at BRU Meerut for future breeding. A total of 73 bull calves were received/ due to receive at Bull Rearing Unit during April 2018 to March 2019. MF Meerut supplied the highest number of male calves (18) followed by Ambala and Jammu (both 12 each) during this year. Since inception of the project, MF Ambala had supplied highest number of male calves to BRU (334) followed by Meerut (309) and Pimpri (184).

Multiplication and Dissemination of Frieswal Germplasm

During the reporting period, 46628 doses of Frieswal semen were produced. A total of 40169 semen doses were distributed to Military Farms and 15706 to Field Progeny Testing Project. This year 41327 doses have been sold to para vets, State Animal Husbandry Departments, Livestock Development Boards, State Agriculture Universities and a revenue of Rs. 616035/- was generated. The semen freezing laboratory has a total stock of 20,24,717 doses of Frieswal semen as on 31.03.2019.

Performance evaluation of Frieswal animals

A total of 55462 lactation records of Frieswal daughters of 180 bulls maintained in various agro-climatic regions over a period of 27 years from 1991 to 2017 were used for analysis. The data were classified according to farm, parity, season and year of birth/calving. The seasons were classified as winter (December to March), summer (April to June), rainy (July to September) and post monsoon (October and November). The data for production and reproduction traits were analyzed using GLM procedure of SAS (SAS Institute, Cary, NC) using farm, parity, season and year of calving as fixed effects and age at first calving as co-variable. Model used for analysis of age at first calving included farm, year and season of birth as fixed effects.

Milk Production performance

The overall means of 300 days milk yield and total milk yield based on 33238 and 55462 lactation records were 3335.82 and 3346.17 kg, respectively. This performance has been achieved despite almost no culling of poor producers as per policy of Military Farms. The peak yield of Frieswal herd averaged 15.21 kg. The effects of farm, parity,



season and year of calving and regression on AFC were significant on all the traits. Frieswal cows at MF Allahabad (4113.03 kg) produced the highest 300 days milk yield followed by Kanpur (3944.07 kg) and Lucknow (3732.01kg). Frieswal cows at Allahabad (4262.94 kg) had the highest total lactation milk yield followed by Kanpur (4077.09 kg) and Lucknow (3811.98 kg). The peak yield was highest at MF Allahabad (19.40 kg) followed by Kanpur (16.90 kg) and Agra (17.05 kg). PY ranged from 11.76 kg at MF Panagarh to 19.40 kg at Allahabad. The variation in production performance among farms might be due to varying managemental and feeding practices and location of farm in various agro-climatic zones. Season of calving also affected the production performance. The cows calved in winter season yielded the highest 300 days milk (3399.73 kg) followed by those calved in post monsoon (3382.97 kg), summer (3297.49 kg) and rainy (3263.08 kg) seasons. Same trend was observed in the case of total lactation milk yield as well as peak yield. The total lactation milk yield and peak yield for winter calvers was highest (3400.54 and 15.87 kg) followed by summer (3357.30 kg and 14.90), post monsoon (3356.62 and 15.47 kg) and rainy calvers (3270.21 and 14.59 kg). There was lot of fluctuation in total lactation milk yield during various years as it ranged from 2941.36 to 3513.22 kg. Higher PY (16.15 kg) was observed in those animals which calved in the year 2003.

The average lactation length of the Frieswal cows was 325.90 days. The effects of farm, parity and season and year of calving and regression of AFC were significant effect on lactation length. Lactation length was longest at MF Rajouri (352.42 days) followed by MF Panitola (346.90 days). All the Military farms had lactation length higher than 300 days. The cows calved during summer season had the longest lactation length (334.46 days).

Reproductive performance

The overall mean age at first calving was 970.65 days (31.92 months). The effects of farm and year of birth were significant on AFC. The animals at MF Dimapur (29.48 months/ 896.63 days) had shorter age at first calving followed by Namukum (30.03 months/913.19 days) and Agra (30.49 months/927.25 days). The longest AFC was

recorded at MF Tenga (37.21 months/1131.62 days) followed by Rajouri (33.53 months/ 1043.37 days). Large variation in AFC reflects the scope for its improvement through improving the general management practices including feeding pattern, timely heat detection and artificial insemination. Declining trend in AFC over the years was noticed which indicates a desirable improvement in this economically significant trait.

Service period (SP), dry period (DP) and calving interval (CI) were also evaluated and the averages were 159.95, 115.36 and 441.96 days, respectively. These traits were also significantly influenced by farm, parity and season and year of calving and regression of AFC. The shortest service period was observed at MF Dagshai (141.08 days) followed by Ferozpur (141.88 days) and Bengdubi (145.35 days). Longest service period was observed in MF Yol (217.39 days). Similar trend was observed for calving interval also, as expected. The shortest calving interval was observed in cows maintained at MF Binaguri (420.10 days) followed by Secunderabad (420.70 days) and Nowshera (422.77days). The longest CI of 500.66 days was noticed at MF Panitola. MF Mhow had the shortest dry period (92.61 days) followed by MF Nowshera (102.58 days) and Bengdubi (105.72 days). Longest DP was found in the cows at MF Meerut (135.05 days). In general, service period and calving interval had no definite trend over the lactations. Frieswal cows calved during post monsoon season had the shortest SP (141.97 days) followed by rainy (154.78 days), winter (165.82 days) and summer (177.14 days) season calvers. Seasonal variations in the other reproductive traits also showed similar pattern as post monsoon calvers had shortest DP and CI (108.55 and 423.79 days) and summer calvers with longest DP and CI (121.22 and 457.81 days). There was no definite trend in SP and CI over the years. Longest SP was found during 1998 (189.13 days) and shortest during 2016 (91.77 days). The cows calved during 1999 had longest (129.37 days) dry period and thereafter a declining trend in dry period was observed. It reflected that attempts are being made for improving the reproductive traits at Military Farms over the years. Increase in the service period is observed in recent years mainly due to reproductive problems of the cows.



B. GENETIC IMPROVEMENT OF CROSSBRED CATTLE UNDER FIELD CONDITIONS- FIELD PROGENY TESTING PROJECT

Evaluation of bulls through progeny testing followed by the extensive use of genetically superior proven bulls is the major way of achieving the genetic improvement in dairy animals. The Field Progeny Testing (FPT) Programme envisages testing of 30 Frieswal bulls having 62.5 per cent HF inheritance in each batch born to elite dam's with a minimum milk yield of 4500 kg. The period of bull usage of each batch is 15 -18 months. The bulls should be free from all genetic diseases and gross physical defects. Presently, programme is implemented in four different units namely Guru Angad Dev Veterinary and Animal Sciences University (GADVASU), Ludhiana, Kerala Veterinary and Animal Sciences University (KVASU), Mannuthy, G.B.Pant University of Agricultural Science and Technology (GBPUA&T), Pantnagar and Bharthiya Agro Industries Federation (BAIF), Urlikanchan, Pune. As per the technical programme, at least 300 cows per bull at each unit will be inseminated and hence, a population of about 9000 cows per unit will be needed for test mating of 30 bulls. Performance records of a minimum of 40 daughters from each

test bull will be collected for evaluation. Use of semen of 15th set of bulls has almost completed and induction of 16th set of bull is under process. So far, about 309 young HF crossbred bulls have been put under the test mating in different sets at four units. Daughters born from 11th set of bulls have completed their first lactation milk yield and evaluation is underway. A total 183 bulls have been evaluated on the basis of their daughters first lactation milk yield. 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 60.1 % in KVASU, 42.2 % in GADVASU, 6.1 % in BAIF and 31.1 % in GBPUA&T unit. Subsequently average age at first calving (AFC) of the Frieswal progenies has been reduced by, 13.1 % in KVASU, 25.7 % in GADVASU, 11.5 % in BAIF and 10.9 % in GBPUA &T unit. The details on the comparative performance of four different FPT units during the year 2018 are summarized in Table 1.

Table 1: Comparative performance of 4 different units of FPT project during the reporting period (1.1.2018 to 31.12.2018)

Particulars	GADVASU Ludhiana	KVASU Thrissur	BAIF Pune	GBPUA&T Pantnagar
Total Artificial inseminations	5376	5450	5799	5074
Pregnancies confirmed	2426	2409	2055	3069
Conception rate %	47.0	45.8	42.5	56.9
Total calving	1732	1255	1281	2579
Female calves born	888	615	596	1207
Female calves reached AFC	499	182	226	203
Female calves completed 1 st lactation	433	139	152	221
Average 305 days milk yield (kg)	3780.5	3066.2	3216.0	3235.3
Average AFC (days)	1042.5	1053.9	956.8	1092
Total loss of data (%)	24.2	4.03	32.7	19.5



Guru Angad Dev Veterinary & Animal Sciences University, Ludhiana

The Field Progeny Testing programme is covering a population of about 13345 cows and 5550 breedable heifers. The insemination work of the Field Progeny Testing project is undertaken through 31 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 period under report, frozen semen of 15th set of bulls was used for performing 5376 artificial inseminations. The first lactation 305 days milk production performance of 647 daughters of 10th set, 576 daughters of 11th set, 608 daughters of 12th set and 208 daughters of 13th set of test bulls ranged from 4121.7±351.5 to 3373.7±183.4, 4260.4±171.2 to 3110.6±215.6, 4473.2±347.5 to 3444.5±155.5, 4134.5±120.1 to 3493.6±118.8 kg, respectively. The average first lactation 305 days milk yield of the daughters of 10th, 11th, 12th and 13th set of bulls were 3714.7±22.9,

3751.8±22.9, 3771.7±22.7 and 3836.5±34.5 kg, respectively. The corresponding averages for age at first calving of the daughters were 1044.2±8.5, 1032.7±8.0, 1012.8±8.2 and 885.3±8.4 days, respectively. The average fat percentages of milk of the daughters of 11th, 12th and 13th set of bulls were 3.6±0.00, 3.7±0.00 and 3.4±0.02. A total of 10,337 farmers have so far been registered and benefited through this project in Ludhiana. A total of 309 bulls in fifteen different batches have so far been inducted in the program. A total 148283 Artificial Inseminations have so far been done and 19862 female calves born of which 6153 have reached age at first calving (Table 2).

In first set of bulls (1995), the average 305-days yield was 2697.8 kg and in 13th set of bulls it was 3836.5 kg indicating a sharp increase of 1138.7 kg milk (42.2 %) in the daughters. The AFC was 1192 days in progenies of first set of bulls (1995) which reduced to 885 days in current set showing a sharp decrease of 307 days (25.7 %) (Fig 1).

Table 2: Setwise information of GADVASU centre

Set No.	Date of start	Total bulls used	Total inseminations	Total A.I.'s 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	752
XIII	1.2.14	15	6662	6662	3039	45.6	6662	1321	542
XIV	1.8.15	30	8299	8299	3851	46.4	8299	1571	51
XV	1.6.17	26	8814	6551	3059	45.6	4352	887	
Total		309	148283	143189	63150	43.9	72059	19862	6153

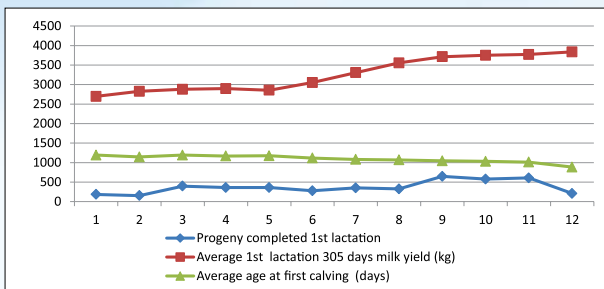


Figure 1: Setwise performance of progenies at GADVASU unit since inception

A total of 184, 154, 397, 361, 361, 278, 351, 326, 647, 576, 608, 208 and 03 daughters of 2nd to 14th set of test bulls completed their first lactation and their average first lactation 305 days milk productions 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, 3771.7±22.7, 3836.5±34.5 and 3737.5±183.7 kg, respectively. Two calf rallies and five village level group meetings were organized to make the dairy farmers aware about the importance of field progeny testing programme. Farmers were advised on scientific breeding, feeding, management and health care practices for improving the production performance of their animals. The FPT project has made significant contribution in changing the scenario of dairy farming in adopted villages in Ludhiana district by providing technical knowhow, superior 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 FPT project has increased average first lactation 305 days milk yields of the crossbred progenies in the adopted villages in 1993 it was 2449.7±57.0 kg which increased to 2965.5±35.3 in 2006, 3133.8±38.0 in 2011 and to 3780.5±23.2 kg in 2018. Some progressive dairy farmers after getting training and superior germplasm from the project have established outstanding crossbred herds having animals with first lactation milk yield of more than 6400 kg and peak yield of more than 40 kg.

Socio economic status of farmers under the Project

The production performance of animals according to different categories of farmers showed

that the farmers with own fodder production facility had higher milk yield of their crossbred cows than the cows maintained by farmers without fodder. Crossbred cows maintained by farmers having adequate fodder supply produced 3788.9±23.5 kg during first lactation against 3487.9±136.2 kg by the farmers having little or no green fodder supply. Commercial farmers had high milk yield (3786.5±23.2 kg) of their animals than the non-commercial farmers (3355.2±232.8 kg) with the availability of remunerative milk prices, the commercial farmers give more attention to feeding and management practices.

Highest milk production (4040.3±97.0 kg) was recorded by owners having college level education. Educated owners have more awareness and practiced dairying on scientific lines for getting higher productivity (Fig. 2).

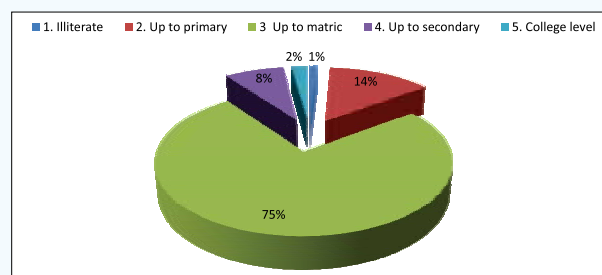


Figure 2: Education level of animal owners participating in the project

The farmers having herd size of more than ten animals had the maximum lactation milk yield of their cows (3969.2±78.7 kg). It was also observed that animals of the farmers having more than 10 acres of land produced maximum milk (3822.5±108.2 kg) (Fig. 3.) A total of 8.2% of the owners were having dairy as their whole time occupation and the milk production of cows reared by such farmers was 4112.1±86.9 kg, significantly higher than the owners with other occupations.

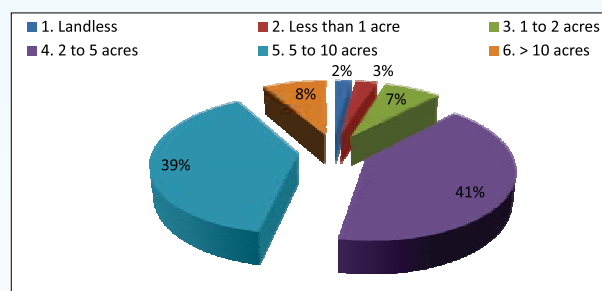


Figure 3: Land holding pattern of animal owners



The milk production of cows reared by the agricultural farmers (3766.8 ± 24.0 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)

More than 95% of cattle of the state are crossbreds as crossbreeding is the accepted breeding policy in Kerala 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 Frieswal bull semen to the farmers of the state. The progenies born under the project are normally producing 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 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 in Kerala. The first set of bull at KVASU was executed in January 1992. So far, 292 bulls in 15 different sets have been inducted in the program. A total of 122665 artificial Inseminations have so far been done in which 9982 female progenies born and a total of 2451 female progenies have reached age at first calving (Table 4).

During 2018, a total of 5450 artificial inseminations were carried out and the overall conception rate was 45.8%. The average first lactation 305 days milk yield of daughters completed their first lactation in the reporting period (2018) was 3066.28 ± 42.31 kg. The average age at first calving of daughters was 1053.98 ± 12.09 days during this reporting period. The per cent loss of data in the project was 2.80 for 12th set, 1.47 for 13th set, 9.70 for 14th set and 4.03 for 15th set of bulls till the end of report period. About 1947 daughters from first twelve batches of bulls have completed their first lactation.

There is a consistent trend of increase in first lactation 305 days milk yield of daughters in subsequent sets of bulls. In the first set of bulls (1992) it was 1958.4 kg and in current set of bulls

Table 4: Setwise information of KVASU centre

Set No.	Date of Start	Total bulls used	Total inseminations	Total AIs followed	Pregnancies confirmed	Conception rate (%)	Followed for calving	Female calves	
								Born	Reached AFC
I	01-01-1992	12	23351	6722	2420	36	1902	956	319
II	01-04-1994	11	12817	4800	1680	35	1300	603	240
III	01-09-1995	11	9331	3942	1324	33.6	1065	757	89
IV	01-11-1998	15	11750	3753	1501	39.9	1489	676	178
V	09-11-2001	19	3437	3261	1136	34.8	847	401	139
VI	24-06-2003	20	8173	7683	2582	33.6	1689	746	216
VII	16-03-2005	24	5759	5211	2281	43.7	1298	597	180
VIII	30-08-2006	22	5703	5514	2472	44.8	1538	768	160
IX	05-02-2008	16	3393	3131	1181	37.7	801	394	81
X	01-07-2009	24	5781	5612	2124	37.8	1324	664	162
XI	01-04-2011	21	4820	4401	2006	45.6	1280	659	235
XII	01-08-2012	28	6045	5531	2357	42.61	1302	642	255
XIII	01-03-2014	14	5211	4850	2063	41.97	1114	545	185
XIV	01-07-2015	29	9650	9211	4134	44.88	2446	1193	12
XV	02-08-2017	26	7444	5775	2644	45.78	768	381	0
TOTAL		292	122665	79397	31905	45.8	20163	9982	2451

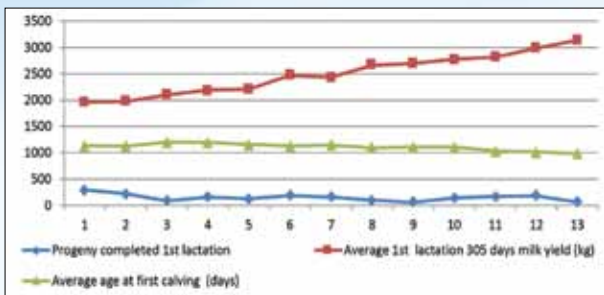


Figure 4: Setwise progeny performance at KVASU unit since inception

it was 3136.55 kg showing a sharp increase of 1178.15 kg milk (60.1%). A trend of decrease in AFC was also observed in subsequent sets of bulls as it was 1136.4 days in progenies of first set of bulls (1992) and 987.0 days in current set showing a sharp decrease of 149.4 days (13.1 %) (Fig 4).

Till the end of reporting period, calving of 14th set of bulls has completed, recording of first lactation milk yield of daughters of 11th set of bulls had completed and 12th set is under progress. Inseminations using semen of 15th set of bulls are under progress. The average conception rates of 14th and 15th sets of bulls were 47.40 and 45.8%, respectively. Average fat contents (%) of morning milk samples at 2nd, 5th and 8th month of lactation of progenies 3.39, 3.51, and 3.86, respectively.

Socio economic status of farmers under the Project

The occupational status of cattle owners of progenies born during the year were classified into five different groups as agriculture farmers, agriculture labourers, government job, private job and business. It was found that 86.38 % of cattle owners were agriculture farmers, 8.28% were agricultural labours and rest of other occupational groups were negligible. The average lactation yield of cows owned by the agriculture farmers was

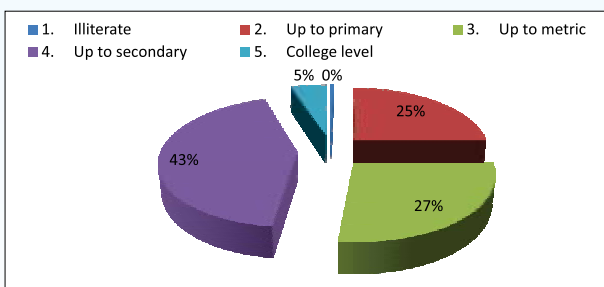


Figure 5: Education level of animal owners participating in the project

substantially higher than that of all other groups. The educational status of cattle owners revealed 48.10% as higher secondary or above, 26.90% matriculation, 24.66% primary school and less than one per cent as illiterate (Fig 5). The progeny performance was found to be correlated with educational status of farmers.

The land holding pattern of farmers with progenies of the project was studied and found that more than 44.6% of progeny owners had one acre or more land. The farmers with 10 cents or less than 10 cents of land are 6.5% and there were no farmers without land (Fig 6). The performance of progenies was better in farmers with 3 to 4 acres of land holding.

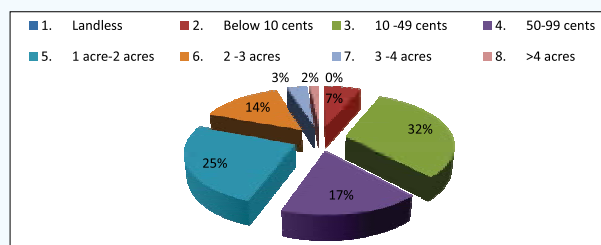


Figure 6: Land holding pattern of animal owners participating in the project

Number of cattle present in houses was taken as herd size and majority (56.21%) of the cattle owners had herd size of 3 or less while 25% of the owners had a herd size of 4 or 5 and 15.17% had 6-10 animals. The herd size of more than 10 was observed only in 3.62% owners of the progenies and the first lactation yield was highest in this group.

BAIF Development Research Foundation, Uruli-Kanchan, Pune

Data for 23 years (1995 to 2017) on daughters owned by 1364 farmers spread over 143 village in 27 cattle developing centres from Ahmednagar, Pune and Satara district of Western Maharashtra were collected. Out of 5180 crossbred progenies born to 286 sires of thirteen different batches, 3719 (71.7 %) completed their lactation performance. A total of 121175 artificial inseminations have so far been done of which 114234 AI followed and 51367 progenies confirmed, leading to a conception rate of 44.9%. A total 15009 female progenies born and 5180 female progenies have reached at the age of first calving (Table 5).



Table 5: Setwise information of BAIF centre

Set No	Bull Batch Starting date	Total bulls used	Total A.I. done	Total 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	477
XIII	Mar-14	15	7139	7139	3221	45.12%	2536	1163	95
XIV	Aug-15	30	14223	14189	6196	43.67%	4007	1783	0
XV	Jul-17	26	8896	7934	3373	42.51%	1055	487	0
Total		286	121175	114234	51367	44.97%	32699	15009	5180

A total of 3719 daughters from first ten sets of bulls have completed their first lactation records. During the year 2018 a total of 5799 artificial inseminations were carried out with the overall conception rate of 42.5%. Average first lactation 305 days milk yield of daughters completed their first lactation in the reporting period (2018) was 3216.0 kg and the average AFC of daughters was 956.8 days. The overall loss of data was 32.7 % till the end of this reporting period.

The first lactation 305 days milk yield of daughters showed consistently increasing trend as it was 2930.3 kg in the first set of bulls (1995) and in current set it was 3109.77 kg showing an increase of 179.43 kg (6.12%) milk. The AFC showed a decreasing trend from 976.5 days in

progenies of first set of bulls (1995) to 863.7 days in current set indicating a decrease of 112.8 days (11.5%) (Fig 7).

The 15th set of bulls were introduced in July 2017 and majority of the daughters are in calving stage. The milk recording of daughters of 11th set of bulls has completed and for 12th and 13th batches daughters are under progress.

Socio economic status of farmers under the Project

The socio-economic status of farmers under the project revealed that out of 1480 farmers, 40.41% had education upto primary level, 37.09% upto secondary, 8.51% higher secondary and 4.59% graduate and above. The proportion of illiterate cow owner was 9.39 per cent (Fig. 8).

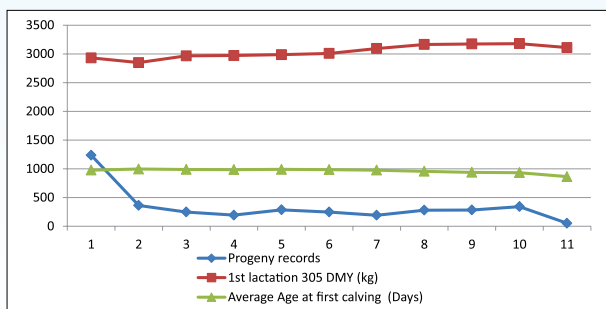


Figure 7: Setwise progeny performance at BAIF unit since inception

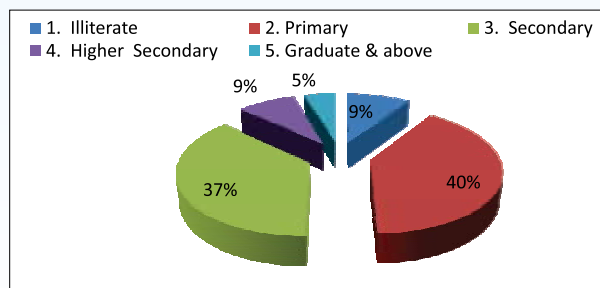


Figure 8: Education status of animal owners participating in the project



Among landholders, more than 2/3rd (69.53%) cattle owners were found 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 generally grown were sorghum, bajra, sugarcane, lucerne and maize. Animals were fed with ready-made feed 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 was not practiced and the animals were mostly stall-fed. About 90.95 per cent of cattle owners were agriculturists and almost all (95.74%) owned land. Nearly 60 per cent farmers had land upto 5 acres and the percentage of farmers having land more than 10 acres was 10.74 (Fig 9)

The animals were protected from infectious diseases like FMD, HS and BQ by preventive

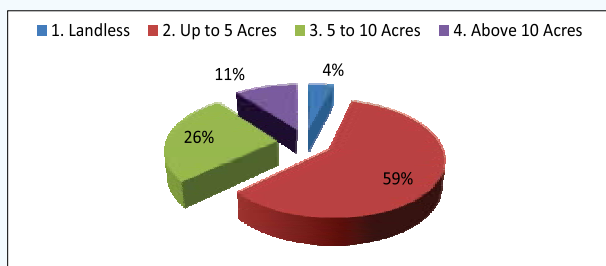


Figure 9: Land Holding pattern of animal owners participating in the project

vaccinations regularly. For external parasite control, ectoparasiticides were used. The use of internal parasiticides is found restricted to calf hood stage.

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

The project was sanctioned by ICAR on 18.06.2009 and it was implemented from 16.09.2009 at GBPUA&T, Pantnagar and presently running through 8 A. I. centres at U.S.Nagar and Nainital districts of Uttarakhand. A total of 44,193 frozen semen doses from 96 bulls (3,000 FSD from 10 bulls of Set-10; 2,906 FSD from 6 bulls of Set-11; 4,410 FSD from 9 bulls of Set-12; 7,350 FSD from 15 bulls of Set-13; 13538 FSD from 30 bulls of Set-14 and 12,989 FSD from 26 bulls of Set-15) were received for test insemination. A total 96 bulls has so far been introduced in 6 different sets and total 29,075 AI were carried out, 16002 pregnancies confirmed, 5384 female progenies born of which 949 has reached age at first calving (Table 6).

During 2018, a total of 5074 AI were carried out of which 5391 followed for pregnancy resulting 3069 confirmed pregnancies leading to a conception rate of 56.9%. A total of 1207 daughters (462 of Set-14 and 745 of Set-15) born

Table 6: Setwise information of 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	221
XIII	05.02.2014	15	5,205	5,205	2,944	2,433	1,058	218
XIV	22.07.2015	30	9787	9787	5414	4582	2126	13
XV	15.06.2017	26	7,523	6,570	3,663	1,622	745	-
Total		96	29,075	28,088	16,002	11,841	5,384	949



and 203 daughters (1 of Set-11, 22 of Set-12, 167 of Set-13 and 13 of Set- 14) reached AFC. The average first lactation 305 days milk yield of daughters completed their first lactation during the reporting period (2018) was 3235.3 kg and the average AFC was 1092.0 days. The overall loss of data was 19.5 % till the end of this reporting period. About 712 daughters from first four batches of bulls have completed their first lactation 305 days milk yield.

The first lactation 305 days milk showed an increasing trend as it was 2494.8 kg in daughters of first set of bulls (2010) which has increased to 3271.3 kg in the current set showing a sharp increase of 776.5 kg yield (31.1%). The AFC has showed a decreasing trend as it was 1149 days in progenies of first set of bulls (2010) which has reduced to 1023 days in current set indicating a decrease of 126 days (10.9 %) (Fig 10).

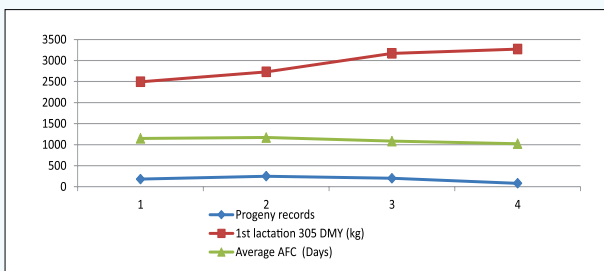


Figure 10: Setwise progeny performance at GBPUA &T, Pantnagar unit since inception

Socio economic status of farmers under the Project

Analysis of occupational status showed that about 65.6% of animal owners belong to farming community, 16.4% labour class and 14.2% service class. About 98% farmers keep their animals under stall feeding. The educational status of owners of the progenies revealed that 17.2% had higher secondary education, 43.4% matriculation, 14.3%

graduate/college qualification, 3.0% post graduate qualification and 9.3% illiterate (Fig 11).

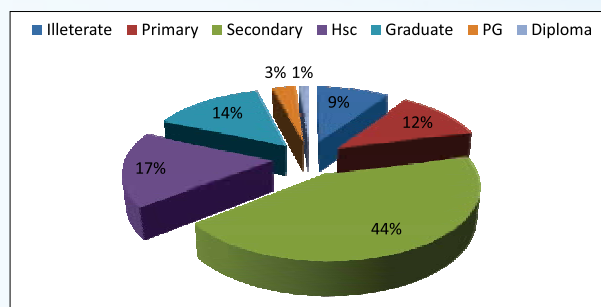


Figure 11: Education status of animal owners participating in the project

According to land holding patterns, about 26.7% farmers had more than 10 acres of land, 11.7% farmers had less than one acre and 16.3% farmers were landless while 20.4% farmers had 5-10 acres of land (Fig 12).

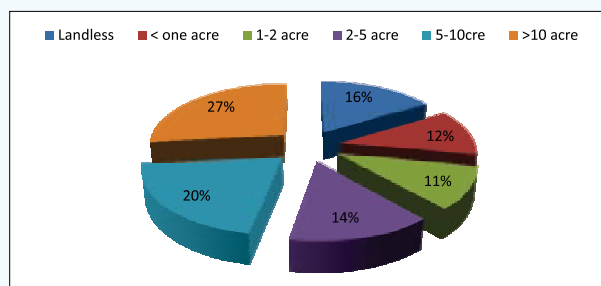


Figure 12: Land holding pattern of animal owners participating in the project

A total of 3 field level training programs, 3 animal welfare camps and 3 Kisaan- choupaal were conducted in field where in 238 farmers took active part to understand the programme. Data loss in terms of mortality, sales of daughters, etc., was 34.9% during the year. However, on cumulative basis a total of 1048 daughter data were lost (19.5%).



C. GENETIC IMPROVEMENT OF INDIGENOUS CATTLE BREEDS THROUGH PROGENY TESTING – INDIGENOUS BREEDS PROJECT

Conservation and genetic improvement of important indigenous cattle breeds of the country are the major objectives of this project. Presently, 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, State Government Farms, NGOs and Gaushalas. Under the project, germplasm (GP) units for each breed were identified at organized farms and data recording (DR) units were identified under both farm and farmer's herds in their native tract.

As per the technical programme, for each breed of cattle, 75 elite breedable females will be made available at the GP unit of each breed 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 progenies per bull. The genetic evaluation of bulls will be done on the basis of first lactation 305-days milk yield of their daughters and frozen semen doses of proven bulls ranked for EBVs will be used to breed large cattle population for improving of milk production potential. 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 10 farmer herds and three associated herds. So far 18050 breedable females were identified and registered under the project.

Herd strength

The herd strength of GP unit as on 31st December, 2018 was 183 comprising of 141 females and 42 males. There were 34 normal calvings in the GP unit during the year producing 17 each female and male calves. The closing herd strength of breedable females was 106 consisting of 47 milch cows, 33 dry cows and 26 heifers of more than 2 ½ years of age. During 2018, GP unit maintained 12 young bulls above one year of age.

The herd strength of DR unit at CBF, Junagadh as on 31st December 2018 was 316 consisting of 253 female and 63 male animals. A total of 54 normal calvings with 28 female and 26 male calves occurred during the year. The unit maintained 181 breedable females aged above 2 years.

Bulls inducted and frozen semen doses produced

So far, 28 bulls in first four sets (6, 9, 9, 4) have been put under semen collection and the frozen semen doses of 24 bulls of first three sets were used for breeding. The semen stock as on 31st December 2018 was 160708 comprising of 20390, 73843, 61035 and 5440 doses of first four sets of bulls (Table 7). During the year, a total of 19240 semen doses (2425, 465, 10890 and 5460 of first four sets of bulls) were frozen and 10125 doses were utilized.

Insemination carried out, conception rate and daughters born

The details of inseminations carried out, conception and daughters born are presented in table 8. A total of 2145 inseminations were carried out and 1023 pregnancies were confirmed resulting with a conception rate of 47.69 per cent. Since inception of the project, 26764 inseminations have been done and 12853 pregnancies were confirmed and the overall conception rate was 48.02 per cent. The total numbers of inseminations carried out since inception for first three sets of bulls were 12186, 8335, and 6243, respectively. A total of



449 daughters born during 2018. A total of 5561 daughters born since inception of the project. The numbers of normal calvings in GP and DR units of CBF, Junagadh were 3 and 45, respectively with a male female ratio of 48.86 and 51.14 per cent.

Set wise performance

A total of 28 bulls in first four sets (6+9+9+4 bulls) have so far been inducted in the program and a total of 219823 (40133+96906+76934+5850) semen doses frozen of which, 59115 were utilized for test mating. The number of cows covered for inseminations in different sets was 27017 (12186+8335+6443). A total of 5561 (3120+1648+793) daughters have so far been produced out. Five hundred thirty daughters from first set and 60 from second sets have reached the AFC, of which 385 (336+49) have completed their first lactation. The six bulls of first set have been evaluated and the average first lactation milk yield of 222 Gir daughters of first set of bulls was 2563.793± 112.61 kg.

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 2344.4 while all lactation 305-days milk yield was 2542.1 kg. The overall average first lactation total milk yield was 3638.7 kg while average all lactation total milk yield was 3224.1 kg. The average first lactation length and first peak yield were 504.2 days and 13.50 kg, respectively. The overall age at first calving, first service period, first dry period and calving interval were 1420 (47 months), 188.5, 25.5 and 468.5 days, respectively. The wet and dry averages of GP unit were 6.86 and 4.03 kg, respectively.

Data recording unit

The average age at first calving of Gir cattle maintained under DR unit of CBF, Junagadh was 1401.9 days (46.6 months) while average estimates for first service period, first dry period and first calving interval were 222.3, 149.7 and 506 days, respectively. The averages for first lactation 305 days and all lactation milk yields were 1868 and 2363.4 kg, respectively with an average first lactation length of 437.2 days. The average first lactation peak yield was 11.5 kg while the all

lactation wet and dry averages were 5.1 and 2.6 kg, respectively.

Breeding values of first set of Gir bulls

The breeding values of six first set Gir bulls were estimated using the first lactation 305-days milk yield of their daughters by BLUP sire model in LSMLMW software. Sire Pankaj had the highest breeding value of +150.71 kg with a superiority of 5.87 per cent. Based on the estimated breeding values, semen doses of Pankaj and Bhavik were recommended for nominated mating for the production young male calves.

Kankrej Breed

The GP unit of Kankrej cattle is located at Livestock Research Station, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar, Gujarat. Under the project, 2 DR units consisting of organized farms and gaushalas and about 6200 farmers animals under 16 AI centres have been registered in their native tract.

Herd Strength

The herd strength of GP unit as on 31st December 2018 was 233 which included 171 females and 62 males and the total number of breedable females above 2 ½ years was 118 consisting of 56 milch, 25 dry and 37 heifers. There were 65 normal calvings in the GP unit during the year producing 28 female and 37 male calves. The unit also maintained 14 breeding bulls and 11 young male calves for breeding purpose.

The DR unit of LRS, Dantiwada had the 158 animals with 125 females and 33 males at the end of year 2018. The unit maintained 76 breedable females above 2 of age of which 36 were in milking, 19 dry and 21 heifers.

Bulls inducted and frozen semen doses produced

A total of 26 Kankrej bulls in three sets have been inducted so far. The first set consisted of eight bulls from Banas Dairy while the second and third sets consisted of nine bulls each. The opening balance of semen doses as on 1st January 2017 was 136487 and during the year 2018, a total of 6995 doses of semen were frozen from the third set of bulls (Table 7). A total of 9679 doses were utilized for insemination during the year. At the end of the year, 71436 doses of frozen semen amounting 2777 doses of first set, 49152 doses of second set



and 19507 doses of third set were available for future breeding. Hundred doses of top ranked bulls were used for nominated mating for the production of young male calves.

Insemination carried out, conception rate and daughters born

During the year 2018, a total of 2466 animals were inseminated, 1110 animals confirmed for pregnancy and 423 daughters born (Table 8). The conception rate during the year was 45.01 per cent against overall conception rate of 47.55 per cent (7533 conceptions out of 15840 inseminations). The numbers of daughters born for the first, second and third set of bulls were 407 and 1256 and 717, respectively resulting 2380 Kankrej daughters since the inception of the project.

Set wise performance

A total of 26 bulls in three sets (8+9+9 bulls) have so far been inducted in the program. Total number of semen doses frozen was 167536 (8000+99614+59922) of which 31430 were utilized/supplied. About 10287 and 13227 semen doses were discarded. The number of cows covered for inseminations in three different sets was 10000 (3000+3500+3500). A total of 326 daughters from first two sets have reached at the age of calving of which, 246 (131+115) have completed their first lactation.

Breeding values of first set of Kankrej bulls

The breeding values of 8 Kankrej bulls of first set were estimated using the first lactation milk yield of their daughters by BLUP in LSMLMW software. The overall average expected breeding value was 2004.314 kg. Sire K020 had the highest breeding value of +189.733 kg (2194.047 kg) with a superiority of 9.46 per cent. Based on the findings, it was recommended that the semen doses of K020 and K017 may be used extensively for nominated mating for the production of young male calves as future bulls.

Productive and reproductive performance

The productive and reproductive performance of Kankrej cattle maintained under GP and DR unit of LRS, Sardarkrushinagar during the year 2018 are presented below.

Germplasm unit

The averages for first lactation milk yield, first lactation 305-days milk yield, total lactation milk

yield and first peak yield were 2315.36, 2258.17, 2682.27 and 10.49 kg, respectively. The average lactation length was 287.2 days. The overall averages for age at first calving, first service period, first dry period and calving interval were 1218.42 (40.6 months), 187.28, 141.0 and 435.73 days, respectively. The wet and dry averages were 8.66 and 5.17 kg, respectively.

Data recording unit

Overall average first lactation total milk yield and first lactation 305-days milk yield of Kankrej unit were 1944.75 and 1850.43 kg, respectively. The average lactation lengths for first and all lactations were 297.5 and 281.66 days, respectively. The first lactation peak yield was 9.19 kg. The average estimates of age at first calving, first service period, first dry period and first calving interval were 1238.42, 195.75, 146.67 and 434.04 days, respectively. The wet and dry averages were 8.36 and 4.88 kg, respectively.

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

In the GP unit at NDRI, Karnal, the herd strength as on 31st December 2018 was 399 including 330 females and 69 males. A total of 129 calving occurred, of which 71 females and 58 male calves born with a female: male ratio of 55: 45. At the end of the year, 204 breedable females of above three years of age and 32 young bulls of above two years of age were available at GP unit. The number of breedable females above two years of age in GP and different DR units was 516 consisting of 204 in Karnal, 107 in Ludhiana; 79 in LUVAS, Hisar; and 126 in Pantnagar.

Bulls inducted and frozen semen doses produced

So far 25 Sahiwal bulls in three sets (8 in first, 7 in second and 10 in third set) were inducted for progeny testing under the project. During the year, 7680 doses were frozen and 4636 doses were utilized for breeding (Table 7). At the end of the year, 22908, 34306 and 31428 doses of first, second and third set of bulls were available for



breeding. Since inception of the project, 174172 semen doses were frozen and 85530 doses were utilized resulting to a balance of 88642 doses for future breeding use.

Insemination carried out, conception rate and daughters born

During the year 2018, a total of 836 inseminations (297 in NDRI, Karnal, 118 in LUVAS, Hisar, 195 in GADVASU, Ludhiana and 226 in Pantnagar) were carried out totaling to 5972 inseminations since inception of the project (Table 8). The conception rate during 2018 was 40.78%. During the year, 341 cows conceived (89 in Pantnagar, 62 in Ludhiana, 68 in Hisar and 122 in Karnal). The number of daughters born during the year in Pantnagar, GADVASU, Ludhiana, LUVAS, Hisar and NDRI Karnal were 35, 19, 32 and 55, respectively while the total number of daughters born since inception was 264, 110, 39 and 449, respectively.

Productive and reproductive performance

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

Germplasm unit

In the Sahiwal GP unit at NDRI, Karnal, the average estimates for first lactation milk yield, first lactation 305-days yield and first peak yield were 1720, 1651 and 10.78 kg, respectively. The first lactation length averaged 258.63 days. Overall average age at first calving, first service period, first dry period, first calving interval were 1326.94 (44 months), 122.43, 120.0 and 368.1 days, respectively. The average first lactation length of the herd was 267.27 days while the all lactation wet and dry averages were 6.32 and 4.29 kg, respectively.

Data recording unit

The highest first lactation total milk yield and 305 days lactation milk yield of 2162.35 and 2144.06 kg were recorded in LUVAS, Hisar followed by GADVASU, Ludhiana (2152.6 and 2118.15 kg) while the lowest yield of 1747.76 and 1745.76 kg was recorded in Pantnagar. The average first lactation length estimates of Sahiwal cows at Hisar,

Ludhiana and Pantnagar were 234.69, 291.92 and 236.44 days, respectively. The average calving intervals of Hisar, Ludhiana and Pantnagar were 454.9, 411.83 and 422.86 days, respectively. During the reporting period, the lowest average age at first calving (AFC) of 1180.33 days (39 months) was observed at Pantnagar unit while highest AFC of 1319.33 days (43.9 months) was noticed in LUVAS, Hisar. However, first service period was lowest (126.58 days) in GADVASU, Ludhiana and highest (168.6 days) at Hisar. The wet averages of milk yield in Hisar, Ludhiana and Pantnagar were 10.12, 6.96 and 7.39, respectively while the herd averages were 5.67, 5.41 and 4.13, respectively.

Set wise performance since inception

The numbers of cows covered for inseminations in different sets were 2223 (838+784+601). A total of 862 daughters (343+294+225) have so far been produced out of the three sets. A total of 295 (222+71+02) daughters from first and second sets have reached the age of first calving, out of which 249 (213+36) have completed their first lactation.

Breeding values of first set of Sahiwal bulls

The expected breeding values of first set of eight Sahiwal bulls were estimated using the first lactation 305-days milk yield of their daughters by BLUP sire model in LSMLMW software. The overall average expected breeding value was 1957.764 ± 59.135 kg. Sire 1852 had the highest breeding value of $+31.98$ kg (1989.75 ± 69.09 kg) with a superiority of 1.63 per cent. Sire 1958 had the lowest breeding value of -16.841 kg (1940.92 ± 71.06) which was 0.86 per cent inferiority (Table 9). The difference between highest and lowest values was 48.83 kg. Among the eight sires, four had breeding values lower than overall average while four had above the overall average. Based on this result, it was recommended that the semen doses of sires 1852 and 1727 may be used extensively for nominated mating for the production of young male calves and breeding for improving the milk production potential of Sahiwal cattle.

The improvement in milk production of three indigenous cattle breeds under IBP from the base population to the daughters of first set of bulls are depicted in Fig. 13.


Table 7: Breed wise details of semen doses collected and utilized during the year 2018

Breed	Set No.	No. of bulls inducted	Semen doses produced		Total	Semen doses utilized			Balance as on 31-12-2018
			Up to 31 st Dec -2017	Jan-Dec 2018		Up to 31 st Dec 2017	Jan-Dec 2018	Total since inception	
Sahiwal	I	8	54754	0	54754	31846	0	31846	22908
	II	7	64365	0	64365	29808	251	30059	34306
	III	10	47373	7680	55053	19240	4385	23625	31428
	Total	25	166492	7680	174172	80894	4636	85530	88642
Gir	I	6	37708	2425	40133	19553	190	19743	20390
	II	9	96441	465	96906	19993	3070	23063	73843
	III	9	66044	10890	76934	9444	6455	15899	61035
	New set	4	390	5460	5850	0	410	410	5440
Total	28	200583	19240	219823	48990	10125	59115	160708	
Kankrej*	I	8	8000	0	8000	2178	3045	5223	2777
	II	9	89438	0	89438	15276	691	15967	49152
	III	9	39049	6995	46044	7367	5943	13310	19507
	Total	26	136487	6995	143482	24821	9679	34500	71436

Kankrej unit: Semen doses used for nominated matting (100) and supplied to field (2945). Discarded semen doses in 2nd set & 3rd set – 10287 & 13227.


Table 8: Breed wise details of insemination carried out, conception and daughter born (Sahiwal DR unit included)

Breed	Set No.	No. of bulls induced	AI done			Conception			Daughters born		
			Up to December 2017	During 2018	Total	Up to December 2017	During 2018	Total	Up to December 2017	During 2018	Total
Sahiwal	I	8	2215	0	2215	776	0	776	343	0	343
	II	7	1939	0	1939	729	0	729	294	0	294
	III	10	982	836	1818	419	341	760	84	141	225
	Overall	25	5136	836	5972	1924	341 (40.78)	2265	721	141	862
Gir	I	6	12186	0	12186	6207	0	6207	3120	0	3120
	II	9	8335	0	8335	4108	0	4108	1647	1	1648
	III	9	4098	2145	6243	1515	1023	2538	345	448	793
	Overall	24	24619	2145	26764	11830	1023 (47.69)	12853	5112	449	5561
Kankrej	I	8	2178	0	2178	1138	0	1138	407	0	407
	II	9	7681	0	7681	3855	0	3855	1256	0	1256
	III	9	3515	2466	5981	1430	1110	2540	294	423	717
	Overall	26	13374	2466	15840	6423	1110 (45.01)	7533	1957	423	2380

Figures in parentheses indicates the conception rate in percentage



Table 9: Expected Breeding values (EBVS) of first set of Sahiwal bulls

Sr. No.	Sire No.	No. of daughters	Mean \pm SE (Kg)	% of Genetic superiority over population	Ranking
Overall		123	1957.764 \pm 59.135		
1	1681	14	1954.182 \pm 70.651	-3.582 (-0.18)	5
2	1727	10	1959.366 \pm 72.227	1.602(+0.08)	2
3	1815	11	1955.869 \pm 71.235	-1.895(-0.09)	4
4	1817	15	1951.785 \pm 71.001	-5.979(-0.30)	7
5	1852	20	1989.754 \pm 69.090	31.989(+1.63)	1
6	1854	22	1957.026 \pm 68.278	-.738(-0.03)	3
7	1909	15	1953.210 \pm 72.475	-4.555(-0.23)	6
8	1958	16	1940.923 \pm 71.069	-16.841(-0.86)	8

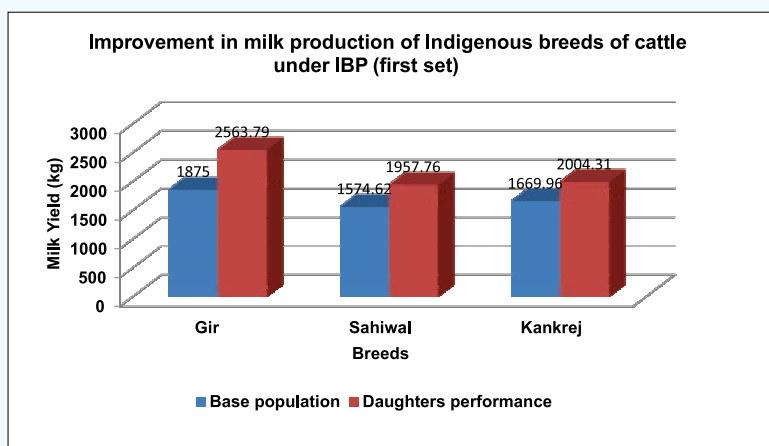


Figure 13: Improvement in milk production of Indigenous cattle breeds under IBP



II. INSTITUTIONAL PROGRAMMES

A. Expression of heat shock protein genes and screening for genetic diseases

Screening for genetic diseases in Frieswal and Indigenous breeds

A modified version of tetra primer-amplification refractory mutation system based polymerase chain reaction (T-ARMS-PCR) for genotyping of rs445709131-SNP responsible for the Bovine Leukocyte Adhesion Deficiency (BLAD) in cattle was developed after replacement of Taq polymerase with SD polymerase (Fig 14). This methodology is user-friendly, fast and less affected by the reaction and cyclic conditions.

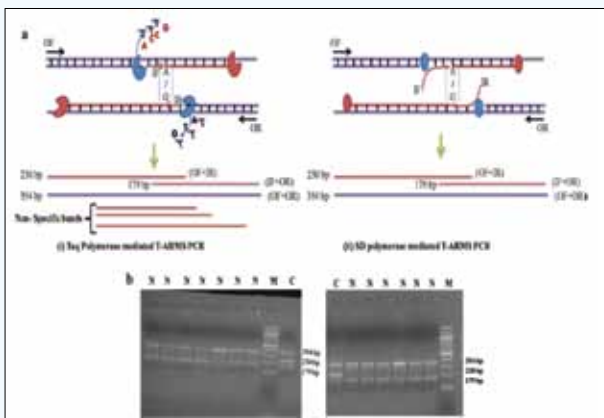


Figure 14: T-ARMS PCR strategy for SNP rs445709131. A conceptual diagram of T-ARMS using Taq polymerase (i) and SD polymerase (ii). b. Genotyping pattern by Taq polymerase (i) and SD polymerase (ii) The outer primers (OF and OR) amplified a 354 bp product. The IF primer generated wild allele with amplicon size of 179 bp while the IR primer generated mutated allele with an amplicon size of 230 bp. N- wild genotype, C- carrier genotype, M- molecular ladder of 100 bp

Functional analysis of IRES elements at bovine heat shock protein genes: an approach to modulate thermo regulatory response in cattle

A putative novel IRES site was identified at 5' UTR region of bovine HSP90. A novel bicistronic expression vector **P^{bhsp90IRES}** was developed by utilizing bovine heat shock protein 90 Internal Ribosomal entry site (IRES) (Fig 15). An Indian



bhsp90IRES

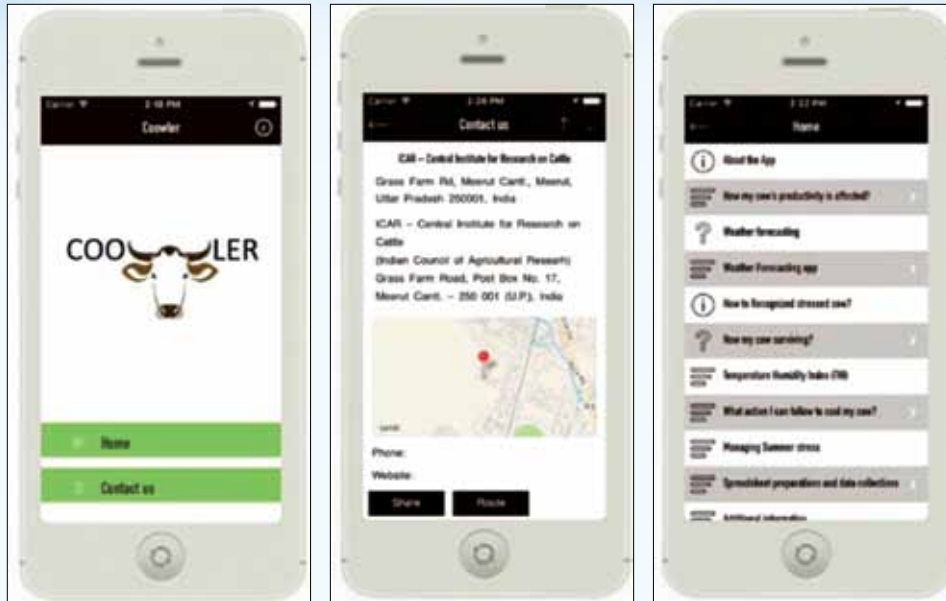
Figure 15: Developed expression cassette P

Patent has been filed and published (The Patent Office Journal no. 02/2019, dated 11/01/2019, Page No: 1129).

Scientific Mobile app on COOWLER

An International collaborative (collaboration with Brazil) mobile app on "COOWLER" developed which deals with information related to summer stress management in cattle. This app is useful for farmers, cattle owners, Veterinary officers, Animal Health Department officials, students, industry professionals and other stakeholders to deal with cattle rearing and managerial practices during summer.





Mobile App on Coowler

B. Semen production and preservation

Germplasm production and performance of Frieswal bulls

During the period of April 2018-March 2019, a total of 3452 ejaculates from 127 Frieswal bulls were collected. The overall average semen volume (ml), sperm concentration (million/ml), initial motility (%) and post thaw motility (%) were 4.69 ± 0.03 , 897.51 ± 8.30 , 57.01 ± 0.32 and 33.46 ± 0.50 , respectively. Out of these, total 235 semen samples from 49 bulls were processed for freezing and semen samples with more than 50% post-thaw motility were frozen. Total 46628 semen doses were produced from these samples for future use under different projects/cattle development programmes. Besides, 912 semen ejaculates were utilized for studies in institute research projects.

During the year, a total of 96375 frozen semen doses were issued to semen distribution centre for supply to Military farms (42050), Field Progeny Testing Project (15706) and other agencies (37860) like NGOs, Gaushalas, para-vets and farmers for cattle improvement and experiments.

To know effect of age of bulls on various semen quality parameters, the bulls were divided into 3 age groups i.e., young (15-36 months), middle (37-48 months), and old (>48 month). The bulls from middle age group donated significantly highest semen volume (Table 10). The age of bulls had no significant effect on average initial sperm motility, however post-thaw motility was significantly low and spermatozoa concentration was significantly higher in the old bulls.

Table 10: 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 (%)
Young (15-36m)	4.39 ± 0.06^a	55.35 ± 0.64	884.45 ± 14.94^a	34.01 ± 1.08^a
Middle (37-48m)	4.81 ± 0.05^b	56.87 ± 0.56	869.33 ± 14.14^a	34.40 ± 0.98^a
Old (>48m)	4.55 ± 0.08^a	55.67 ± 0.79	966.93 ± 21.87^b	28.09 ± 1.27^b
Overall	4.60 ± 0.03	56.06 ± 0.37	896.59 ± 9.38	33.08 ± 0.64

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



Germplasm production and performance of Sahiwal bulls

From 4 Sahiwal bulls, a total of 264 ejaculates were collected and were evaluated for quality attributes and the overall average semen volume (ml), sperm concentration (million/ml), initial motility (%) and post thaw motility (%) were 3.76 ± 0.08 , 953.83 ± 26.89 , 59.13 ± 1.14 and 40.57 ± 1.32 , respectively. A total of 10073 semen doses were frozen during the reported period from ejaculates of 3 bulls. A total of 10315 doses were disbursed to Semen Distribution Centre for sale, while 1094 semen doses were disbursed under IBP of the institute.

Quality assessment of Frieswal bull semen

Frozen semen samples from 79 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. Post thaw semen quality was evaluated in randomly selected (cryopreserved, 0.25 ml, French mini) two straws per bull after it was thawed at 37°C for 30 seconds (Fig 16). Two replicates per sample were used for evaluation of different quality parameters of spermatozoa. The per cent progressive motility following thawing at 0, 30 and 60 minutes of incubation at 37°C were 50.64 ± 0.27 , 43.84 ± 0.51 and 35 ± 0.58 respectively. The plasma membrane integrity (%) as determined by HOST was 49.85 ± 1.35 while acrosome integrity (%) as determined by Giemsa staining was 72.45 ± 0.81 . The average sperm concentration per 0.25 ml straw was 21.27 ± 0.50 million. The mean bacterial load in the frozen semen samples was 406.44 ± 62.46 CFU/ml. Twenty-two out of 79 (27.84%) samples were negative for bacterial growth. The bacterial counts of all samples were below 5000 CFU/ml.

Similarly, 47 newly introduced bulls' neat semen samples were assessed for semen viability and morphology using eosin-nigrosin stain and acrosome integrity by Giemsa staining. The average per cent live sperms and abnormalities of the head, mid piece and tail of sperms were 72.46 ± 1.07 , 7.45 ± 0.62 , 5.34 ± 0.47 , 3.68 ± 0.32 , respectively (Table 11). Neat semen samples from 10 problematic bulls with poor motility, were also assessed for viability and morphology. The average per cent live sperm was 48.99 ± 3.26 and the abnormalities of sperm head, mid piece and tail were 18.04 ± 3.88 , 9.67 ± 2.19 , 4.57 ± 1.55 per cent, respectively (Table 11).

Table 11: Quality control parameters for viability and morphology of neat semen of Frieswal bulls

Sperm Parameters	New bulls (n=141 samples)	Problem bulls (n=10)
Live (%)	72.46 ± 1.07	48.99 ± 3.26
Dead (%)	27.32 ± 1.07	51.01 ± 3.26
Abnormal head (%)	7.45 ± 0.62	18.04 ± 3.88
Abnormal mid piece (%)	5.34 ± 0.47	9.67 ± 2.19
Abnormal tail (%)	3.68 ± 0.32	4.57 ± 1.55
Total abnormality (%)	16.45 ± 1.09	32.39 ± 5.09

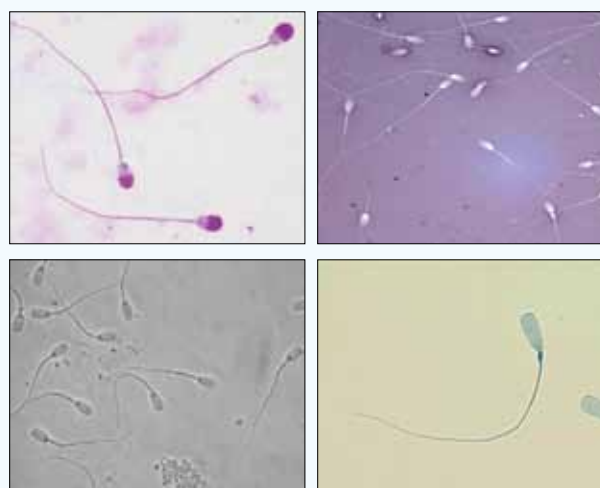


Figure 16: (L to R) 1st row: Intact acrosome, Live and dead sperm, 2nd row: HOST reaction, Mid piece droplet abnormality

Amelioration of oxidative stress and improvement of semen quality parameters in breeding bulls

To study the effect of supplementation of vitamin E and Selenium on oxidative stress and semen quality of breeding bulls, total 18 bulls (6 good and 12 poor) were equally divided into three groups where 6 good bulls served as healthy control (G1), 6 poor bulls were administered Vitamin E and Selenium @10ml s/c once weekly for 3 weeks (G2) while other 6 poor bulls were used as untreated control (G3). The seminal plasma samples collected at fortnightly interval up to two months were evaluated for the semen quality and biochemical parameters viz., MDA, SOD, Catalase as per standard procedures. The bulls of supplemented group (G2) had significantly low levels of MDA in post supplementation period from 2nd fortnight onwards as compared to pre-supplementation period and also as compared to



bulls of G3 group. The levels of SOD significantly improved during 2nd fortnight onwards in bulls of G2 as compared to their pre-supplementation values and became at par as with values as in good bulls of G1 group. The values of Catalase were significantly higher in bulls of supplemented group (G2) during 3rd fortnight onwards as compared to their pre-supplementation values and G3 animals (Fig 17).

The supplementation of vitamin E and selenium found to have improved the semen quality in poor bulls (G2) in terms of volume, motility, sperm concentration and HOST. The semen volume was improved significantly during 4th fortnight in supplemented group (G2) bulls as compared to their pre-supplementation values which was significantly higher than G3 bulls during post supplementation 3rd and 4th fortnights. Sperm concentration did not show significant variation within group at different time intervals of trial in the supplemented bulls (G2). However,

significantly higher sperm concentration in bulls of G2 was found as compared to G3 bulls during 3rd and 4th fortnights after supplementation. Initial sperm motility was significantly higher in G2 bulls during 3rd and 4th fortnights post-supplementation period than their pre-supplementation values and G3 animals. The values of HOST were significantly improved in G2 animals during post supplementation 3rd fortnight onwards than their pre-supplementation and values of G3 animals. The values of percent intact acrosome (PIA) did not show significant variation in the bulls of different groups on within and between group comparisons during whole study period. The percentage of live sperm cells was significantly higher during post supplementation 4th fortnight in the bulls of vitamin E and Se supplemented group (G2) as compared to G3 animals however, within group comparison did not show any significant variation in the percentage of live sperms in G2 animals at different time intervals of study.

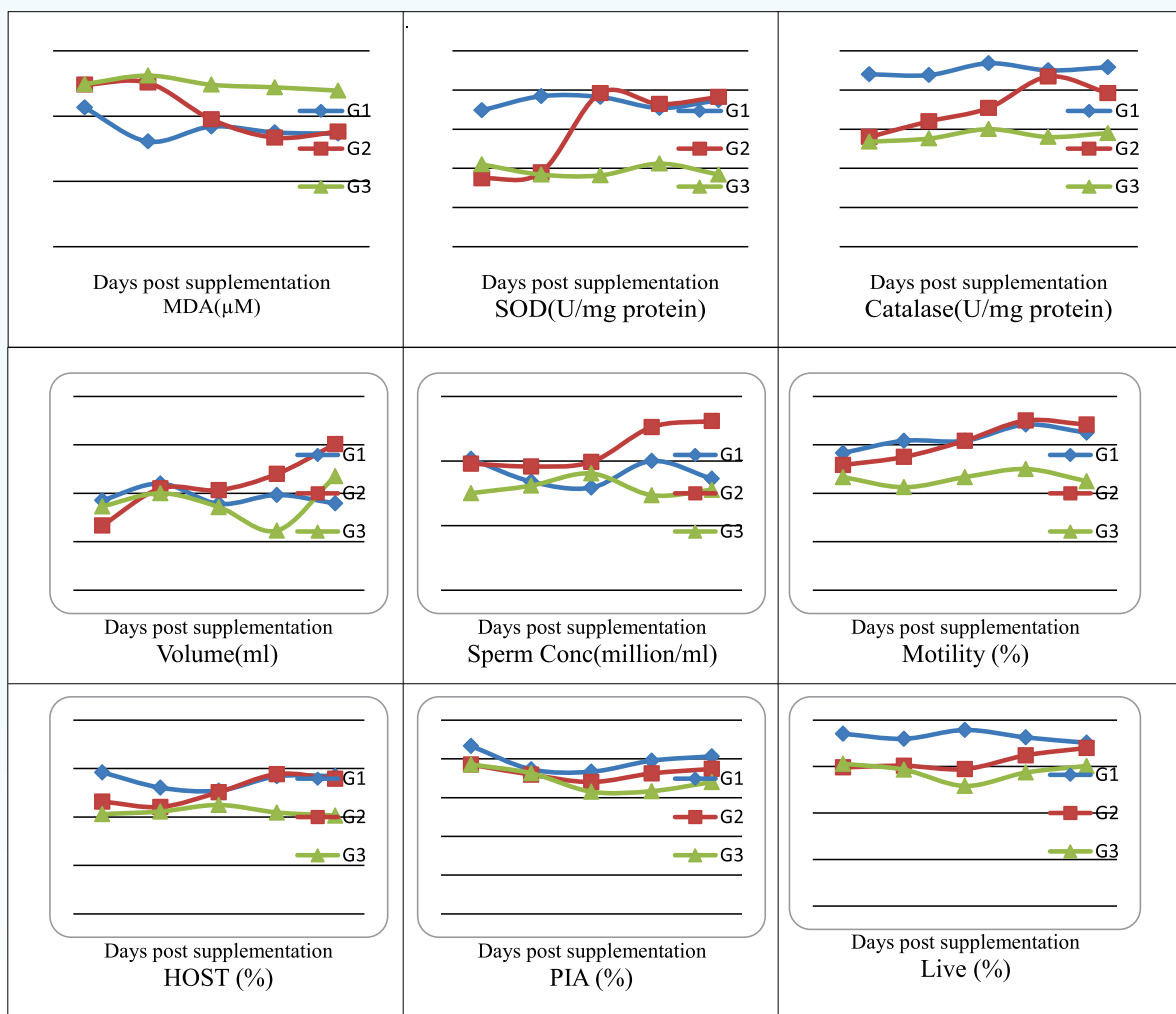


Figure 17: G1- Healthy control, G2- Treatment group (supplemented with Vitamin E and Selenium injection @10ml s/c weekly for three weeks), G3- Untreated control



Mitigation of cryodamages using retinol and retinoic acid

The cryodamages assessed by electron-microscopy (TEM) revealed different changes in sperm plasma membrane. During freezing and thawing process, the swelling of sperm plasma membrane and ruffling of outer acrosomal membrane were observed as major cryodamages. Hence to minimize the extent of cryodamages during these processes, in a study, retinol and retinoic acid were used as antioxidant and membrane stabilizer in different concentrations. Retinol was used at 2.5 (T1), 5.0 (T2) and 10.0 (T3) mM level whereas retinoic acid was used at 1.0 (T1), 3.0 (T2) and 5.0 (T3) mM (Table 12)

The effect of levels of retinol on motility and HOST were rated on comparative basis considering the lowest difference between after dilution (AD) and post thaw (PT) values as 100% and relative scores were worked out for other levels of retinol. The total scores obtained thus were compared between retinol conc. Retinol with conc. of 2.5 mM was found to be better treatment for obtaining overall better performance considering percent motility and HOST together. Retinoic acid @ 1.0 mM was found comparatively better with regard to acrosomal integrity and post thaw semen quality.

Table 12: Effect of Retinol and Retinoic acid on Semen Quality Parameter (SQP)

Treatment	Stage	SQP (%)	C (control)	T ₁ (2.5 mM)	T ₂ (5.0mM)	T ₃ (10 mM)
Retinol	Post dilution(AD)	Motility	71.56±7.46	70.55±10.67	64.66±10.24	64.56±10.12
	Post equilibration (AE)		64.68±7.34	64.34±4.94	60.23±5.94	60.26±5.58
	Post thaw (PT)		47.67±6.56	51.27±5.69	47.81±5.48	46.44±5.33
	Post dilution(AD)	HOST	66.35±8.32	68.42±8.65	70.14±8.68	68.15±8.72
	Post equilibration (AE)		58.32±9.45	60.16±8.75	63.85±6.66	62.75±9.52
	Post thaw (PT)		46.54±8.75	50.36±10.25	44.14±7.55	43.82±10.55
	Post dilution(AD)	Acrosome integrity	78.34±4.35	79.54±5.35	78.12±6.32	77.68±6.35
	Post equilibration (AE)		70.32±5.65	72.14±6.34	73.35±5.36	70.16±7.75
	Post thaw (PT)		63.14±6.68	64.28±6.60	66.18±4.88	63.88±6.65
			C (control)	T₁ (1 mM)	T₂ (3mM)	T₃ (5 mM)
Retinoic acid	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	45.42±5.83	43.74±6.22
	Post dilution(AD)	HOST	63.15±6.62	62.14±6.87	64.18±7.14	63.75±6.15
	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	44.16±6.25	42.11±5.75	42.35±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	63.85±2.75	62.50±2.75	60.10±3.10



Quantification of Heparin Binding Proteins in semen

Seminal proteins play a pivotal role in sperm maturation, metabolism, capacitation, defense, motility, modification of sperm membranes, acrosome reaction, interaction with the oviductal epithelium and fertilization. The seminal plasma from number of mammalian species contain HBPs which are the prominent proteins secreted from the prostate, seminal vesicles and bulbo-urethral glands into seminal fluid and bind to sperm at ejaculation. The addition and removal of a variety of proteins at ejaculation play an important role in sperm capacitation and exhibit considerable variation in actual semen fertilization capacity. Binding of HBP to sperm membrane increased the number of heparin binding sites on sperm surface and conveyed the capacitating effects, thereby influencing sperm fertilizing ability and success of cryopreservation process. Therefore, the present study was envisaged to investigate the HBP profile in Frieswal and Sahiwal bull semen and its correlation with semen freezability.

The concentration (mg/mL) of total proteins and heparin binding proteins (HBPs) in the seminal plasma of 18 Frieswal bulls were 108.16 ± 1.30 and 22.58 ± 1.81 , respectively. The electrophoretic pattern of seminal plasma HBPs revealed eight i.e., 16, 22, 24, 28, 34, 60, 67, 190 kDa, and sperm membrane HBPs revealed seven i.e., 16, 28, 36, 54, 55, 63, 190 kDa, major protein bands of varying intensity ranging from 16-190 kDa (Fig 18). The

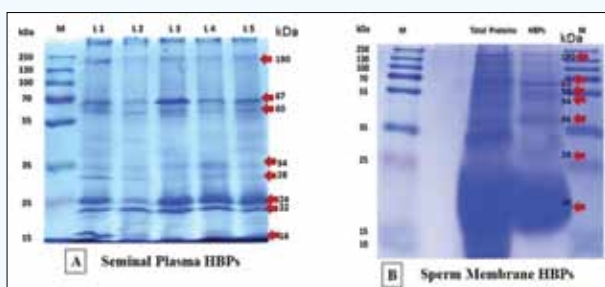


Figure 18: **Electrophoretic pattern of heparin binding proteins (HBPs) in Frieswal bull semen.** (A) 16, 22, 24, 28, 34, 60, 67 and 190 kDa HBPs identified in seminal plasma (B) 16, 28, 36, 54, 55, 63 and 190 kDa HBPs in sperm membrane of Frieswal bull semen. L1-L5: Different bull semen sample numbers; M: Protein molecular weight markers

presence or absence of a particular protein band in the seminal plasma or the sperm membrane may contribute to difference in the freezability or the fertilizing ability of the spermatozoa, if any.

Standardization of IVM-IVF on Feeder Cell Monolayers

In earlier phase of the experiment, the protocol for foetal fibroblast cell was standardized for using it as a feeder cell Monolayer. In order to standardize the IVM-IVF protocol, the buffalo ovaries were used. All visible surface follicles (>4 mm) were aspirated utilising 18G hypodermic needle and collected into oocyte collection medium. The average oocyte recovery rate was 3.81 per ovary. On the basis of presence of compact cumulus oocytes complexes (COCs), 73.73% oocytes were considered as of good quality. Oocytes having at least 3-5 layers of cumulus cells and evenly granulated ooplasm were subsequently cultured in 60 µl drop of maturation media covered with sterile mineral oil in 35 mm culture dish at $38.5 \pm 1^{\circ}\text{C}$, 5% CO_2 under humidified air (95%) for 22-24 hrs in CO_2 incubator. Table 13 depicts different attributes of *in vitro* maturation and fertilisation. Maturation rate was 71.23% on the basis of expansion of cumulus oophorous cell layers *in vitro*. Good quality matured oocytes were incubated with capacitated buffalo sperms in fertilization drop for overnight and the excess sperms were gently washed out. Thereafter it was kept for embryo development in media up to seven days, however, the oocytes failed to cleave.

Table 13: Different attributes of *in vitro* oocyte maturation and fertilization (IVMFC)

S. No.	Attributes Recorded	Value(s)
1	No. of Trials	8
2	Total no. of ovaries	26
3	Total no. of oocytes aspirated	99
4	Average oocyte recovery rate (No. oocytes/ovary)	3.81
5	No. of good oocytes	73 (73.73%)
6	Maturation Rate	71.23% (52/73)
7	No. of oocytes used in IVF	52
8	No. of embryos developed	Nil



C. Augmentation of reproductive efficiency

Embryo Transfer Technology

Sahiwal ETT Calf produced at farmers' doorstep:

In an attempt to disseminate the Embryo Transfer Technology (ETT) under lab to land initiative, a team of scientists from ICAR-CIRC, Meerut has produced the first ETT Sahiwal female calf at farmers' door step on 5th September 2018 at Karala village. All the procedures viz. superovulation, flushing, evaluation and transfer were performed totally under the field conditions for this venture.



During the report period, a total of 4 Indigenous (2 Sahiwal, 1 each of Rathi and Gir) cows were subjected to super-ovulatory treatment (PG with 5th FSH-P injection). Three Indigenous cows responded to 260 mg FSH-P with optimum super-ovulatory response and these animals were flushed. A total of 6 embryos could be recovered from two donors and 5 embryos were transferred in 4 recipients which ultimately resulted in pregnancy in one animal. Table 14 depicts overall results of ETT work done at farmers door step. A male calf was also born through ETT from last year's flushing and embryo transfer at Daluhera Gaushala in Baghpat district.

The transfer of a frozen embryo of Red Sindhi in CB recipient could not succeed as pregnancy could not be established.

Table 14: Superovulatory response and Embryo recovery and transfer in Indigenous cattle

S. No.	Parameters	Values
1	No. of animals treated	04
2	No. of animals responded	03
3	No. of Animals flushed	03
4	Mean No. of CL	5.80±1.55
5	Mean no. of anovulatory follicles	1.75±0.50
6	No. of animals from which embryo could be recovered	02
7	No. of embryos /ova recovered	4.50±0.50
8	No. viable embryos	03.00±1.00
9	No. of embryos transferred	05/04 recipients
10	Pregnancy established	01
11	Calf born till date including flushings from previous year	02 (1 male ,01 female)

Use of sex sorted semen:

The AI with sex sorted semen of HF bull was attempted in 10 crossbred cows. The success rate was very poor as only one calf (female) was born.

Estrus response and conception rate using modified Ovsynch protocol:

The modified Ovsynch protocol with fixed time insemination was attempted in 13 cows using P₀G₆P₁₃G₁₆ schedule with fixed time insemination at day 16 and 17 in such a way that first insemination along with 2nd GnRH injection was done at 72 hrs post PG2 and followed by 2nd insemination at 18 hrs later i.e., at 90 hrs post PG2. The standard Ovsynch protocol (GPG) in eight animals served as control. The conception rate was improved to 76.92% in modified Ovsynch protocol as compared to 62.50% in control (Table 15).

Standard Ovsynch: GPG Protocol (control) -

0G_____7P_9G_10AI

Modified Ovsynch: PGPG Protocol -

0PG₁___6GnRH₁___13PG₂___16GnRH₂ +AI₁-17AI₂



Table 15: Estrus response to modified OVSYNCH protocol

	No. Animals	No. of animals responded to estrus (%)	No. of animals conceived at 1 st service (%)	No. of animals conceived at 2 nd service (%)	Total no. of Anim. Conceived	Overall conception rate (%)
Ovsynch	8	05 (62.50)	3	2	5	62.50
Modified Ovsynch	13	11 (84.61)	7	3	10	76.92

D. Improvement of cattle through nutritional manipulation

Effect of combined supplementation of Cu, Mn and Zn (as inorganic sulphates) in bulls

Effect on feed intake and body weight gain

To study the effect combined supplementation of micro-minerals i.e., Cu, Mn & Zn in the diets of breeding Frieswal bulls, a feeding trial was conducted in 30 animals divided into two categories of 15 animals in each viz., good and poor based on their previous semen production data. Under each category the available 15 bulls were further divided into 3 groups of 5 animals each. All the animals were individually offered uniform diet of wheat straw (*ad lib*), 20 kg seasonal green fodder and 3.0 kg of concentrate mixture (TDN-66% & CP-17.3%, calculated) comprised of 20, 60, 5, 12, 2 and 1 parts of maize, wheat bran, GNC, mustard oil cake, mineral mixture, and common salt, respectively. In addition to the basal diet, the animals in each of the categories divided in different groups were offered with basal supplementation of minerals at the level of 12.5 ppm Cu, 55 ppm Mn and 40 ppm Zn (D1) and additional supplemental levels having 20 ppm Cu, 65 ppm Mn and 60 ppm Zn (D2) and 25 ppm Cu, 80 ppm Mn and 80 ppm Zn (D3).

During the feeding trial period, the daily individual feed intake, body weights and semen parameters recorded as per the farm schedule, indicated no statistical differences in average DMI from concentrate (2.80 kg) and green fodder (3.03 kg) in all the groups across both categories. However, individual average DMI from wheat straw varied across both categories which ranged from 3.07-3.19 and 2.86-3.24 kg/d in different groups of good and poor categories of bulls, respectively. The average total DMI and DMI (per 100 kg bwt) ranged from 8.89 to 9.01 and 1.46 to 1.51 kg/d in different groups in good bulls while the same ranged from 8.68 to 9.06 and 1.57 to 1.66 kg/d respectively

in different groups in poor categories of bulls (Fig 19). During entire experimental feeding, the average total DMI remained in the range of 8.68 to 9.06 kg/d and total DMI/100 kg BW remained in the ranged of 1.46 to 1.66 kg/d in all groups across both categories of bulls.

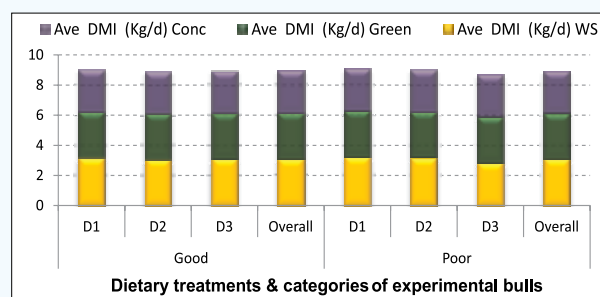


Figure 19: Depiction of feed intake (DM basis) in different groups and categories of bulls on dietary supplementation with combination of Cu, Mn & Zn at three levels

The trend of body weight changes (Fig 20) in different groups of bulls in both categories indicated that the average total gain in BW was in the range of 34.5 to 81.7 kg during entire six months feeding period. In good category bulls the ADG (g) was 199.4, 161.2 and 337.2 whereas in poor category of bulls it was 284.3, 305.3 and 381.6 fed on diets D1, D2, and D3, respectively. The overall ADG was lower (232.6 g) in good bulls than poor bulls (323.7 g) indicating positive effect of supplementation and the ADG was higher

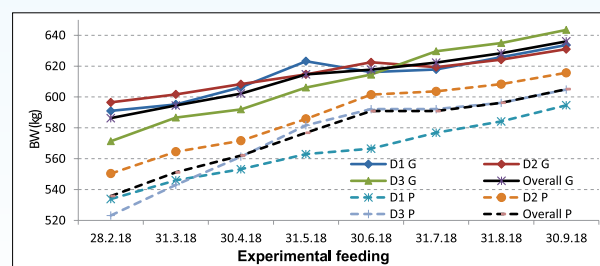


Figure 20: Trend of body weight changes in different groups and categories of bulls on dietary supplementation with combination of Cu, Mn & Zn at three levels



in groups of bulls supplemented with diet D2 in both categories although differences were non-significant.

Effect on nutrient Utilization

A digestibility trial of 7 days duration was conducted in two phases involving all 30 bulls. The data on the intake and digestibility of different nutrients in different categories and groups of Frieswal bulls has been presented in the Table 16. The supplementation of micro-minerals and type of bulls had no effect on intake and digestibility of different nutrients as same remained similar across the categories and dietary supplemented groups of experimental bulls.



A view of feeding of Frieswal bulls during digestibility trial

Effect on semen quality

The effect of combined micro mineral supplementation from March to September 2018 on semen quality parameters is presented in Table 17. The bull semen was collected as per the farm schedule and data were used as per the sperm cycle of sixty days. The results indicated that increased level of supplementation of combination of Cu, Mn & Zn during entire period of feeding had significantly better effect on improving the overall sperm concentration (millions/ml) from 752.4 in D1 to 768.3 in D2 and 814.4 in D3 group bulls. However, the hot conditions during summer months had undulant effect on the overall sperm concentration as same was seen during different periods/cycle of semen collection. There was significant difference in the good and poor bulls in the terms of sperm concentration (954.5 Vs 620.2 millions/ml semen). Similar beneficial effect of combined mineral supplementation was evident when the increased percent motility and lesser extent of total sperm abnormalities including the head and tail were observed in supplemented groups.

Table 16: Average daily nutrient intake during digestibility trial in different groups and categories of bulls on combined mineral supplementation

Parameters		Categories/ groups of animals							
		Good				Poor			
		D1	D2	D3	Overall	D1	D2	D3	Overall
DM intake	Total (kg)	9.42	9.37	9.56	9.45	8.30	9.36	8.95	8.87
	kg/100kg BW	1.54	1.50	1.46	1.50	1.42	1.60	1.46	1.50
	g/kg W ^{0.75}	76.4	75.0	73.7	75.0	69.7	78.6	72.7	73.7
N intake	Total (g)	786	787	794	789	747	785	773	768
	g/100kg BW	129	126	121	126	128	134	127	130
	g/kg W ^{0.75}	6.4	6.3	6.1	6.3	6.3	6.6	6.3	6.4
% Digestibility	DM	58.1	59.0	60.4	59.2	57.1	58.1	56.4	57.2
	CP	55.2	58.3	51.4	55.0	55.4	52.9	58.2	55.5
	CF	50.9	51.5	53.0	51.8	45.7	50.0	47.0	47.6
	EE	62.1	63.0	62.2	62.4	62.6	60.2	61.5	61.4
	TA	13.4	11.6	12.8	12.6	11.3	11.3	11.7	11.4
	NFE	63.0	64.6	66.5	64.7	63.8	64.0	62.5	63.4
	NDF	50.8	52.0	52.8	51.9	47.3	49.8	47.3	48.2
	ADF	40.3	42.5	43.2	42.0	36.7	40.1	38.1	38.3



Table 17: Semen quality parameters (average) of bulls in different groups and categories on supplementation of combined Cu, Mn & Zn

Parameters	Dietary treatments			Semen collection period (cycles)				Bull category	
	D 1	D 2	D 3	P 0	P 1	P 2	P 3	Good	Poor
Semen volume (ml)	5.2	5.1	4.7	4.6 ^a	5.1 ^{ab}	5.5 ^b	4.9 ^a	5.1	4.9
Sperm concentration (Mil/ml)	752.4 ^a	768.3 ^{ab}	814.4 ^b	748 ^{ab}	857 ^b	763 ^{ab}	716.9 ^a	954.5 ^b	620.2 ^a
Total sperm concentration (Mil/ejaculate)	3915.2	3931.1	4075.5	3651.5 ^{ab}	4327.1 ^b	4293.9 ^b	3491.5 ^a	4848.9 ^b	3098.9 ^a
Motility (%)	56.6 ^a	55.2 ^a	60.9 ^b	62.1 ^b	59.6 ^b	53.2 ^a	53.7 ^a	66.0 ^b	49.1 ^b
PTM (%)	40.2	37.1	36.4	-	37.6	40.5	35.9	38.2	37.6
HOST (%)	43.2	41.3	36.7	-	40.9 ^b	30.8 ^a	48.9 ^a	43.8 ^b	37.0 ^a
Head abnormality (%)	18.9 ^b	14.3 ^a	11.2 ^a	-	-	-	-	12.0 ^a	17.5 ^b
Midpiece abnormality (%)	12.4	12.3	14.5	-	-	-	-	10.9 ^a	15.2 ^b
Tail abnormality (%)	4.5 ^b	2.9 ^a	2.0 ^a	-	1.1 ^a	4.5 ^b	3.5 ^a	1.2 ^a	5.0 ^b
Total abnormality (%)	35.8 ^b	29.3 ^a	27.6 ^a	-	-	-	-	24.2 ^a	37.7 ^b

NB: Values with different superscripts in sub rows differ significantly ($P < 0.05$)

Assessment of nutritional status of cattle in Meerut district through biochemical parameters:

Status of important blood biochemical parameters of cattle during winter and summer season

Blood samples of cattle were collected during winter (n-40) and summer seasons (n-40) randomly from different villages of four blocks in Meerut district for biochemical profiling of animals reared on the prevailing feeding system.

The analysis for total protein (TP), cholesterol, glucose, Ca, P, Albumin and creatinine was carried out in blood/ plasma samples and results presented in Table 18 & 19 indicated that the levels of Ca in all the villages during both seasons were lower in 30 to 90 % animals than the reference values indicating need of Ca supplementation to the animals. The levels of TP in blood plasma of animals in Kastala, Khanpur and Alipur villages were low in 50%, 30%, 10% animals, respectively during summer period however, during winter season it improved to reach normal or more than normal level in the

animals of Khanpur and Kastala villages. The blood glucose level during summer season was generally lower in 20 to 60% animals of Atrada, Kastala and Alipur villages but in general during winter season glucose level in blood plasma was improved or was slightly low in some animals of villages like Alipur and Khanpur.

It was also revealed that during winter and summer months the level of TP was mostly normal in all animals or high in few during winter or low in some animals during summer season. The levels of blood glucose in animals were generally normal during winter season while in summer, it was low in nearly 30% animals. In general, Ca deficiency was noticed in 50% of animals during winter and 60% in summer months. The levels of cholesterol were not much influenced by the seasonal variation.

Overall the biochemical parameters in the blood plasma of animals remain within normal range, and the average values of TP, glucose and cholesterol were 6.80 g/dl, 55.95 mg/dl and 140.63 mg/dl respectively. However the value of Ca was little low at 8.72 mg/dl.


Table 18: Status of blood plasma biochemical parameters during winter (W) and summer (S) seasons in different villages

Village	Khanpur		Atrada		Alipur		Kastala		Average	
	n	n	n	n	n	n	n	n		
Season	W	S	W	S	W	S	W	S	W	S
Total Protein (g/dl)	7.63 (H2)	6.24 (L3)	7.25 (H2)	6.42	7.15	6.33 (L1)	7.53 (H1)	5.88 (L5)	7.39	6.22
Glucose (mg/dl)	58.42 (L2)	62.31	60.3	58.66 (L2)	58.16 (L3; H1)	43.75 (L6)	63.92	42.03 (L5)	60.2	51.69
Ca (mg/dl)	9.05 (L3)	9.18 (L4; H1)	8.85 (L6)	8.67 (L6; H1)	8.48 (L6)	7.35 (L9)	9.21 (L4)	8.92 (L5)	8.9	8.53 (L)
P (mg/dl)	6.08	5.49	5.46	5.76	6.11	6.43	5.93	6.04	5.89	5.92
Cholesterol (mg/dl)	129.19 (L2)	180.04 (H1)	167.93 (L1; H1)	144.24 (L1; H1)	123.67 (L3)	111.65 (L3)	159.46	108.86 (L4)	145.06	136.2
Albumin (g/dl)	2.76	3.63	2.76	2.88	2.87	2.86	3.06	2.77	2.86	3.04
Creatinine (mg/dl)	0.97	1.36	1.1	1.5	1.34	1.02	1.19	1.26	1.15	1.28

Note: The alphabets mentioned in parenthesis indicate the number of animals higher (H) or lower (L) than the normal reference values.

Table 19: Status of different blood plasma biochemical parameters in cattle during winter (W) and summer (S) seasons

Parameter	Reference values/ranges	No. of animals involved during	
		Winter season	Summer season
Total proteins	Low (<5.95 g/dl)	0	9
	Normal (5.95-8.00 g/dl)	35	31
	High (>8.00 g/dl)	5	0
Glucose	Low (<46.85 mg/dl)	5	13
	Normal (46.85-88.29 mg/dl)	34	27
	High (>88.29 mg/dl)	1	0
Ca	Low (<8.88 mg/dl)	19	24
	Normal (8.88-10.80 mg/dl)	21	14
	High (>10.80 mg/dl)	0	2
Cholesterol	Low (<88.80 mg/dl)	6	8
	Normal (88.80-231.66 mg/dl)	33	30
	High (>231.66 mg/dl)	1	2

Blood plasma parameters of animals reared on low cost feeding system prevailing in Sardhana tehsil of Meerut district

In the Sardhana tehsil of Meerut district some animal owners have adopted a practice of feeding the milch animals, primarily buffaloes with local cheap feed resources. The paddy straw, wheat bran, mailly and kutta were the frequently used ingredients while wheat flour was occasionally used for animal feeding. The *mailly* (20.64% DM, 19.39% CP, 8.1% CF, 8.48% EE, 16.93% Ash & 12.39% AIA) is sugar rich grey coloured slurry and

a by-product from the jaggery production industry. The *kutta* (25.7% DM, 45.5% CP, 17.11% CF, 3.73% EE, 3.90% Ash & 1.43% AIA) is a brewery industry by-product and is a good source of protein. In order to ascertain the effect of feeding on blood profile, analysis was carried out and results are presented in table 20. The values of biochemical parameters in blood plasma of buffalo and crossbred cows pregnant and non-pregnant categories were found within the normal range. It appeared that animals were on normal plane of nutrition on the by-product based feeding system.



Services offered (Feed sample analysis of Military farms)

Feed analyses facilities are being extended to all the military farms on free of charge basis. Total of 431 feed samples from different military farms were analysed for different proximate during 2018-19 (Table 21). Few samples received from farmers/entrepreneurs/traders were also analysed on payment basis.

Value addition of dung waste through Vermi composting

To add value of dung produced and to manage farm waste in an effective manner, the activity of vermi composting was initiated. During the year 2018-19, a total of 66254 kg of vermi compost was produced and revenue of Rs. 3.436 lakhs was generated.

Table 20: Biochemical parameters (average) in blood plasma of buffalo and crossbred cows

Type of animal	Total protein (g/dl)	Albumin (g/dl)	Glucose (mg/dl)	Ca (mg/dl)	P (mg/dl)	Cholesterol (mg/dl)	Creatinine (mg/dl)	
Buffalo (n=11)	7.55	2.67	52.2	8.8	6.13	122.34	1.29	
Crossbred cow	Pregnant (n=7)	7.22	2.56	58.79	9.08	6.1	118.57	0.79
	Non-pregnant (n=5)	7.52	2.66	57.47	8.77	6.11	120.85	0.99
	Total (n=12)	7.35	2.6	58.24	8.95	6.11	119.45	0.87

Table 21: Proximate composition (Av. % DM basis) of feed ingredient samples from various Military Farms (analysed during Apr 2018- Mar 2019).

Parameters	Name of Feed Ingredient								
	Baled Hay	CS Cake	GN Cake	Guar Meal	Maize Whole	MO Cake	Rice Polish	Soya DOC	Wheat Bran
	(n=1)	(n=25)	(n=38)	(n=1)	(n=83)	(n=76)	(n=5)	(n=17)	(n=185)
Moisture									
Mean	9.19	8.45	8.38	7.30	10.67	9.27	8.11	7.92	10.27
Min	-	7.21	7.02	-	9.05	7.03	7.27	6.75	8.00
Max	-	9.41	10.19	-	12.38	11.49	8.82	9.35	11.89
CP									
Mean	-	23.76	47.00	44.89	-	37.12	18.73	48.28	15.03
Min	-	22.40	44.63	-	-	34.13	17.50	47.25	13.13
Max	-	25.38	48.13	-	-	38.50	20.13	48.91	16.63
CF									
Mean	-	23.05	8.66	7.94	-	9.32	7.89	5.35	10.62
Min	-	22.14	8.11	-	-	8.06	7.37	5.07	9.09
Max	-	25.83	9.80	-	-	11.08	8.17	6.09	11.69
EE									
Mean	-	5.58	6.04	-	-	8.82	-	-	-
Min	-	5.16	5.26	-	-	8.12	-	-	-
Max	-	6.81	7.18	-	-	9.62	-	-	-
ASH									
Mean	-	5.63	7.67	7.93	-	8.29	6.73	6.26	4.80



Parameters	Name of Feed Ingredient								
	Baled Hay	CS Cake	GN Cake	Guar Meal	Maize Whole	MO Cake	Rice Polish	Soya DOC	Wheat Bran
	(n=1)	(n=25)	(n=38)	(n=1)	(n=83)	(n=76)	(n=5)	(n=17)	(n=185)
Min	-	5.07	6.25	-	-	7.12	6.58	5.47	4.09
Max	-	6.39	8.75	-	-	9.58	6.87	6.84	5.89
AIA									
Mean	-	1.19	1.70	1.48	-	1.70	1.33	1.35	0.46
Min	-	0.85	1.46	-	-	1.32	1.24	1.19	0.26
Max	-	1.78	1.90	-	-	1.98	1.46	1.68	0.79

III. INTER-INSTITUTIONAL PROGRAMMES

Genetic variation of bovine Kisspeptin gene among indigenous cattle breeds

DNA databank of Kankrej (200) and Gir (80) maintained in the laboratory was used in the study. Kisspeptin gene exon-1 and exon-2 comprising of 334 bp and 308 bp amplicons were amplified in Kankrej, Gir and Frieswal cattle respectively. The SNPs were identified by PCR-SSCP and custom sequencing. By PCR-SSCP, three genotypes of exon-1 were observed as AA- 39%, AB- 46% and BB- 15% respectively and two genotypes of Exon-2 were observed as AB- 66% and BB – 34% respectively. Two missense SNPs (G→A & C→T) were observed in exon-1 while one missense (T→C) and two synonymous SNPs (G→A & C→T) were observed in exon-2 of bovine Kisspeptin gene were identified in Kankrej, Gir and Frieswal cattle breeds.

Further PCR amplified fragments of exon-1 were digested with SfoI and AciI while exon-2 amplified products were digested with HaeIII restriction enzyme. In exon-1, SfoI recognize restriction site GGC[^]GCC at position 292 and AciI recognize restriction site C[^]CGC at position 108 while in exon-2, GG[^]CC restriction site was recognized by HaeIII at position 90. The genotyping study was conducted on 149 Kankrej, 47 Gir and 100 Frieswal to screen out the missense mutations in exon-1 and exon-2. In exon-1 CC (51), CT (71), TT (27) genotypes in Kankrej, CC (13), CT (21), TT (13) genotypes in Gir and CC (03), CT (47) TT (50) genotypes in Frieswal were found at position 292. Similarly, GG (102), GA (43), AA (04) genotypes in Kankrej, GG (34), GA (10), AA (03) genotypes in Gir

and GG (66), GA (34), AA (00) genotypes in Frieswal were observed at position 108 (Fig 21). In exon-2 CC (40), CT (108), TT (00) genotypes in Kankrej, CC (04), CT (39) while TT genotype was absent in Gir and CC (03), CT (96), TT (01) genotypes in Frieswal were found at position 92.

In exon-1 at position 292, the allelic frequency C (58%), T (42%) in Kankrej, C (50%), T (50%) in Gir, and C (58%), T (42%) in Frieswal while at position 108, the allelic frequency G (82%), A (18%) in Kankrej, G (83%), A (17%) in Gir, and G (83%), A (17%) in Frieswal were observed (Fig 22 & 23). The allelic frequency C (74%), T (26%) in Kankrej, C (54%), T (46%) in Gir, and C (51%), T (49%) in Frieswal were seen at position 92 in exon-2. Seven gene bank accession numbers were obtained on SNPs at bovine kisspeptin exonic region in Kankrej and Gir cattle.

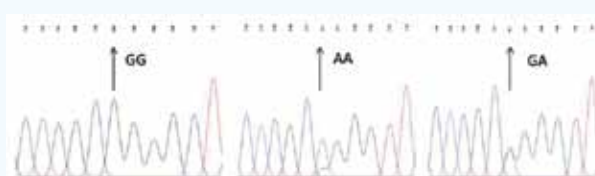


Figure 21: Chromatogram showing g.108 G>A (exon 1) SNP in Kisspeptin gene in Kankrej and Gir cows

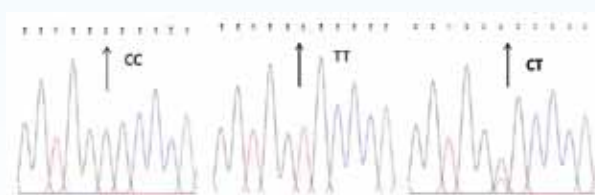


Figure 22: Chromatogram showing g.292 C>T (exon 1) SNP in Kisspeptin gene in Kankrej and Gir cows



S9	AACTATATGGCGCGAGGGCTCTCAGTCCTATTTCCATGCTGTGTTGGTTCAGGCTTGTCC	60
S10	AACTATATGGCGCGAGGGCTCTCAGTCCTATTTCCATGCTGTGTTGGTTCAGGCTTGTCC	60

S9	CTCCACGGTCAGGGTTGTCTCCTCCCTTCCAGGTGCCTGCTGCACGCGGGGCTCTGCCCC	120
S10	CTCCACGGTCAGGGTTGTCTCCTCCCTTCCAGGTGCCTGCTGCACGCGGGGCTCTGCCCC	120

S9	AGGGCCTAGCCCAGGCAGCGAGCCTAACCCCGTTCCTCCTCCCTCTCTGTCTTGGACT	180
S10	AGGGCCTAGCCCAGGCAGCGAGCCTAACCCCGTTCCTCCTCCCTCTCTGTCTTGGACT	180

S9	CAGGGCACTTCCAAGACCTGCATCTTCTCACCAGGATGAACGTGCTGCTTTCCTGGCAGC	240
S10	CAGGGCACTTCCAAGACCTGCATCTTCTCACCAGGATGAACGTGCTGCTTTCCTGGCAGC	240

S9	TGATGCTTCTCCTTTGTGCCACCGCCTTCAGGGAGACACTGGAAAAGGTGGTGCATGG	300
S10	TGATGCTTCTCCTTTGTGCCACCGCCTTCAGGGAGACACTGGAAAAGGTGGTGCATGG	300

S9	AGAATCCTAGAACCACAGGTATGAGTTGTCTGGG	334
S10	AGAATCCTAGAACCACAGGTATGAGTTGTCTGGG	334

Figure 23: Nucleotide sequences and alignment between KISS1 alleles G and A G/A substitution at position 108 and alleles C and T C/T substitution at position 292

Characterisation of bovine heat shock protein 70 chaperon among native and crossbred cattle

Blood samples were collected from both Sahiwal (*Bos indicus*) and Frieswal (*Bos indicus* X *Bos taurus*) cattle breeds. PBMC cells were isolated and cultured. PBMC cells were given heat shock at 42°C in water bath. Genomic DNA was extracted and quality was assessed. Specific primers designed

for partial amplification of heat shock protein 70 (Hsp70) and in-vitro amplification of Hsp70 in both Sahiwal and Frieswal was conducted. Amplified products were individually cloned in pTZ57/R cloning vector and subjected for sequencing (Fig 24). Obtained sequences were subjected for alignment and the deduced amino acid sequences were subjected for obtaining protein structures (Fig 25 & 26).

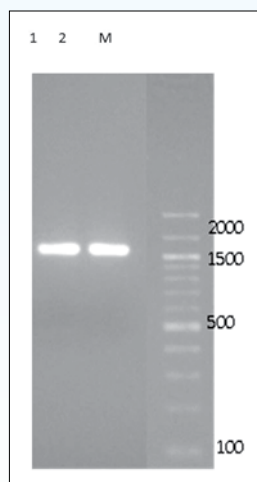


Figure 24: Gel electrophoresis to identify bovine HSP70 in Sahiwal and Frieswal cattle

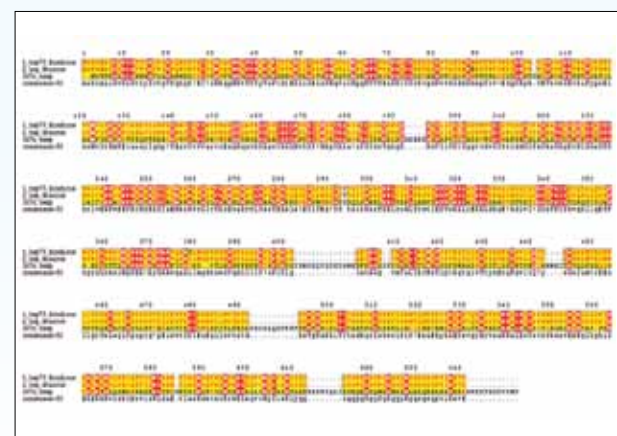


Figure 25: Amino acid residues alignment of Sahiwal Frieswal cattle HSP70

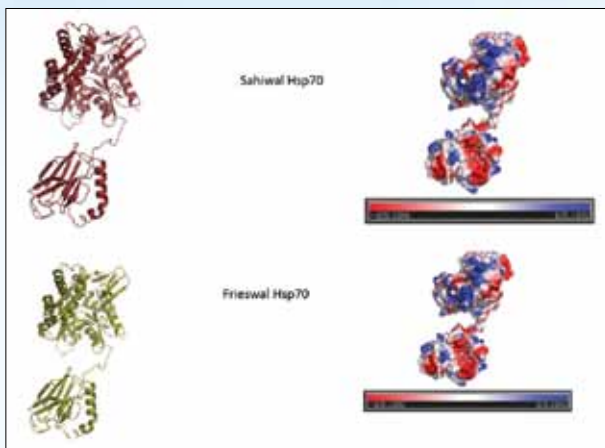


Figure 26: Comparative structure prediction of Sahiwal and Frieswal HSP70 protein

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

Developed the web portal named **SIReDAM** wherein primary data collected from various centres are stored in central place using Relational Database Concept (RDBMS) with accessing and editing privileges to stakeholders (Fig 27). This portal would act as primary database and providing analysis and visualization tools for management and genetic evaluation of cattle for sustainable livestock production. The portal has in-built analysis and visualization tools with high computing and data processing facility at back-end.

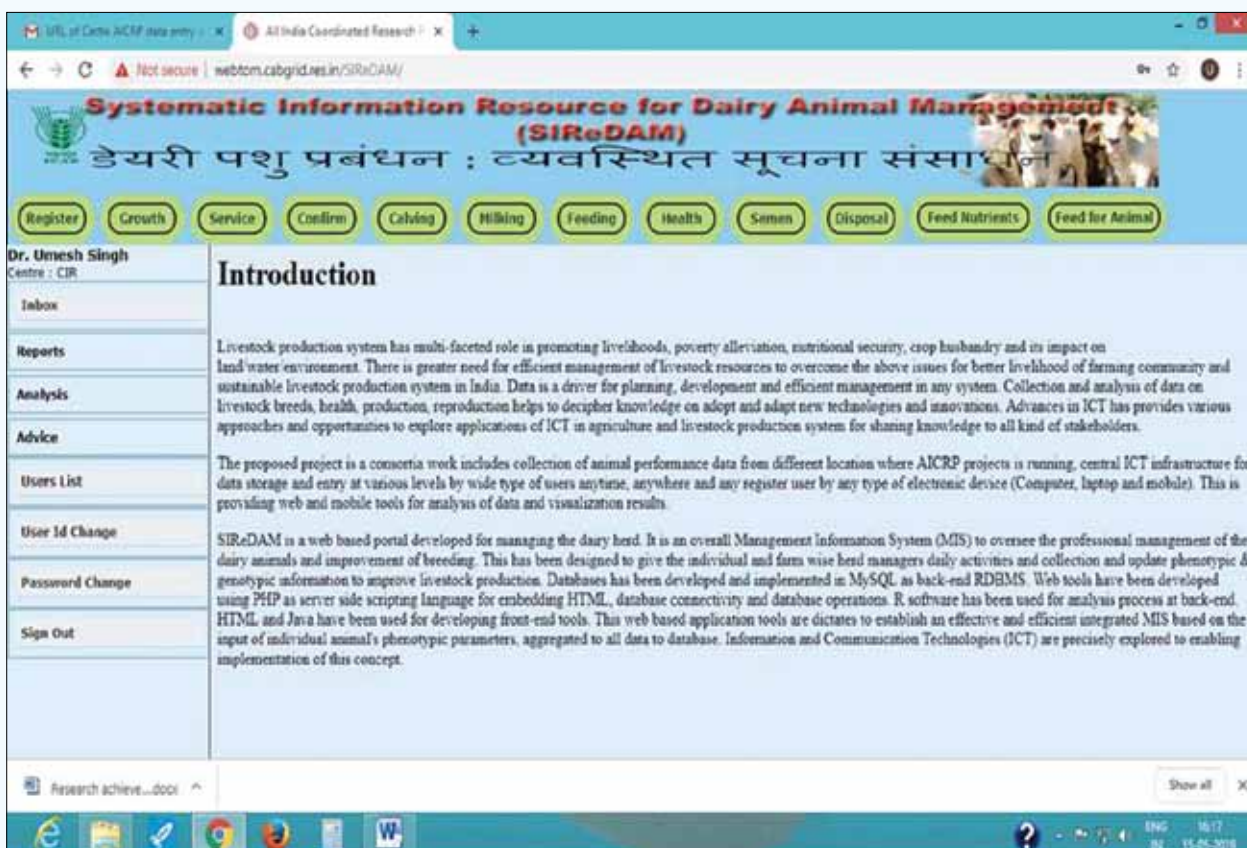


Figure 27: SIReDAM: A web server for phenotype and genotype analysis for cattle breeding management



IV. EXTERNALLY FUNDED PROGRAMMES

Identification of differentially expressed microRNAs in Sahiwal (*Bos indicus*) breed of cattle during thermal stress

MicroRNAs (miRNAs) are a class of small non-coding RNAs that play key roles in post transcriptional gene regulation that influence various fundamental cellular processes, including the cellular responses during environmental stresses. The investigation aimed to identify differentially expressed miRNAs during thermal stress in Sahiwal (*Bos indicus*) dairy cattle, adapted with tropical climate over a long period of time. Stress responses of the animals were characterized by determining various physiological as well as biochemical parameters and differential expression profile of major heat shock protein genes. Ion Torrent deep sequencing and CLC-genomic analysis identified a set of differentially expressed miRNAs during summer and winter seasons and most of the identified miRNAs were found to target

heat shock responsive genes especially members of heat shock protein (HSP) family (Fig 28). Real-time quantification-based analysis of selected miRNAs revealed that bta-mir-1248, bta-mir-2332, bta-mir-2478, and bta-mir-1839 were significantly ($p < 0.01$) over expressed while bta-mir-16a, bta-let-7b, bta-mir-142, and bta-mir-425 were significantly ($p < 0.01$) under expressed during summer in comparison to winter. The present study enlists differentially expressed miRNAs at different environmental temperatures in Sahiwal (*Bos indicus*) that may be important for further understanding the role of miRNAs on thermoregulatory mechanisms.

Database of Stressed Cattle miRNA

A comprehensive collaborative database (in collaboration with IIT-Roorkee) on the list of differentially expressed miRNAs in cattle during thermal stress has been developed (Fig 29).

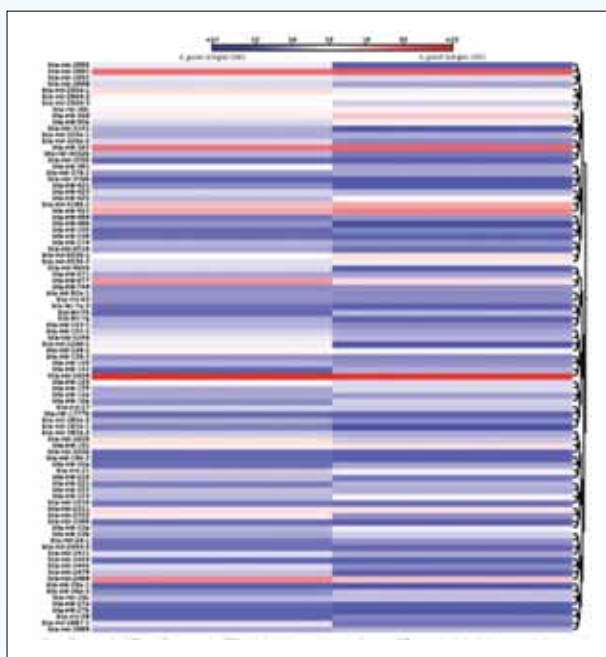
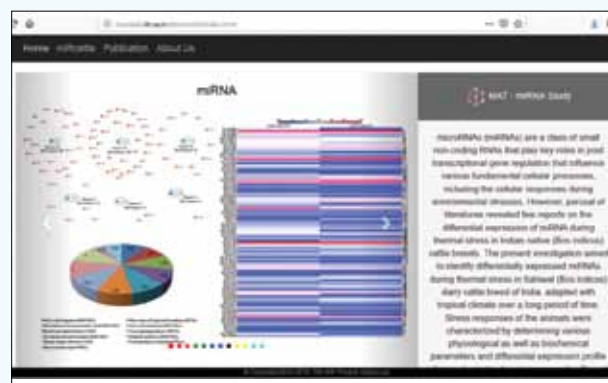


Figure 28: Heat map for differentially expressed miRNAs during winter (left) vs summer (right) in Sahiwal breed of cattle. The rows are centered using vector scaling and they are clustered using Euclidean distance and complete linkage. Intensity of the different colors indicates variation in the level of expression for a particular miRNA during winter vs summer seasons. Same or different color in both the column indicates null or maximum variation of expression levels, respectively. The columns are clustered using correlation distance and average linkage.



Database of Stressed Cattle miRNA

miRNA (Stressed)	Expression Values	Length	Count	Annotation
UUCGUCAGAAATGUCAGAAUC	23	1	1	bta-mir-127
UUAACUATTCCTTCGAAACCTGA	23	1	1	bta-mir-326
AACCGAATTCCTTCGAAACCTGA	23	1	1	bta-mir-198
AACCGAATTCCTTCGAAACCTGA	23	1	1	bta-mir-127
AACCGAATTCCTTCGAAACCTGA	23	1	1	bta-mir-127
AACCGAATTCCTTCGAAACCTGA	23	1	1	bta-mir-127
AACCGAATTCCTTCGAAACCTGA	23	1	1	bta-mir-127
AACCGAATTCCTTCGAAACCTGA	23	1	1	bta-mir-127
AACCGAATTCCTTCGAAACCTGA	23	1	1	bta-mir-127
AACCGAATTCCTTCGAAACCTGA	23	1	1	bta-mir-127
AACCGAATTCCTTCGAAACCTGA	23	1	1	bta-mir-127
AACCGAATTCCTTCGAAACCTGA	23	1	1	bta-mir-127
AACCGAATTCCTTCGAAACCTGA	23	1	1	bta-mir-127
AACCGAATTCCTTCGAAACCTGA	23	1	1	bta-mir-127
AACCGAATTCCTTCGAAACCTGA	23	1	1	bta-mir-127
AACCGAATTCCTTCGAAACCTGA	23	1	1	bta-mir-127
AACCGAATTCCTTCGAAACCTGA	23	1	1	bta-mir-127

Figure 29: Database on Stressed cattle miRNAs (MAT miRNA)



Comprehensive transcriptomics of Frieswal bull spermatozoa

RNA deep sequencing is one of the preferred tools for absolute quantification of messenger RNA and the study was intended to investigate the abundance of spermatozoal transcripts in categorized Frieswal (Holstein-Friesian X Sahiwal) crossbred bull semen through RNA deep sequencing. A total of 1546561 and 1019308 numbers of reads were identified among good and poor quality bull spermatozoa based on their conception rate and post mapping with *Bos taurus* reference genome identified 1,321,236 and 842,022 number of transcripts among good and poor quality RNA libraries, respectively. However, a total number of 3510 and 6759 functional transcripts were identified among good and poor quality bull spermatozoa, respectively (Fig 30-33). Most of the identified transcripts were related to spermatozoa functions, embryonic development and other functional aspects of fertilization. Wet laboratory validation of the top five selected transcripts (AKAP4, PRM1, ATP2B4, TRIM71

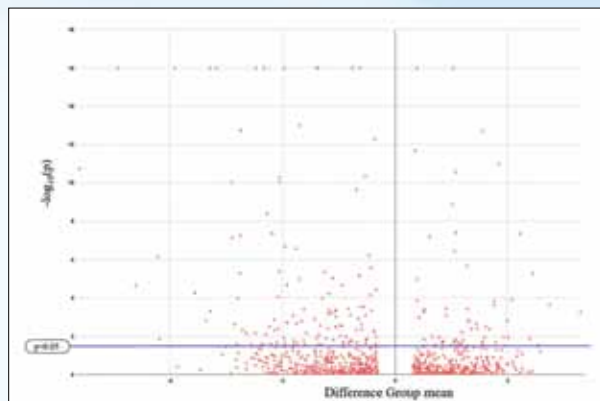


Figure 31: Volcano graph of p-values and difference group mean. This contains data of all 1216 transcripts of Frieswal bull spermatozoa. The data above the cut-off value shows differential expressed transcripts

and SLC9B2) illustrated the significant ($p < 0.01$) level of expression in the good quality crossbred bull semen than the poor quality counterparts. This comprehensive profiling of spermatozoal transcripts is a useful non-invasive tool to understand the causes as well as an effective way to predict male infertility in crossbred bulls.

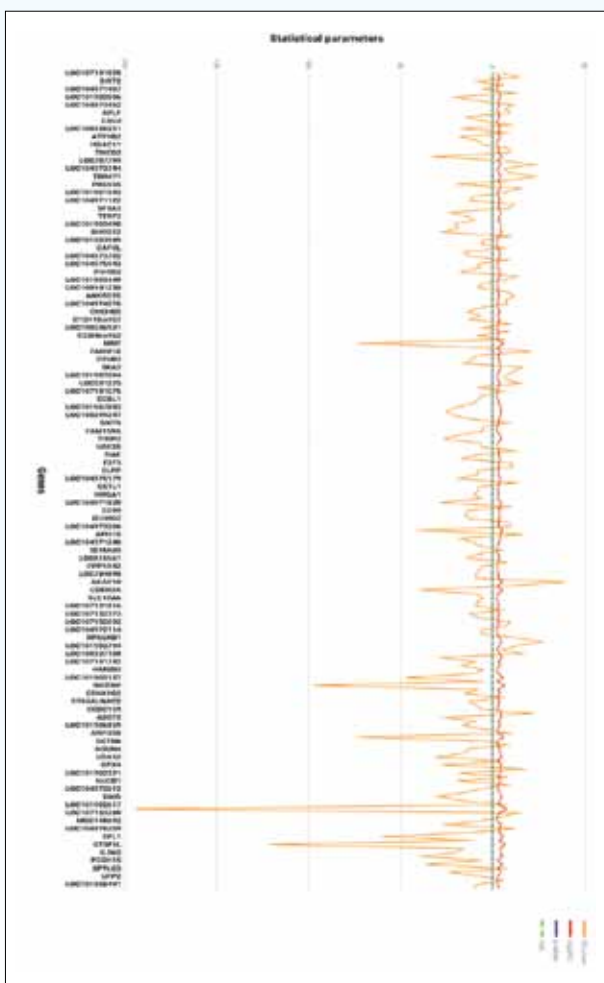


Figure 30: Differentially expressed transcripts with their corresponding normalized statistical values

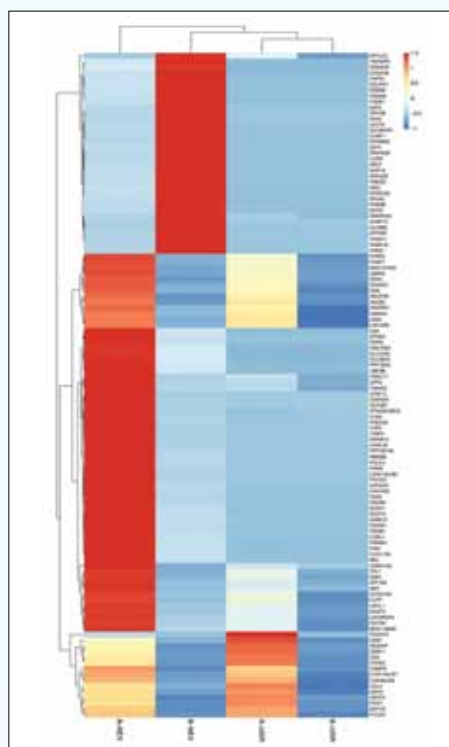


Figure 32: Heat map for differentially expressed transcripts among good (B) vs poor (A) fertile bull spermatozoa. There are total 116 rows, 4 columns. The rows are centered using vector scaling and they are clustered using Euclidean distance and complete linkage. The columns are clustered using correlation distance and average linkage. Here the B-NEV and A-NEV represent normalized expression values in good (B), poor (A) fertile bull spermatozoa respectively. B-UGR and A-UGR represent unique transcript reads for each transcript in good (B), poor (A) fertile bull spermatozoa, respectively.

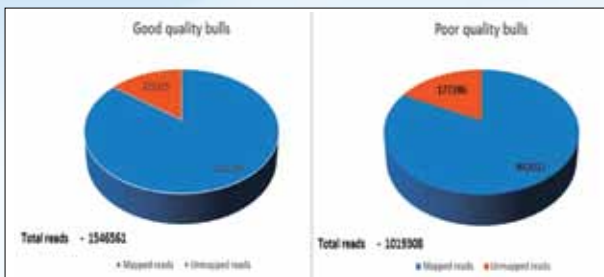


Figure 33: Distribution of mapped reads with *Bostaurus* genome among good and poor quality bull semen



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

The farmer FIRST Programme under the title “Livelihood Improvement through Sustainable Dairy Farming using Suitable Interventions” in three villages of Sardhana block of Meerut namely Jhitkari, Chhabadiya and Chandana villages and Mera Gao-Mera Gaurav (MGMG) activities in 20 villages reaching 863 households covering majority of small and marginal farmers with the objective of productivity enhancement of dairy based integrated farming system, Late variety wheat cultivation followed by sugarcane harvesting, fodder cultivation, diversified agriculture, mango orchard management with intercropping of mustard followed by pulse (Urad) and vegetables, honey bee keeping with diversified agriculture, scientific dairy herd management, technology demonstration like AI, estrus synchronization, ETT, clean milk production, mastitis prevention and control, milk processing and marketing, vermi-composting and livestock waste management, alongwith integrated farming.



Major activities:

Farmer-Scientist interface meeting was organized and seed distribution of late sowing



wheat variety was done to 63 farmers of different villages under Farmer First Programme & Mera Gaon Mera Gaurav.

Six infertility camps were organised with follow-up after 15 days covering 214 farmer households and 314 animals .



Exposure visit of 26 farmers to HAU and ICAR-CIRB, Hisar for awareness on advanced practices of scientific rearing of dairy animals.

Exposure visit of 56 farmers to Krishi Unnati Mela IARI, Pusa, New Delhi.

Economic gain analysis of 30 farmers of different villages adopted under farmer FIRST programme.

In Kisan Goshthi, 128 farmers were distributed with animal recording sheet, mineral mixture, dewormers, HB strong and other health tonics.

Kisan samman divas was conducted on 23-12-2018 where late sowing wheat variety was distributed to 119 farmers.



Water budgeting and enhancing water productivity in livestock based farming system (CRP on water, ICAR, New Delhi)

Water footprint assessment in Indigenous and Crossbred cattle

With the aim to assess water footprint in cattle, indigenous and crossbred cattle dairy farms adjoining to Meerut districts were selected. At indigenous cattle dairy farm (Fig 34A), Sahiwal, Gir, Kankrej, Tharparkar and Rathi breeds were

maintained, whereas, on crossbred cattle dairy farm (Fig 34B), the cows of Holstein Friesian X indigenous cattle were maintained. Buckets and water meters (magnetic) were used for recording of observations on water usage inside the animal sheds at both dairy farms. The observations were recorded on water utilization round the clock on different farm activities viz. drinking, floor cleaning, animal washing, feed preparation etc. in the dairy farm.

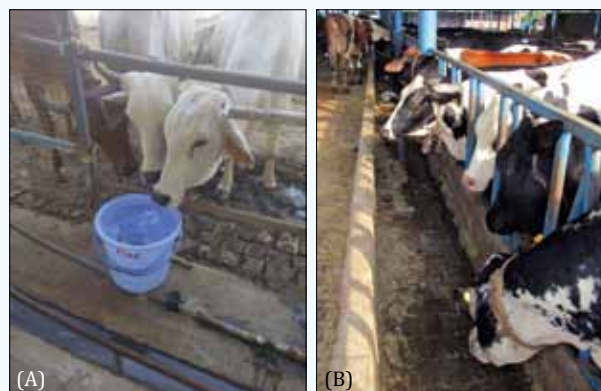


Figure 34: Recording of observations on water intake at indigenous (A) and crossbred (B) cattle farm

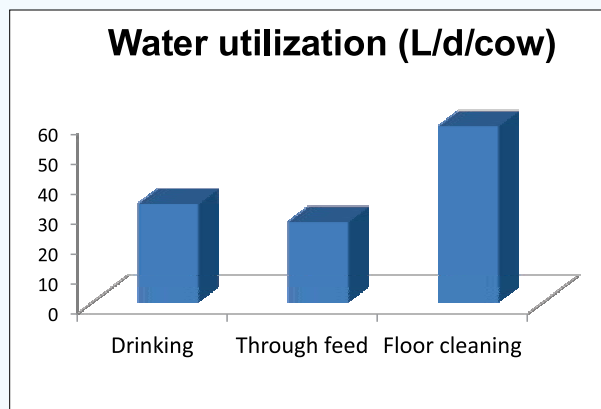


Figure 35: Water utilization pattern in indigenous cattle farm

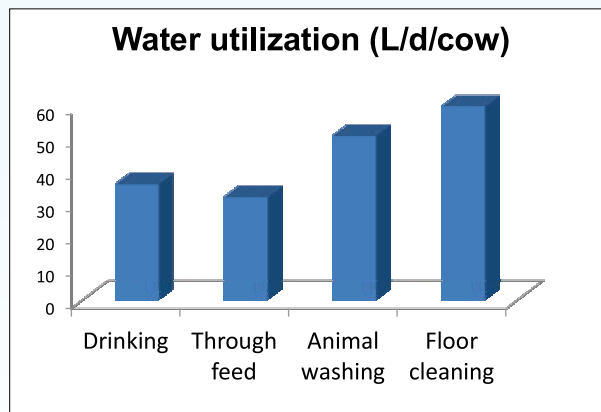


Figure 36: Water utilization pattern in crossbred cattle farm



Average daily milk yield from indigenous and crossbred cow was 4.68 and 8.39 litres, respectively. Average drinking water intake/cow/day in indigenous and crossbred dairy farm was 32.84 and 35.9 L, respectively (Fig 35 & 36). Indigenous and crossbred cows consumed 27.22 and 31.82 L water, respectively through feed and fodder daily. Almost similar quantity of water (58.6 and 60.0 L/head/d) was utilized for floor cleaning in indigenous and crossbred farm. It was observed that the indigenous cattle were washed only once in a month, however, the crossbred were washed daily due to soiling. When compared for washing, indigenous and crossbred cow was washed with 36.6 and 50.1 L water/ day, respectively. The results revealed that the water footprint of milk was larger in crossbred than indigenous cattle.

Water budgeting at Military Dairy Farm

The present study was conducted to assess water budgeting in Frieswal (79) and Sahiwal (25) dairy cattle production system during winter season at Military Dairy Farm, Meerut. Water meters (magnetic) were installed for recording of observations on water usage inside the cattle milking shed. The observations were recorded during floor cleaning twice daily. Daily average 61.06 L/animal water was utilized for cleaning of the shed. The water utilized in the morning and afternoon period was 30.78 ± 0.69 and 30.28 ± 0.53 L/animal/day, respectively in this shed for the same purpose. Average 25.97 L water was consumed daily by individual cow during that season. Water consumption (L) in the morning (13.09 ± 0.14) was comparatively higher than in the evening (12.88 ± 0.12).

Water budgeting under cooling strategy in Frieswal bull sheds during summer season

Effect of cooling strategy on water utilization was assessed in Frieswal breeding bulls during summer season. Ambient maximum & minimum temperature and relative humidity were comparable in fogger and shower groups (Fig 37 & 38). Average water utilized/bull/day was 35.67 and 243.83L in fogger and shower group, respectively.

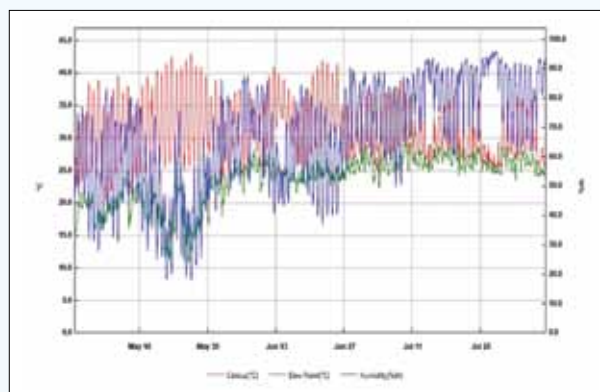


Figure 37: Temperature, RH and dew point inside bull shed with arrangement of fogger system

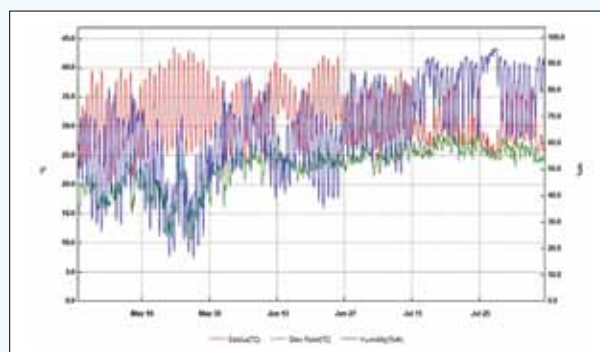


Figure 38: Temperature, RH and dew point inside bull shed with arrangement of shower system

TECHNOLOGIES/ METHODOLOGIES/ CONCEPTS

Identification of Functional Internal Ribosomal Entry Sites (IRES) at Bovine Heat Shock Protein 90. **The Patent Office Journal No. 02/2019, dated 11/01/2019, Page No. 1129.**

EXTENSION ACTIVITIES

Mera Gaon Mera Gaurav Initiative

The initiative Mera Gaon Mera Gaurav (My Village My Pride) has been implemented in 22 selected villages around Meerut by ICAR–Central Institute for Research on Cattle, Meerut Cantt. for facilitating direct interface of scientists with the farmers to provide technological inputs, knowhow, knowledge and advisories on regular basis. For reaching to the farmers all the scientists have been involved by making four core groups of 5-6 scientists each involving multi disciplinary and heterogeneous subject matter specialists led by a senior member with one member secretary to regularly interact with the farmers and make them acquainted with newer innovative agricultural and allied technologies, farm practices and scientific methods in agriculture, animal husbandry, dairying and other related fields like conservation agriculture, climate smart agriculture, water harvesting and moisture conservation, diversified agriculture, integrated farming system, importance of quality germplasm and conservation, multiplication and upgradation of germplasm of their livestock, waste management and vermi-composting. The post harvest technologies and processing and value addition using secondary agriculture were also focused during the interactions.

The government sponsored farmers oriented schemes like Pradhanmantri Sichai Yojana, Soil Health Cards, Fasal Bima Yojana, Rastriya Gokul

Mission, Kamdhenu Yojana, Desi Gaay Sanrakshan Avam Samvardhan, Swachh Bharat Abhiyan, Kisan gosthies are being popularized and highlighted in these villages.

The clinical health camps for addressing the infertility in farm animals, health examination, treatment and deworming and other animal related activities were undertaken during the camps. Importance of vaccination, deworming, good nutrition, health and hygiene, superior germ plasm for genetic improvement, artificial insemination, quality semen and reproduction management including timely insemination, estrus detection, source of semen and precautions during artificial insemination were also discussed and demonstrated.

The collaborative programmes with state Government, IIFSR and public enterprisers were also organised for clean milk production and dugdh utpadak gosthies were organized to sensitize the farmers for increasing the productivity and quality as well as value addition of their produce to enhance their income from the farm.

Mera Gaon Mera Gaurav initiative was also highlighted during Kisan Mela/ Krishi Unnati Mela/ State Govt. organised Kisan Sammelan etc. Institute had reached to more than one thousand farmers through direct interactions, interface, follow-ups and distributed the farmer oriented technical information through pamphlets, literature etc.



Participation in different Kisan Melas and Exhibitions

S. No.	Name of the exhibition	Organised by	Venue	Duration
1	All India Farmers' Fair and Agri-Industrial Exhibition-2018	Sardar Vallabhbhai Patel University of Agriculture and Technology, Modipuram, Meerut	Sardar Vallabhbhai Patel University of Agriculture and Technology, Modipuram, Meerut	Oct. 12-14, 2018
2	Virat Kisan Mela-2018	Department of Agriculture, Uttar Pradesh	Samrat Prithviraj Degree College, Baghat	Dec. 21-23, 2018
3	Krishidham Expo-2019	ICAR-CPRI, Shimla	ICAR-CPRI Centre Modipuram, Meerut	Feb. 15-17, 2019
4	XIV th ASC India Expo-2019	ICAR-IARI, New Delhi	ICAR-IARI Campus, Pusa, New Delhi	Feb. 20-23, 2019

TV TALK at DD Kisan

S.No.	Title	Name of the Scientist	Date of Recording
1	गोवंश संरक्षण हेतु विचार विमर्श कार्यक्रम	Dr. Umesh Singh	August 16, 2018

RADIO TALK on AIR, Nazibabad

S. No.	Title	Name of the Scientist	Date of Recording
1	पशुओं में कृत्रिम गर्भाधान क्यों व कैसे	Dr. Umesh Singh	July 9, 2018
2	पशुओं में मुँह पका रोग एवं उसका नियंत्रण	Dr. Ravinder Kumar	August 30, 2018
3	दुधारू पशुओं हेतु शीतकाल में संतुलित चारा प्रबंधन	Dr. Pramod Singh	November 20, 2018



Radio School Programme

All India Radio, Nazibabad broadcasted a series of 26 radio talks on different aspects of cattle production under radio school programme for the benefit of farmers and stakeholders residing in far flung areas from February 19, 2019 to March 13, 2019. The details of the radio talks are as below:

S. No.	Topic of talk	Delivered by	
1	उत्पादन बढ़ाने हेतु पशु पोषण की नवीनतम तकनीकियाँ	Dr. N.V. Patil	
2	केन्द्रीय गोवंश अनुसंधान संस्थान का परिचय एवं गोवंश विकास में भूमिका	Dr. Rajendra Prasad	
3	दुधारू पशुओं का उचित खानपान		
4	संकर नस्ल का हिमीकृत वीर्य का उत्पादन		
5	ए.आई.सी.आर.पी. परियोजना द्वारा देशी नस्लों का सुधार एवं विकास .	Dr. Umesh Singh	
6	दूध पदार्थों में मूल्य संवर्धन	Dr. Vinod Kumar	
7	पशुओं में प्रजनन संबंधी समस्याएँ एवं निदान .	Dr. Suresh Kumar Dhoop Singh	
8	भ्रूण प्रत्यारोपण तकनीकी द्वारा गोवंश का सुधार		
9	कृत्रिम गर्भाधान तकनीक की समस्याएँ एवं समाधान		
10	फ्रीजवाल परियोजना	Dr. Sushil Kumar	
11	प्रक्षेत्र संतति परीक्षण परियोजना	Dr. A.K. Das	
12	पशुपोषण में खनिज लवणों का महत्व	Dr. Pramod Singh	
13	डेरी फार्म पर नवजात बच्चों की देखभाल	Dr. A.S. Sirohi	
14	दुधारू पशुओं का प्रबंधन एवं देखभाल		
15	मौसम के कुप्रभाव से पशुओं के बचाव हेतु उचित आवासीय व्यवस्था		
16	पशु अनुसंधान कार्य एवं भविष्य की चुनौतियाँ	Dr. Ravinder Kumar	
17	सफलतापूर्वक व्यावसायिक डेरी की स्थापना एवं संचालन		
18	केन्द्रीय गोवंश अनुसंधान संस्थान द्वारा किसानों को उपलब्ध कराये जाने वाली विकसित तकनीकियाँ, उत्पाद एवं परामर्श सेवाएँ		
19	हरे चारे की मुख्य फसलें एवं उनका वर्ष भर उत्पादन चक्र		
20	केंचुआ खाद: एक अतिरिक्त आय का साधन तथा डेरी फार्म पर अवांछित पदार्थों का प्रबंधन		
21	पशुपालन में बैंक ऋण तथा डेरी परियोजनाओं की जानकारी		
22	किसान संवाद कार्यक्रम		
23	थनैला रोग की समस्या का कारण एवं निदान		Dr. Naimi Chand
24	गोवंश की मुख्य बीमारियाँ और निदान		
25	मेरा गाँव मेरा गौरव पहल के अंतर्गत संस्थान के कार्यकलाप		Dr. Naresh Prasad
26	पशुधन में जैवप्रौद्योगिकी का योगदान	Dr. Rajib Deb	

TRAINING AND CAPACITY BUILDING

Staff of the Institute attended various training programmes organised by different organizations to update their knowledge on different aspects including science and technology, administration and financial management. The details of the training programmes / conferences / meetings attended by the staff are given below:

S. No.	Name	Particulars of training/ conference/ seminar/ workshop	Duration	Venue
International				
1	Dr. Rajib Deb	Advanced Research and Training under TWAS Fellowship- 2017, Italy	Feb 01-Jun 30, 2018	Universidade Federal de Goias, Goiania, Brazil
National				
1	Dr. Umesh Singh	Meeting of Expert Committee on costing and Distribution of bulls produced under NDP-1	April 04, 2018.	DADF, GOI
2	Dr. Suresh Kumar DS Dr. A. S. Sirohi Dr. Ravinder Kumar	National Conference on "Small holders livestock producers' in India: Opportunities and Challenges" and XXV Annual Convention of Indian Society of Animal Production and Management	April 11-13, 2018	SDAU, Sardarkrushinagar, Gujarat
3	Sh. Harish Ram	भाकृअनुप में राजभाषा प्रबन्धन एवं नई दिशाएं	Apr. 24-25, 2018	ICAR-CRIDA Hyderabad (TS)
4	Dr. Ravinder Kumar	National Symposium on New paradigm in veterinary medical research and management of laboratory and farm animals: scientific, ethical and welfare perspectives (LASAICON-2018)	April 28-29, 2018	Department of Animal Husbandry (Govt. of UP), Lucknow .UP
5	Dr. S.K. Verma	Nutritional perspectives for augmenting animal productivity: An approach to double farmer's income	Jul 23-Aug 01, 2018	CoVS& AH, ND Vety Science University, Jabalpur
6	Dr. Sushil Kumar	Intellectual Property Valuation & Technology Management	Aug 24-28, 2018	ICAR-NAARM Hyderabad (TS)
7	Dr. Pramod Singh Dr. A. S. Sirohi	National Workshop on "Sustaining Animal Food Systems"	September 06, 2018.	ICAR-IVRI, Izatnagar (UP)
8	Dr. Rajendra Prasad Dr. Umesh Singh Dr. Sushil Kumar	Brainstorming workshop on Genomic selection and its implementation in India: The way forward:	September 17, 2018	ICAR-IVRI, Izatnagar
9	Dr. Umesh Singh Dr. Sushil Kumar Dr. A K Das Dr. T V Raja Dr. Rajib Deb Dr. Amod Kumar	17 th AICRP Annual Review Meet	October 12, 2018	ICAR-CIRC, Meerut
10	Dr. Siddhartha Saha Dr. Y.K. Soni	Socio-economic impact assessment of research programmes	Oct 25-27, 2018	ICAR-NAARM Hyderabad (TS)
11	Mrs. Pushpa	Enhancing efficiency and behavioral skills	Oct 25-31, 2018	ICAR-NAARM Hyderabad (TS)



12	Dr. Rajendra Prasad Dr. Umesh Singh	Brain storming session on Breeding Strategies for a Sustainable Cattle Production: Way Forward	November 02, 2018	ICAR-NDRI, Karnal
13	Sh. Manoj Nehra	Refresher course on Establishment and Financial Management for section officers of ICAR and Institutes	Nov 15-20, 2018	CPCRI, Shimla by ICAR-NAARM Hyderabad (TS)
14	Dr. Sanjeev Kumar Verma	XI Biennial Conference (ANACON 2018)	November 19-21, 2018	Bihar Animal Science University, Patna
15	Dr. Umesh Singh Dr. Sushil Kumar	Interactive meet on Characterization and Registration of Animal Genetic Resources	December 03, 2018	NASC Complex New Delhi
16	Dr. Sushil Kumar	3 rd KRISHI Nodal Officers' Workshop on Dec 4-5, 2018 at New Delhi.	December 3-4, 2018.	NASC Complex/ IASRI, New Delhi
17	Sh. Harish Ram Sh. N.S. Saini	Refresher course on Establishment and Financial Management for section officers of ICAR and Institutes	Dec 10-14, 2018	NIASM, Baramati by ICAR-NAARM Hyderabad (TS)
18	Dr. Rajendra Prasad Dr. Shrikant Tyagi Dr. Umesh Singh Dr. Sushil Kumar Dr. A.K. Das Dr. Pramod Singh Dr. S.K. Verma Er. Rajeev Verma Sh. S.K. Sharma Sh. A.K. Sharma Sh. D.S. Verma, Sh. Rajnish Kumar Sh. Om Prakash Agarwal Sh. Manoj Nehra Sh. Vikas Kumar	Workshop cum training programme on Internal Auditors under ISO 9001:2015	Dec. 10-11, 2018	ICAR-CIRC, Meerut by M/s Quality Consultants, Gurugram
19	Dr. A. S. Sirohi	International Conference on "Climate Change, Biodiversity and Sustainable Agriculture"	December 13-16, 2018	AAU, Jorhat, Assam
20	Dr. Suresh Kumar Dr. Naimi Chand Dr. Y. K. Soni	XXXIV annual convention of ISSAR and international symposium on "Productivity enhancement through augmenting reproductive efficiency of livestock for sustainable rural economy"	December 28-30, 2018.	COVS, AAU, Anand
21	Dr. Umesh Singh Dr. Rajib Deb	Consultative meeting on Development of Roadmap on Genomic selection on Cattle and Buffaloes and Modalities for National Genetic Evaluation System (NGES)	January 18-19, 2019	NASC Complex, New Delhi
22	Dr. A. S. Sirohi	National Conference on "Innovations in Animal Production for Sustainability and Doubling Farmers Income & XXVI Annual Convention of the Indian Society of Animal Production and Management	January 23-25, 2019	COVAS, Mannuthy, KVASU, Kerala
23	Dr. Umesh Singh Dr. A K Das Dr. Amod Kumar	XVI National Symposium on Animal Genetic Resources for Food and Social Security (SOCDAB)	February 07-08, 2019	ICAR-NBAGR, Karnal
24	Dr. Ravinder Kumar	Krishidham Expo-2019	February 15-17, 2019	ICAR-CPRI Centre Modipuram, Meerut



25	Dr. Ravinder Kumar	XIV Agricultural Science Congress- 2019 on Innovations for Agricultural Transformation, New Delhi	February 20-23, 2019	National Agricultural Science Complex, New Delhi`
26	Sh. Kailash Sh. Dungar Singh Sh. Jitendra Giri Sh. Mohan Chandra Sh. Umesh Kaushik Sh. Veer Pal Singh Sh. Sunil Kumar Smt. Neerja Joshi	Basic computer operation	Mar 13-14, 2019	ICAR-CIRC, Meerut
27	Dr. Srikant Tyagi Dr. Sushil Kumar Dr. Pramod Singh Dr. TV Raja Dr. Naimi Chand Dr. Rajib Deb	Group discussion on “use of modern biotechnological tools for detection of genetic disorders and purity testing of livestock produce”	Mar. 23, 2019	ICAR-CIRC, Meerut

HRD budget provision and expenditure during 2018-19 (in lakh): Provision (RE): Rs.4.00 Lakh, Expenditure: Rs.3.998 Lakh

Seminars / Trainings organized

S. No.	Name of the training	Venue and Date	Course Director/ Organizing Secretary
1	MANAGE sponsored Certified Livestock Advisor Programme on Sustainable Dairy Production to Improve Farm Economy	ICAR-CIRC, Meerut September 11-25, 2018	Dr. S K Verma
2	National Productivity Week-2019 and National Productivity Day was celebrated on the theme of NPW-2019 “Circular Economy for Productivity and Sustainability”	ICAR-CIRC, Meerut Feb. 12-18, 2019	Dr. Ravinder Kumar
3	One day training programme on “Commercial dairy farming for enhancement of productivity” for progressive dairy farmers and scientific staff	ICAR, CIRC, Meerut, Feb. 15, 2019	Dr. Ravinder Kumar
4	ATMA, Muzaffarnagar sponsored Farmers’ Training Programme	ICAR-CIRC, Meerut, Feb. 27, 2019	Dr. S K Verma
5	ATMA, Muzaffarnagar sponsored Farmers’ Training Programme	ICAR-CIRC, Meerut, Feb. 28, 2019	Dr. S K Verma
6	RAWE Training cum visit for student of B.Sc. (Ag) class of CSSS (PG) college, Machhara	ICAR-CIRC, Meerut, Mar. 14, 2019	Dr. Ravinder Kumar

DISTINGUISHED VISITORS

S. No.	Name of the Visitor	Date of Visit
1	Dr. Tarcisio da Cruz Mesquita Hon'ble Min. of Agriculture and Livestock Bele, State of Para, Brazil	11.01.2019
2	DDG (MF) IHQ of MoD (Army)	18.07.2018
3	Prof. Gaya Prasad Hon'ble Vice Chancellor SVPUAT, Meerut	28.02.2019

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, 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 scientists of the Institute guided the research works of the students as co-chairman/ member of the students research advisory committee. The library facilities were extended

to the faculty and students of local Institutions. Several trainees/ students from neighbouring Institutions like COAEHS, CCSU 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, IIT-Roorkee, SHUATS, Allahabad etc.

INSTITUTE TECHNOLOGY MANAGEMENT UNIT (ITMU)

During this year 2018-19, Institute Technology Management Committee Meeting was held on Sep. 26, 2018 to discuss the issues related with price fixation of the technologies developed and other routine works under the chairmanship of Dr. Rajendra Prasad, Director, CIRC, Meerut. During the year, complete specification of IRES was filed and two early publication requests were filed. Process for technology validation has been started and is in progress with Punjab Biotechnology Incubator, Mohali Chandigarh. Two technology inventory Bulletin were prepared and published.





Two technology inventories were published in the form of pamphlets.



Students, farmers and other para-vet visiting the institute were provided with latest technology information developed by the institute and other ICAR institutes for livestock application.

RIGHT TO INFORMATION ACT 2005

दिनांक 01.04.2018 से 31.03.2019 तक जनसूचना अधिकार अधिनियम-2005 के अंतर्गत ऑनलाईन/ऑफलाईन मांगी गई सूचना का विवरण:

क्र.सं.	कुल प्राप्त ऑनलाईन/ऑफलाईन मांगी गई आर.टी.आई. सूचना	कॉलम 2 में से कुल प्राप्त ऑफलाईन मांगी गई आर.टी.आई. सूचना	भा.कृ.अ.प.,नई दिल्ली के माध्यम से मांगी गई कुल प्राप्त ऑनलाईन आर.टी.आई. सूचना	कितनों के जवाब दिए गए/निपटान किया गया	संस्थान में प्राप्त ऑफलाईन आर.टी.आई. की आई.पी.ओ. के रूप में जमा फीस	कुल प्राप्त भा.कृ.अ.प., नई दिल्ली को भेजी गई ऑनलाईन/ऑफलाईन मांगी गई आर.टी.आई. सूचना की फीस
1	10	03	07	10	रु. 30.00 कुल आर.टी.आई. संख्या-03	रु. 100.00

RESEARCH PROJECTS

The following research projects were in operation during the year 2018-19

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/IX04334/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 3. Dr. A.S. Sirohi 4. Dr. Rani Alex 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
	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
Inter Institutional 77	4	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 2. Dr. Rani Alex (Co-Opted) 3. Dr. KS Murthy -JAU 4. Dr. BS Rathod-SDAU
	5	Purification and characterisation of bovine heat shock protein 70 chaperon among native and crossbred cattle	AGB/IP/IXX13725/RD/(1/10/2017 To 31/03/2020)	(1/10/2017 To 31/03/2020)	Dr. Rajib Deb	1. Dr. Yogesh Kumar Soni 2. Dr. Sougata Hazra-IIT Roorkee
Institutional	6	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
	7	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. Rani Alex
	8	Genetic evaluation of Frieswal cows using different lactations yield	AGB/IP/IXX13833/SK/(1/10/2017 To 31/03/2020)	(1/10/2017 To 31/03/2020)	Dr. S.K. Rathee	1. Dr. A.K. Das 2. Dr. Ravinder Kumar (Co-opted)



Project type	S. No.	Project title	Project ID (PIMS)	Period	PI	Co-PIs
	9	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)	(1/10/2012 To 31/3/2019)	Dr. Pramod Singh	1. Dr R. Prasad
	10	Micronutrient status in the feeds and effect of dietary supplementation on growth and semen quality of Frieswal bull calves	AN/IP/OXX02836/PS/ (9/10/2014- 31/3/2018)	(1/10/2014 To 31/3/2018)	Dr. Pramod Singh	1. Dr R. Prasad
	11	Assessment of Nutritional status of cattle in Meerut district through biochemical parameters	AN/IP/IXX13724/SK/ (1/10/2017- 31/3/2020)	(1/10/2017 To 31/03/2020)	Dr. SK Verma	1. Dr. Rajendra Prasad 2. Dr. J.K. Singh
	12	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)
	13	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)
	14	Use of Assisted Reproductive Technologies for Genetic Improvement and Propagation of Elite Cattle	AP/IP/IXX12962/SKDS/ (7/10/2016 - 31/3/2019)	(7/10/2016 To 31/3/2019)	Dr. Suresh Kumar D.S.	1. Dr S. Saha 2. Dr. Rajib Deb (Co-Opted)
	15	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 4. Dr. AS Sirohi (Co-Opted)
	16	Androgen and their relation with sexual behaviour and seminal attributes in bulls at CIRC-BRU.	AP/IP/...../ JK/(1/10/2017- 31/03/2020)	(1/10/2017 To 31/03/2020)	Dr. J.K. Singh	Dr. Suresh Kumar (Co-Opted) 2. Dr. S. Saha (Co-Opted) 3. Dr. YK Soni 4. Dr. Megha Pandey (Co-Opted) 5. Dr. Naimi Chand (Co-Opted)
	17	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 (Co-Opted)



Project type	S. No.	Project title	Project ID (PIMS)	Period	PI	Co-PIs
	18	Studies on heavy metal status, their effects on biochemical profile and semen quality in cattle	SFL/IP/IXX12033/NM/ (3/10/2015-30/9/2018)	(3/10/2015 To 30/9/2019)	Dr. Naimi Chand	1. Dr S. Tyagi
Externally funded	19	Cataloging of miRNA transcripts during thermal stress and their crosstalk with heat shock protein 70 mRNA in cattle (Funded by : SERB,DST,GOI Budget: 21.40 Lakhs)	AGB/Ext-DST/OXX03250/RD/ (20/11/2015-19/11/2018)	20/11/2015 To 19/11/2018	Dr. Rajib Deb	NA
	20	Livelihood Improvement through Sustainable Dairy Farming using Suitable Interventions (Farmer FIRST Programme) (Funded by: ICAR Budget: 82.40 Lakhs)	APY/Ext- Funded/ OXX03793/SK/ (05/04/2017 To 31/03/2018)	05/04/2017 To 31/03/2019	Dr. Suresh Kumar D.S.	1. Dr. S. Saha 2. Dr. Naresh Prasad 3. Dr. Naimi Chand 4. Dr. Yogesh Kumar 5. Dr. Megha Pandey 6. Dr. JP Dabas
	21	Water budgeting and enhancing water productivity in livestock based farming system (Funded by: ICAR Budget: 60.00 Lakhs)	SFL/EXTFUND/ OXX03230/MK/ (3/8/2015 To 31/3/2018)	3/8/2015 To 31/3/2020	Dr. A.S. Sirohi	1. Dr. R. Prasad 2. Dr. S. Saha
	22	Dynamics of circulatory micro RNA profile among motile and impaired bull spermatozoa (Funded by :SERB,DST,GOI Budget: 42.98 Lakhs)	AGB/Ext-DST/..... (25/7/2016 To 24/10/2019)	25/7/2016 To 24/10/2019	Dr. Rani Singh	Dr. Rajib Deb
	23	Combating carbapenem resistant enterobacteriace in animal farm: using combinatorial approach of conventional therapeutics and theranostic nano medicine (Funded by SPARC,MHRD, GOI Budget:110.00 Lakhs)	AGB/Ext-SPARC/..... (01/02/2019 To 31/01/2021)	01/02/2019 To 31/01/2021	Dr. Saugata Hazra, IIT-Roorkee	Dr. Rajib Deb
	Service Project	24	Value addition in dung waste through Vermi culture	SFL/ISP/IXX13473/ MK/06/07/15 to continuing)	06-07-2015 to continued	Sh. C.P. Singh
25		Screening for genetic diseases in Frieswal and Indigenous bulls	AGB/IP-SP/IXX12180/ RRA	01-10-2014 to continued	Dr. Rajib Deb	
26		Quality assessment of Frieswal bull semen	SFL/IP-SP/IXX10465/ SKDS)	01-06-2013 to continued	Dr. Naimi Chand	

PUBLICATIONS

Research Articles

1. Alyethodi R R, Singh U, Kumar S, Alex R, Deb R, Sengar G S, Raja TV, Prakash B. 2018. T-ARMS PCR genotyping of SNP rs-445709131 using thermostable strand displacement polymerase. *BMC Research Notes*. 11:32. doi:10.1186/s13104-018-3236-6.
2. Chand N, Sirohi A S and Tyagi S. 2018. Autohemotherapy for management of cutaneous papillomatosis in a bull. *Intas Polivet*. **19(1)**: 96-97.
3. Kumar S, Pande M, Sirohi A S, Soni Y K, Tyagi S, Kumar M and Arya S. 2018. Supplementation of Butylated Hydroxytoluene (BHT) Reduces Oxidative Stress and Improves Quality of Frozen-Thawed Frieswal Bull Spermatozoa. *International Journal of Livestock Research*. **8(11)**: 315-320.
4. Kumar S, Alex R, Gaur G K, Mukherjee S S, Mandal D K, Singh U, Tyagi S, Kumar A, Das A K, Deb R, Kumar M, Sirohi A S, Chand N, Prasad R, Bhasin V, Prakash B, Kashyap S (2018) Evolution of Frieswal cattle: A crossbred dairy animal of India. *The Indian Journal of Animal Sciences*. **88(3)**:265-275.
5. Pande M, Srivastava N, Kumar S, Soni Y K, Kumar M, Tyagi S, Sirohi A S, Chand N, Omerdin and Arya S. 2018. 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*. doi: 10.18805/ijar.B-3565.
6. Prasad N, Kumar S, Pande M, Soni Y, Saha S, Chand N and Arya S. 2019. Socioeconomic Status and Problems Faced by Dairy Farmers of Sardhana Block of Meerut District. *International Journal of Livestock Research*. **9(4)**: 49-57.
7. Raja T V, Rathee S K, Kumar R, Alex R, Kumar S, Singh U, Das A K and Prakash B. 2018. Modelling of the first lactation milk yield of Frieswal cows using different mathematical functions. *Indian Journal of Animal Sciences*. **88(5)**: 593-597.
8. Raja T V, Kumar R, Rathee S K, Prakash B and U Singh. 2018. Effect of certain factors on first lactation peak yield and days to attain peak yield in Frieswal cattle. *Indian Journal of Animal Sciences*. **88(1)**: 125-127.
9. Sengar G S, Deb R, Singh U, Junghare V, Hazra S, Raja T V, Alex R, Kumar A, Alyethodi R R, Kant R, Jakshara S and Joshi C G. 2018. Identification of differentially expressed microRNAs in Sahiwal (*Bos indicus*) breed of cattle during thermal stress. *Cell Stress and Chaperones*. **23(5)**: 1019-1032.
10. Singh R, Junghare V, Hazra S, Singh U, Sengar G S, Raja T V, Kumar S, Tyagi S, Das A K, Kumar A, Koringa P, Jakhesara S, Joshi C G and Deb R. 2019. Database on spermatozoa transcriptogram of categorised Frieswal crossbred (Holstein Friesian X Sahiwal) bulls. *Theriogenology*. **15**: 130-145.
11. Singh R, Sengar G S, Singh U, Deb R, Junghare V, Hazra S, Kumar S, Tyagi S, Das A K, Raja T V and Kumar A. 2018. Functional proteomic analysis of crossbred (Holstein Friesian X Sahiwal) bull spermatozoa. *Reproduction in Domestic Animals*. **53(3)**: 588-608.
12. Singh S, Chakraborty D and Das A K. 2018. Factors Affecting First Lactation Production Efficiency Traits of Frieswal Traits. *International Journal of Advanced Biological Research*. **8(2)**: 231-233.
13. Soni Y K, Kumar S, Saha S, Pande M, Prasad R, Singh J K, Verma S K and Bansal V K. 2018. Oestrus induction and fertility response in anoestrus Frieswal heifers subjected to various treatments. *International Journal of Livestock Research*. **8(2)**: 146-152.
14. Srivastava N, Pande M, Raja T V, Tyagi S, Kumar S, Kumar S, Kumar R, Sirohi A S, Chand N, Arya S, Kumar A and Din O. 2018. Prognostic value of post thaw semen quality parameters, mitochondrial integrity and cholesterol content of sperm membrane vis-à-vis conception rate in Frieswal bulls. *Indian Journal of Animal Sciences*. **88(8)**: 892-898.



Book chapters

1. Sirohi A S, Chand N and Tyagi S. 2019. Role of antimicrobial resistance in dairy cattle production system. In: George S, Suraj P T, Harikumar S and Sunilkumar N S. eds., Innovations in Animal Production for Sustainability and Doubling Farmers Income & XXVI Annual Convention of the Indian Society of Animal Production and Management. Thrissur, Kerala, ISBN 978-81-937921-0-0.

Books / Monograph

1. Singh U, Alex R, Raja T V, Alyethodi R R, Kumar S and Prakash B. 2018. Livestock Breeding from Concept to Application. Indian Council of Agricultural Research, DKMA, Pusa New Delhi. ISBN: 978-81-7164-178-9.

Technical bulletins

1. Alyethodi R R, Singh U, Kumar S, Alex R, Deb R, Sengar G S and Prakash B. 2018. Development of a single Tube PCR Assay for Rapid Detection of Bovine Complex Vertebral Malformation (CVM) carrier. CIRC Technology Inventory # 3.
2. Deb R, Sengar G S, Raja T V, Singh U and Kumar S. 2018. Development of a Bovine heat shock protein 90 Internal Ribosomal Entry Site (IRES) based Expression Vector-Pbbsp90IRES. CIRC Technology Inventory # 4.

Training manual

1. Sirohi A S, Chand N, Deb R, Verma S K, Tyagi S, Saha S, Soni Y K, Sharma A and Arya S. 2018. Training manual of MANAGE sponsored Certified Livestock Advisor Programme on "Sustainable Dairy Production to Improve Farm Economy", September 11-25th, Published by ICAR- Central Institute for Research on Cattle, Meerut. 196 p.

Technical pamphlets

1. A colour based assay for differentiating cow vs goat milk/meat
2. Development of a diagnostic test for early detection of Bovine Leukocyte Adhesion Deficiency (BLAD) Carriers in Cattle
3. भैंस की दूध में गाय की दूध की मिलावट का लैम्प विधि द्वारा परीक्षण
4. Frieswal: A Genetically Superior Milch Cattle Breed
5. Development of a Bovine Heat Shock Protein 90 Internal Ribosomal Entry Site (IRES) based Expression vector-Pbbsp90IRES
6. पश्चिमी उत्तर प्रदेश में गेहूँ की उन्नत फसल हेतु आवश्यक प्रौद्योगिकी।

Invited lectures/ lead papers delivered

S. No.	Title of the lecture	Name of the programme	Venue and Date	Delivered by
1	Dairy farming for developing women entrepreneur	ICAR sponsored short course on "Empowerment of small and marginal women farmers through Agri-entrepreneurship	ICAR-IIFSR, Modipuram, Meerut, 12 th July, 2018	Dr A. S. Sirohi
2	On-Farm record keeping and accounting procedures	capacity building and skill upgradation programme for technical staff on "Farm Management	ICAR-IIFSR, Modipuram, Meerut, 15 th Sept 2018	Dr A. S. Sirohi
3	Role of antimicrobial resistance in dairy cattle production system	National Conference on "Innovations in Animal Production for Sustainability and Doubling Farmers Income & XXVI Annual Convention of the Indian Society of Animal Production and Management	COVAS, Mannuthy, KVASU, Kerala. 23 rd to 25 th January, 2019	Dr A. S. Sirohi
4	Maintenance and analysis of animal farm records	capacity building and skill upgradation programme on "Farm Management	ICAR-IIFSR, Modipuram, Meerut 15 th February 2019	Dr A. S. Sirohi
5	Reproductive management of dairy animals	Kisan Goshthi in Kisan Mela and Krishi Takniki Pradarshani	ICAR-IIFSR, Modipuram at Village - Gaidikhata (UK) on 23 rd Feb. 2019	Dr Y. K. Soni



S. No.	Title of the lecture	Name of the programme	Venue and Date	Delivered by
6	Breed improvement in dairy animals to enhance the productivity	Khrif Gosthi (UP Govt.)	Subharti Law College, Subharti University Meerut on 04 th Jun. 2018	Dr Ravinder Kumar
7	Dairy animal breeding	Khrif Gosthi (UP Govt.)	ICAR-CPRI, Modipuram, Meerut during 15 th -17 th Feb. 2019.	Dr Ravinder Kumar

Extension folders (Hindi)

- सोनी योगेश कुमार, सुरेश कुमार, एस.साहा, मेघा पांडे, नरेश प्रसाद, नेमी चंद, महेश कुमार, ब्रह्म प्रकाश व राजेंद्र प्रसाद. 2018. डेरी पशुओं में बाँझपन एवं उचित प्रबंधन. भा.कृ.अनु.प.–केन्द्रीय गोवंश अनुसंधान संस्थान ग्रास फार्म रोड, मेरठ छावनी– 250001 (उ.प्र.) भारत, पृष्ठ 1–4.
- पांडे मेघा, सुरेश कुमार, योगेश कुमार सोनी, एस. साहा, नेमी चंद, नरेश प्रसाद, महेश कुमार व शुभम आर्य. 2018. गोपशुओं में ग्रीष्मकाल का पुनुरुत्पादन पर दुष्प्रभाव एवं बचाव. भा.कृ.अनु.प.–केन्द्रीय गोवंश अनुसंधान संस्थान ग्रास फार्म रोड, मेरठ छावनी– 250001 (उ.प्र.) भारत, पृष्ठ 1–4.
- साहा सिद्धार्थ, सुरेश कुमार, नेमी चंद, योगेश कुमार सोनी, नरेश प्रसाद, मेघा पांडे, महेश कुमार, ब्रह्म प्रकाश व राजेंद्र प्रसाद. 2018. कृत्रिम-गर्भाधान: तकनीकी ज्ञान. भा.कृ.अनु.प.–केन्द्रीय गोवंश अनुसंधान संस्थान ग्रास फार्म रोड, मेरठ छावनी– 250001 (उ.प्र.) भारत, पृष्ठ 1–4.
- प्रसाद नरेश, नेमी चंद, सिद्धार्थ साहा, सुरेश कुमार, योगेश कुमार सोनी, मेघा पांडे, महेश कुमार, ब्रह्म प्रकाश व राजेंद्र प्रसाद. 2018. गो-पशुओं में खुर-पका मुंहपका रोग: निदान, उपचार एवं बचाव. भा.कृ.अनु.प.–केन्द्रीय गोवंश अनुसंधान संस्थान ग्रास फार्म रोड, मेरठ छावनी– 250001 (उ.प्र.) भारत, पृष्ठ 1–4.
- चंद नेमी, सुरेश कुमार, योगेश कुमार सोनी, सिद्धार्थ साहा, नरेश प्रसाद, मेघा पांडे, ए. एस. सिरौही, महेश कुमार, ब्रह्म प्रकाश व राजेंद्र प्रसाद. 2018. गोपशुओं में थनैला पर काबू कैसे पायें? भा.कृ.अनु.प.–केन्द्रीय गोवंश अनुसंधान संस्थान ग्रास फार्म रोड, मेरठ छावनी– 250001 (उ.प्र.) भारत, पृष्ठ 1–4.

PROFESSIONAL RECOGNITIONS

Sr. No.	Name	Recognition/Award	Awarding event and date	Awarding institute/org.
1.	Dr. Umesh Singh	Fellow	March 23, 2019	International Society of Noni Science, Chennai, T.N.
2.	Dr. A S Sirohi	2 nd Best paper presentation, (Co-author)	National Conference on small holders livestock producers' in India: Opportunities and Challenges. April 11-13, 2018	Indian Society of Animal Production and Management
3.	Dr. A S Sirohi	Dr D. K. Bidarkar award, Best paper presentation	National Conference on "Innovations in Animal Production for Sustainability and Doubling Farmers Income. January 23-25, 2019	Indian Society of Animal Production and Management
4.	Dr. Suresh Kumar D.S.	Best paper presentation	National Conference on "Small holders livestock producers' in India: Opportunities and Challenges, April 11-13, 2018	Indian Society of Animal Production and Management
5.	Dr. S.K. Verma	Elected as Vice President (Central Zone, ANSI)	Animal Nutrition Society of India for the biennium 2019-20	Animal Nutrition Society of India
6.	Dr. Rajib Deb	Associate Fellow	National Academy of Biological Sciences (NABS), India (2018)	National Academy of Biological Sciences (NABS), India
		Research Advisor	Nan Yang Academy of Sciences (NASS), Singapore with effect from 21 st October 2018	Nan Yang Academy of Sciences (NASS), Singapore

AWARDS

Dr. Naimi Chand received Certificate of appreciation (2018) by International Journal of Livestock Research in recognition of outstanding contribution to quality of journal as Member of Scientific Advisory Board.

Dr. Siddhartha Saha received Certificate of appreciation (2018) by International Journal of Livestock Research in recognition of outstanding contribution to quality of journal as Member of Scientific Advisory Board.

Dr. Yogesh Kumar Soni received Certificate of appreciation (2018) by International Journal of Livestock Research in recognition of outstanding contribution to quality of journal as Member of Scientific Advisory Board.

Dr. Rajib Deb received Surajben Jethalal Thaker Prakruti Mandir Gold Medal Award (2018) of the Academy of Sciences for Animal Welfare recognized by the Animal Board of India under

the Ministry of Environment, Forest and Climate Change, Govt. of India.

Dr. Rajib Deb has been awarded the National Academy of Agricultural Sciences (India) (NAAS) Associateship (w.e.f. 1st Jan 2019).



Dr. Rajib Deb, Scientist (SS) receiving NAAS Associateship during NAAS Foundation day

IMPORTANT COMMITTEES AND MEETINGS

RESEARCH ADVISORY COMMITTEE (RAC)

1.	Prof. A. K. Misra Vice Chancellor Govind Ballabh Pant University of Agriculture & Technology Pantnagar, Uttam Singh Nagar Uttrakhand – 263 145	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 Dean, College of Veterinary Science & Animal Husbandry Anjor, Durg – 491 001 Chhattisgarh State	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, 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, SVP 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 Genetic 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. Dutta, Principal Scientist (Animal Biotechnology), 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 (Newly constituted w.e.f. 25-06-2018)

1. 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 Secretary (Office)

STAFF SIDE

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



Important Meetings

XVIII Research Advisory Committee (RAC)

The XVIII RAC meeting of ICAR-CIRC, Meerut was conducted on 17th August 2018 under the chairmanship of Prof. A.K. Misra, Vice-Chancellor, GBPUA&T, Pantnagar, Uttarakhand. The RAC members viz., Dr. R.S. Gandhi, ADG (AP&B), ICAR; Dr. B.K. Joshi, Ex Director, NBAGR, Karnal; Dr. D. N. Kamra, Former Head Division of Animal Nutrition, IVRI, Izatnagar; Prof. V. Keshav Rao, Former Head LPT, RGVC, Pondicherry and Dr. Rajendra Prasad, Director (Acting) and Member Secretary, RAC ICAR-CIRC attended the meeting. Dr. Rajendra Prasad presented the action taken report on the recommendations of the last RAC held on 15th May 2017.

Institute Research Committee (IRC)

The IRC meeting for the year 2017-18 held on 14th to 15th December, 2018 under the chairmanship of Dr. Rajendra Prasad, Director (Acting), ICAR-CIRC, Meerut. A total of 38 projects (3 AICRP projects, 25 Institutional, 5 externally funded, 2 Pilot and 3 Service project) were presented before the IRC. In addition to this, three new project proposals were discussed. By and large, the progress of the projects was satisfactory.

XVII Annual Review Meeting of AICRP

The XVII Annual review meet of AICRP on Cattle was conducted on 12th October 2018 under the chairmanship of Dr. R.S. Gandhi, Assistant Director General (AP&B), ICAR New Delhi at ICAR-CIRC, Meerut to review the performance of the projects during the year 2017. The proceedings of meeting started with welcome address delivered by Dr. Rajendra Prasad, Director (Acting) ICAR-CIRC, Meerut. In the opening remarks, Chairman Dr. R.S. Gandhi ADG (AP&B) stressed the importance of crossbreeding for increasing milk production of cattle in the country. He said that the projected demand for milk will be more and cattle may play vital role in meeting the same. Further, he stated that Frieswal Project may not be continued on large scale as the Frieswal animals are under disposal at Military Farms. He suggested that necessary

plans may be evolved to retain this valuable crossbred germplasm evolved over a period of 30 years. He discussed on the problems of disposing the male calves and requested the scientists to come out with a plan to utilize the surplus male calves. Further, he said that Government of India is implementing various programmes including Rashtriya Gokul Mission for improving the milk production potential of Indigenous cattle breeds. He requested the PIs of all units to devote their fulltime for improving the production efficiency of cattle by disseminating superior male germplasm of AICRP on Cattle covering a large population. Dr. Umesh Singh, In-charge AICRP on Cattle presented the Action taken report on recommendations of XVI Review Meet held on June 22, 2017 at NASC Complex, New Delhi. Dr. Sushil Kumar presented the PC report of Frieswal Project. He stressed that the Directorate of Frieswal should ensure that the elite animals are maintained properly so that their milk production is not deteriorated. Dr. Umesh Singh, PI presented the PC report of Indigenous Breeds Project. In his presentation he reported that the first set of bulls of all the three breeds were evaluated for their breeding values and the same was intimated to respective GP units for extensive dissemination of semen doses of ranked bulls for improvement. Later, PIs of various GP and DR units of IBP presented the annual progress of their respective units. Dr. A K Das, PI presented the PC report of Field Progeny Testing project and PIs of four FPT units presented the annual report of respective units. The meeting came to an end with the vote of thanks delivered by Dr. Umesh Singh, In-charge AICRP on Cattle.

Institutional Bio safety Committee Meeting

The IBSC meeting was held in the committee room of Central Institute for Research on Cattle (CIRC) Meerut on September 6, 2018. Two research projects were examined and discussed for any biosafety issues 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.

INSTITUTE ACTIVITIES

S. No.	Institute activities/ Days celebrated/ Sports etc.	Venue and date
1	World Environment Day	ICAR-CIRC, June 5, 2018
2	Live telecast of Hon'ble Prime Minister interaction with Farmers	ICAR-CIRC, June 19, 2018
3	International Yoga Day	ICAR-CIRC, June 21, 2018
4	Independence Day	ICAR-CIRC, August 15, 2018
5	Institute Foundation Day	ICAR-CIRC, November 3, 2018
6	ICAR Zone annual Inter-Institutional Staff Sports Meet (North Zone)	ICAR-CIRB, Hisar, November 14-16, 2018
7	Women Farmers' Day	ICAR-CIRC, December 15, 2018
8	Republic Day	ICAR-CIRC, January 26, 2019
9	National Productivity Week- 2019	ICAR-CIRC, February 12-18, 2019
10	Live telecast of Inauguration of Prime Minister Kisan Samman Nidhi Yojna and organization of Kisan Goshthi	February 24, 2019
11	Science Day	ICAR-CIRC, February, 28, 2019



संस्थान में आयोजित हिन्दी सप्ताह एवं अन्य राजभाषा कार्यों की जानकारी

- संसदीय राजभाषा समिति की दूसरी उपसमिति द्वारा दिनांक 15.06.2018 को केन्द्रीय गोवंश अनुसंधान संस्थान, मेरठ का निरीक्षण अशोक होटल, नई दिल्ली में किया गया।
- संस्थान में राजभाषा हिन्दी के उचित प्रयोग एवं हिन्दी में कार्य करने एवं बोलने की झिझक को दूर करके बढ़ावा देने हेतु सभी अधिकारियों एवं कर्मचारियों के लाभ के लिए हिन्दी सप्ताह का आयोजन दिनांक 14.09.2018 से 20.09.2018 तक किया गया जिसमें विभिन्न प्रतियोगिताओं में निम्न सूचीनुसार 34 अधिकारियों/कर्मचारियों (अन्य ट्रेनिंग प्रतिभागियों सहित) को पुरस्कृत किया गया:-



क.सं.	अधिकारी/कर्मचारी का नाम	पुरस्कार	राशि (रु०)
हिन्दी शब्दावली प्रतियोगिता (दिनांक 14.09.2018)			
1	डॉ. योगेश कुमार सोनी	सान्त्वना पुरस्कार	300.00
2	डॉ. सिद्धार्थ साहा	सान्त्वना पुरस्कार	300.00
3	डॉ. प्रमोद सिंह	सान्त्वना पुरस्कार	300.00
4	श्रीमति ऑंचल शर्मा (एस.आर.एफ.)	सान्त्वना पुरस्कार	300.00
5	श्री एन. एस. सैनी	सान्त्वना पुरस्कार	300.00
6	श्री ज्ञानेंद्र सिंह सेंगर (आर.ए.)	सान्त्वना पुरस्कार	300.00
7	डॉ. सुशील कुमार	सान्त्वना पुरस्कार	300.00
8	कु. रचना त्यागी (वाई.पी.-2)	सान्त्वना पुरस्कार	300.00
9	श्री आशीष कुमार (परियोजना सहायक)	सान्त्वना पुरस्कार	300.00
10	श्री विकास कुमार	सान्त्वना पुरस्कार	300.00
11	श्री डी. एस. वर्मा	सान्त्वना पुरस्कार	300.00
12	डॉ. नेमीचंद	सान्त्वना पुरस्कार	300.00
कार्यालय में चल रही ट्रेनिंग के प्रतिभागी			
13	डॉ. प्रफुल्ल चंद्र भटनागर	सान्त्वना पुरस्कार	300.00
14	डॉ. कमलकान्त यादव	सान्त्वना पुरस्कार	300.00
15	डॉ. पूर्णिमा बानोला	सान्त्वना पुरस्कार	300.00
16	डॉ. आर. श्रीधर	सान्त्वना पुरस्कार	300.00
17	डॉ. प्रदीप एम. सी.	सान्त्वना पुरस्कार	300.00
18	डॉ. मोहम्मद असलम	सान्त्वना पुरस्कार	300.00
19	डॉ. रविन्द्र कुमार	सान्त्वना पुरस्कार	300.00
20	डॉ. पीयूष त्रिपाठी	सान्त्वना पुरस्कार	300.00
हिन्दी निबंध लेखन प्रतियोगिता (दिनांक 15.09.2018)			
वैज्ञानिक एवं तकनीकी वर्ग			
1	डॉ. रविन्द्र कुमार	सान्त्वना पुरस्कार	300.00
2	डॉ. राजिब देब	सान्त्वना पुरस्कार	300.00
प्रशासनिक एवं तकनीकी वर्ग			
1	श्रीमति पुष्पा	सान्त्वना पुरस्कार	300.00
हिन्दी स्मरण शक्ति प्रतियोगिता (दिनांक 18.09.2018)			
1	श्रीमति पुष्पा	प्रथम	1000.00
2	श्रीमति नीरजा जोशी	द्वितीय	800.00
3	श्री सौरभ यादव (एस.आर.एफ.)	तृतीय	600.00



हिन्दी पत्रलेखन प्रतियोगिता (दिनांक 19.09.2018)			
1	श्री एन. एस. सैनी	प्रथम	1000.00
2	श्री ज्ञानेंद्र सिंह सेंगर (आर.ए.)	द्वितीय	800.00
3	श्रीमति अनीता जैन	तृतीय	600.00
हिन्दी टंकण प्रतियोगिता (दिनांक 20.09.2018)			
1	श्री एन. एस. सैनी	प्रथम	1000.00
2	श्री मनोज नेहरा	द्वितीय	800.00
3	श्री विकास कुमार	तृतीय	600.00
हिन्दी प्रश्नमंच प्रतियोगिता (दिनांक 20.09.2018)			
	टीम/वर्ग-1		
1	श्री एस. के. शर्मा	प्रथम	400.00
2	श्री शुभम आर्य (एस.आर.एफ.)	प्रथम	400.00
3	श्री सौरभ यादव (एस.आर.एफ.)	प्रथम	400.00
	टीम/वर्ग-2		
1	डॉ. नरेश प्रसाद	द्वितीय	450.00
2	श्री आशीष कुमार (परियोजना सहायक)	द्वितीय	450.00
	टीम/वर्ग-3		
1	श्री सुरेश चन्द	तृतीय	200.00
2	श्रीमति पुष्पा	तृतीय	200.00
3	श्री ज्ञानेंद्र सिंह सेंगर (आर.ए.)	तृतीय	200.00
पूरे वर्ष प्रतिदिन हिन्दी में आज का शब्द लेखन हेतु सराहनीय योगदान विशेष प्रोत्साहन पुरस्कार			
1	श्री वीरपाल सिंह	प्रथम पुरस्कार के बराबर	1000.00

संस्थान में आयोजित बैठकों/कार्यक्रमों की जानकारी

- दिनांक 01.03.2019 को संस्थान संयुक्त कर्मचारी परिषद की बैठक का आयोजन किया गया।
- दिनांक 18.03.2019 को संस्थान प्रबंधन समिति की बैठक का आयोजन किया गया।

स्वच्छ भारत अभियान

संस्थान में "स्वच्छता ही सेवा कार्यक्रम" अभियान के अन्तर्गत दिनांक 15.09.2018 से दिनांक 02.10.2018 तक स्वच्छता विषय पर वाद-विवाद, विचार-विमर्श, जागरूकता कार्यक्रम, पोस्टर प्रतियोगिता का आयोजन किया गया एवं संस्थान परिसर व सार्वजनिक स्थानों पर स्टॉफ द्वारा साफ-सफाई (सैनीटेशन) के अंतर्गत

श्रमदान के कार्य किए गए। इस दौरान दिनांक 17.09.2018 को हिन्दी कार्यशाला का आयोजन कराया गया जिसमें डॉ. चारु शर्मा, भूतपूर्व विभागाध्यक्ष-हिन्दी विभाग, मेरठ कालेज ने व्याख्यान दिया। इस दौरान दिनांक 01.10.2018 को हिन्दी किसान गोष्ठी का भी आयोजन कराया गया जिसमें लगभग 120 क्षेत्रीय प्रगतिशील किसानों एवं कार्यालय के सभी अधिकारियों एवं कर्मचारियों ने भाग लिया

संस्थान में "स्वच्छता ही सेवा कार्यक्रम" अभियान के अन्तर्गत दिनांक 16.12.2018 से दिनांक 31.12.2018 तक स्वच्छता विषय पर वाद-विवाद, विचार-विमर्श, जागरूकता कार्यक्रम, पोस्टर प्रतियोगिता का आयोजन किया गया जिसके अंतर्गत संस्थान परिसर व सार्वजनिक स्थानों (स्थानीय मलिन बस्तियों, गाँवों व प्राथमिक स्कूलों आदि) में स्टॉफ द्वारा साफ-सफाई (सैनीटेशन) के अंतर्गत



श्रमदान, पर्यावरण, स्वास्थ्य-चिकित्सा, भोजन, खान-पान, प्रदूषण, पौधारोपण आदि विषयों पर कार्यशालाओं का आयोजन किया गया। इसके अतिरिक्त इस दौरान दिनांक 23.12.2018 को किसान दिवस का भी आयोजन किया गया।

इस दौरान निम्नलिखित कार्यशालाओं का आयोजन भी किया गया:-

1. "पोलीथीन के दुष्प्रभाव एवं इनसे बचने के उपाय" (दिनांक 27.12.2018, व्याख्यानदाता : डॉ. एस. के. वर्मा, प्रधान वैज्ञानिक)
2. "जैविक उच्छिष्ट के निस्तारण के बारे में जागरूकता" (दिनांक 29.12.2018, व्याख्यानदाता : डॉ. प्रमोद सिंह, प्रधान वैज्ञानिक)

विभिन्न कार्यक्रम

- माननीय श्री अटल बिहारी वाजपेयी, भूतपूर्व प्रधानमंत्री जी का आकस्मिक निधन होने के कारण संस्थान में दिनांक 17.08.2018 को दोपहर बाद 01:00 बजे दिवंगत आत्मा की शान्ति के लिए सभी अधिकारियों एवं कर्मचारियों ने 2 मिनट का मौन धारण किया गया।
- संस्थान में राष्ट्रीय एकता एवं साम्प्रदायिक सौहार्द को बनाए रखते हुए भूतपूर्व प्रधानमंत्री स्वर्गीय श्री राजीव गाँधी जी के जन्मदिवस दिनांक 20.08.2018 को "सद्भावना दिवस" के रूप में मनाया गया एवं दिनांक 20.08.2018 को प्रातः 12:00 बजे निदेशक महोदय द्वारा सभी अधिकारियों एवं कर्मचारियों को "सद्भावना दिवस" की शपथ दिलाई गई।
- संस्थान में भारत रत्न स्वर्गीय श्री अटल बिहारी वाजपेयी, भूतपूर्व प्रधानमंत्री जी की प्रथम मासिक पुण्य तिथि पर उनके सम्मान में दिनांक 16.09.2018 (रविवार) को सॉय: 04:00 बजे उनके कविता संग्रह पर एक कविता पाठ का आयोजन सभागार में किया गया।
- सरदार वल्लभ भाई पटेल के जन्मदिवस 31 अक्टूबर, 2018 को "राष्ट्रीय एकता दिवस (National Unity Day)" के रूप में मनाया गया एवं दिनांक 31.10.2018 को प्रातः 11:00 बजे निदेशक महोदय द्वारा सभी अधिकारियों एवं कर्मचारियों को "राष्ट्रीय एकता दिवस" की शपथ दिलाई गई।

- संस्थान में दिनांक 29.10.2018 से 03.11.2018 तक "सतर्कता जागरूकता सप्ताह" मनाया गया जिसके अंतर्गत निम्नलिखित कार्यक्रम किए गए:-

क्र.सं.	कार्यक्रम का विवरण
1	"भ्रष्टाचार मिटाओ-नया भारत बनाओ-"Eradicate Corruption-Build a New India" विषय पर निबंध लेखन (दिनांक 31.10.2018 को प्रातः 11:30 बजे से) विजेता प्रतिभागी:- श्रीमति नीरजा जोशी, कृ.स.क. - प्रथम पुरस्कार श्रीमति सोनम सैनी, क.लि. - द्वितीय पुरस्कार श्री हरीश राम, प्र.अ. - तृतीय पुरस्कार
2	"भ्रष्टाचार मिटाओ-नया भारत बनाओ-"Eradicate Corruption-Build a New India" विषय पर सतर्कता अधिकारी द्वारा दिनांक 01.11.2018 को अपराह्न 03:30 बजे संबोधन दिया गया।
3	"भ्रष्टाचार मिटाओ-नया भारत बनाओ-"Eradicate Corruption-Build a New India" विषय पर कार्यशाला (सभी के लिए) (दिनांक 02.11.2018 को दोपहर 03:00 बजे से)

मोबाईल एप्लिकेशन

- मोबाईल एप्लिकेशन काउलर विकसित किया गया। इसे संस्थान एवं न्यूकिल्यों पे-स्कयुसस रेप्लीकान विश्वविद्यालय, ब्राजील के सहयोग से विकसित किया गया।

संस्थान की राजभाषा कार्यान्वयन समिति की बैठक

1. माह जून, 2018 को समाप्त तिमाही की 67 वीं तिमाही बैठक दिनांक 28.06.2018 को हुई।
2. माह सितम्बर, 2018 को समाप्त तिमाही की 68 वीं तिमाही बैठक दिनांक 29.09.2018 को हुई।
3. माह दिसम्बर, 2018 को समाप्त तिमाही की 69 वीं तिमाही बैठक दिनांक 02.01.2019 को हुई।
4. माह मार्च, 2019 को समाप्त तिमाही की 70 वीं तिमाही बैठक दिनांक 29.03.2019 को हुई।

सरकारी कामकाज मूल रूप से हिन्दी में करने के लिए प्रोत्साहन योजना वर्ष 2017-18 लागू की गई एवं 04 अधिकारियों/कर्मचारियों को पुरस्कृत किया गया।



हिन्दी प्रोत्साहन योजना पुरस्कार (2017-18) (अप्रैल, 2017 से मार्च, 2018 तक)			
क. सं.	विजेता प्रतिभागियों के नाम	विजेता/ पुरस्कार पद	पुरस्कार की नकद राशि
1	श्री एन.एस. सैनी, सहायक	प्रथम	5000.00
2	श्री डी. एस. वर्मा, सहा.वि. एवं लेखा.	द्वितीय	3000.00
3	श्री मनोज नेहरा, सहायक	द्वितीय	3000.00
4	श्रीमति नीरजा जोशी, कु.स. कर्मचारी	तृतीय	2000.00

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 छमाही समीक्षा बैठक में समीक्षा हेतु दिनोंक 01.10.2017 से 31.03.2018 तक समाप्त छमाही की हिन्दी के प्रगामी प्रयोग/कार्यान्वयन संबंधी समेकित छमाही प्रगति रिपोर्ट कार्यालय पत्राँक 2-6/04/2013-स्था./खण्ड-1/39 दिनोंक 18.04.2018 के द्वारा अध्यक्ष, नगर राजभाषा कार्यान्वयन समिति, मेरठ के अवलोकनार्थ स्थानीय कार्यालय राजभाषा अधिकारी एवं सदस्य सचिव,

(नगर राजभाषा कार्यान्वयन समिति, मेरठ) कार्यालय मुख्य महाप्रबंधक (राजभाषा अनुभाग), उ.प्र.(प.) दूरसंचार परिमंडल, भारत संचार निगम लिमिटेड, मेरठ को भेजी गई तथा उक्त कार्यालय द्वारा दिनोंक 28.05.2018 को आयोजित छमाही समीक्षा बैठक में कार्यालय की ओर से श्री ए. के. शर्मा, सहायक 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 छमाही समीक्षा बैठक में समीक्षा हेतु दिनोंक 01.04.2018 से 30.09.2018 तक समाप्त छमाही की हिन्दी के प्रगामी प्रयोग/कार्यान्वयन संबंधी समेकित छमाही प्रगति रिपोर्ट कार्यालय पत्राँक 2-6/04/2013-स्था./खण्ड-1/1062 दिनोंक 23.10.2018 के द्वारा अध्यक्ष, नगर राजभाषा कार्यान्वयन समिति, मेरठ के अवलोकनार्थ स्थानीय कार्यालय राजभाषा अधिकारी एवं सदस्य सचिव, (नगर राजभाषा कार्यान्वयन समिति, मेरठ) कार्यालय मुख्य महाप्रबंधक (राजभाषा अनुभाग), उ.प्र.(प.) दूरसंचार परिमंडल, भारत संचार निगम लिमिटेड, मेरठ को भेजी गई तथा उक्त कार्यालय द्वारा दिनोंक 24.10.2018 को आयोजित छमाही समीक्षा बैठक में कार्यालय की ओर से श्री ए. के. शर्मा, सहायक प्रशासनिक अधिकारी एवं श्री शंकर कश्यप, आशुलिपिक ने भाग लिया।

STAFF DETAILS

दिनांक 31.03.2019 तक कार्यरत अधिकारियों/कर्मचारियों की सूची:-

क्रमांक	अधिकारी/कर्मचारी का नाम	पदनाम
वैज्ञानिक वर्ग		
1	डॉ. एन. वी. पाटिल	प्रधान वैज्ञानिक एवं निदेशक (कार्यवाहक) (दिनांक 30.01.2019 से)
2	डॉ. राजेन्द्र प्रसाद	प्रधान वैज्ञानिक (दिनांक 30.01.2019 तक कार्यवाहक निदेशक)
3	डॉ. श्रीकान्त त्यागी	प्रधान वैज्ञानिक
4	डॉ. उमेश सिंह	प्रधान वैज्ञानिक
5	डॉ. विनोद कुमार	प्रधान वैज्ञानिक
6	डॉ. एस. के. धूप सिंह	प्रधान वैज्ञानिक
7	डॉ. सुशील कुमार	प्रधान वैज्ञानिक
8	डॉ. महेश कुमार	प्रधान वैज्ञानिक (दिनांक 24.04.2018 तक अचानक देहान्त हो जाने के कारण)
9	डॉ. अचिन्त्य कुमार दास	प्रधान वैज्ञानिक
10	डॉ. प्रमोद सिंह	प्रधान वैज्ञानिक
11	डॉ. संजीव कुमार वर्मा	प्रधान वैज्ञानिक
12	डॉ. अजयवीर सिंह सिरोही	प्रधान वैज्ञानिक
13	डॉ. रविन्द्र कुमार	प्रधान वैज्ञानिक
14	डॉ. टी. वी. राजा	प्रधान वैज्ञानिक
15	डॉ. नैमी चन्द	प्रधान वैज्ञानिक
16	डॉ. सिद्धार्थ साहा	प्रधान वैज्ञानिक
17	डॉ. जे. के. सिंह	वरिष्ठ वैज्ञानिक
18	डॉ. नरेश प्रसाद	वैज्ञानिक (एस.एस.)
19	डॉ. राजिब देब	वैज्ञानिक (एस.एस.)
20	डॉ. रफीक रहमान अल्यतोद्दी	वैज्ञानिक (एस.एस.) (दिनांक 13.07.2018 तक) (भा.कृ.अनु.प. अंतर-संस्थानीय स्थानांतरण)
21	डॉ. (श्रीमति) रानी एलेक्स	वैज्ञानिक (एस.एस.)
22	डॉ. एस. के. राठी	वैज्ञानिक
23	डॉ. (श्रीमति) मेघा पाण्डे	वैज्ञानिक
24	डॉ. योगेश कुमार सोनी	वैज्ञानिक
25	डॉ. अमोद कुमार	वैज्ञानिक (दिनांक 09.10.2018 से)



तकनीकी वर्ग		
1	श्री सी. पी. सिंह	मुख्य तकनीकी अधिकारी
2	श्री राजीव वर्मा	सहायक मुख्य तकनीकी अधिकारी
3	श्री जितेन्द्र कुमार	सहायक मुख्य तकनीकी अधिकारी
4	श्री यशपाल मल्होत्रा	तकनीकी अधिकारी
5	श्री एस. के. शर्मा	तकनीकी अधिकारी
6	श्री सुरेश चन्द	तकनीकी अधिकारी
7	श्री ओमकार सिंह	तकनीकी अधिकारी
8	श्री छोटे सिंह	तकनीकी अधिकारी
प्रशासनिक वर्ग		
1	श्री हरीश राम	प्रशासनिक अधिकारी
2	श्री डी. एस. वर्मा	सहायक वित्त एवं लेखाधिकारी
3	श्री ए. के. शर्मा	सहा. प्रशा. अधिकारी (दिनांक 02.02.2019 तक)
4	श्री एन. एस. सैनी	सहा. प्रशा. अधिकारी (दिनांक 08.02.2019 से)
5	श्री रजनीश कुमार	कनिष्ठ लेखाधिकारी
6	श्रीमति अनिता जैन	निजी सचिव
7	श्री ओ. पी. अग्रवाल	सहायक
8	श्री मनोज नेहरा	सहायक
9	श्रीमति पुष्पा	वैयक्तिक सहायक
10	श्री शंकर कश्यप	आशुलिपिक (हिन्दी)
11	श्री विकास कुमार	वरिष्ठ लिपिक
12	श्रीमति सोनम सैनी	कनिष्ठ लिपिक
कुशल सहायक कर्मचारी		
1	श्री वीर महेन्द्र	कुशल सहायक कर्मचारी
2	श्री कैलाश	कुशल सहायक कर्मचारी
3	श्री डूंगर सिंह	कुशल सहायक कर्मचारी
4	श्री जितेन्द्र गिरि	कुशल सहायक कर्मचारी
5	श्री मोहन चन्द्र	कुशल सहायक कर्मचारी
6	श्री उमेश कौशिक	कुशल सहायक कर्मचारी
7	श्री वीरपाल सिंह	कुशल सहायक कर्मचारी
8	श्री सुनील कुमार	कुशल सहायक कर्मचारी
9	श्रीमती नीरजा जोशी	कुशल सहायक कर्मचारी

PERSONAL MILESTONES

Acting charge of the Director, ICAR-CIRC, Meerut

1. Dr. N. V. Patil, Principal Scientist (Animal Nutrition) has taken over the acting charge of the Director, ICAR-CIRC, Meerut on 30-01-2019 from Dr. Rajendra Prasad, Principal Scientist (Animal Nutrition).

NEW JOININGS

1. Dr. N. V. Patil, Director (Acting), ICAR-National Research Centre on Camel, Bikaner joined ICAR-CIRC, Meerut as Principal Scientist (Animal Nutrition) on 29-12-2018 (F/N) after having been relieved on 28-12-2018 (A/N) from ICAR-NRCC, Bikaner.

2. Dr. Amod Kumar, Scientist (Animal Genetics & Breeding) has joined ICAR-CIRC, Meerut as Scientist on 09-10-2018 (F/N) after having been relieved on 29-09-2018 (A/N) from ICAR-NAARM, Hyderabad.
3. Smt. Sonam Saini has joined ICAR-CIRC, Meerut as Lower Division Clerk on 25-10-2018 (F/N).

TRANSFERS

1. Dr. Rafeeqe Rahman Alyethodi, Scientist (Animal Genetics & Breeding) transferred on the same post to ICAR-CIARI, Portblair on Inter-Institutional Transfer Basis and was relieved on 13-07-2018 (A/N) from ICAR-CIRC, Meerut.

PROMOTIONS

During the year, the following staff members were promoted to next higher grade with effect from the dates mentioned against each.

S. No.	Name of the Officials	Promoted to next higher grade	Date of Promotion
1.	Dr. Sanjeev Kumar Verma (Animal Nutrition)	Principal Scientist	04.07.2016
2.	Dr. Ajayvir Singh Sirohi (Livestock Production & Management)	Principal Scientist	29.04.2017
3.	Dr. Ravinder Kumar (Animal Genetics & Breeding)	Principal Scientist	01.05.2017
4.	Dr. T.V. Raja (Animal Genetics & Breeding)	Principal Scientist	07.05.2017
5.	Dr. Naimi Chand (Veterinary Medicine)	Principal Scientist	26.09.2017
6.	Dr. Siddhartha Saha (Animal Physiology)	Principal Scientist	20.05.2018
7.	Sh. Niranjana Singh Saini, Assistant	Asstt. Administrative Officer	08.02.2019

STANDING INSTITUTIONAL COMMITTEES

Works Committee:

- | | |
|--|------------------------------------|
| 1. Dr. Sushil Kumar, Principal Scientist | Chairman |
| 2. Shri Krishan Kumar, STO | Member
IIFSR, Modipuram, Meerut |
| 3. Shri D.S. Verma, AF&AO | Member |
| 4. Shri Rajiv Verma, ACTO | Member |
| 5. Asstt. Administrative Officer | Member Secretary |

Printing and Publication Committee:

- | | |
|---|----------|
| 1. Dr. Shrikant Tyagi, PS & Incharge, PME | Chairman |
| 2. Dr. A.S. Sirohi, Principal Scientist | Member |
| 3. Dr. S.K. Verma, Principal Scientist | Member |
| 4. Dr. T.V. Raja, Principal Scientist | Member |
| 5. Dr. (Mrs.) Rani Alex, Scientist (SS) | Member |

Store Supply Inspection Committee:

- | | |
|-------------------------------------|------------------|
| 1. Dr. S. Saha, Principal Scientist | Chairman |
| 2. Dr. Y.K. Soni, Scientist | Member |
| 3. Indenting Officer | Member |
| 4. Incharge Store | Member Secretary |

PME Cell:

- | | |
|--|--------------|
| 1. Dr. Shrikant Tyagi, Principal Scientist | Officer I/C. |
| 2. Dr. T.V. Raja, Principal Scientist | Member |
| 3. Dr. Rajib Deb, Scientist (SS) | Member |

Purchase Advisory Committee:

- | | |
|--|------------------|
| 1. Dr. Rajendra Prasad, Principal Scientist | Chairman |
| 2. Dr. S.K. Dhoop Singh, Principal Scientist | Member |
| 3. Dr. A.K. Das, Principal Scientist | Member |
| 4. Dr. Naimi Chand, Principal Scientist | Member |
| 5. Shri D.S. Verma, AF&AO | Member |
| 6. Shri Harish Ram, Administrative Officer | Member Secretary |

Tender Opening & Financial Evaluation Committee:

- | | |
|--|------------------|
| 1. Dr. Sushil Kumar, Principal Scientist | Chairman |
| 2. Dr. A.K. Das, Principal Scientist | Member |
| 3. Dr. A.S. Sirohi, Principal Scientist | Member |
| 4. Shri Harish Ram, Administrative Officer | Member |
| 5. Shri D.S. Verma, AF&AO | Member |
| 6. Asstt. Administrative Officer | Member Secretary |

**Local Purchase Committee:**

- | | |
|--|------------------|
| 1. Dr. A.K. Das, Principal Scientist | Chairman |
| 2. Dr. Pramod Singh, Principal Scientist | Member |
| 3. Shri D.S. Verma, AF&AO | Member |
| 4. Indenting Officer | Member |
| 5. Asstt. Administrative Officer | Member Secretary |

Technical Tender Evaluation Committee:

- | | |
|---|------------------|
| 1. Dr. Umesh Singh, Principal Scientist | Chairman |
| 2. Dr. Naimi Chand, Principal Scientist | Member |
| 3. Dr. Rajib Deb, Scientist (SS) | Member |
| 4. Indenting Officer | Member |
| 5. Incharge Purchase | Member Secretary |

Repair, Maintenance & AMC Committee:

- | | |
|--|------------------|
| 1. Dr. Pramod Singh, Principal Scientist | Chairman |
| 2. Dr. S.K. Rathee, Scientist | Member |
| 3. Shri D.S. Verma, AF&AO | Member |
| 4. Shri Rajiv Verma, ACTO | Member |
| 5. Indenting Officer | Member |
| 6. Asstt. Administrative Officer | Member |
| 7. Incharge Purchase | Member Secretary |

Women Complaint Committee:

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

Library Advisory Committee:

- | | |
|---|------------------|
| 1. Director | Chairman |
| 2. Dr. Rajendra Prasad, Principal Scientist | Member |
| 3. Dr. Shrikant Tyagi, Principal Scientist | Member |
| 4. Dr. S.K. Dhoop Singh, Principal Scientist | Member |
| 5. Dr. Sushil Kumar, Principal Scientist | Member |
| 6. Dr. Naimi Chand, Principal Scientist | Member |
| 7. Dr. (Mrs.) Megha Pande, Scientist | Member |
| 8. Shri D.S. Verma, AF&AO | Member |
| 9. Shri Harish Ram, Administrative Officer | Member |
| 10. Dr. S. Saha, Principal Scientist & I/C. Library | Member Secretary |

Rajyabhasha Committee:

- | | |
|--|----------|
| 1. Director | Chairman |
| 2. Dr. S.K. Verma, Principal Scientist | Member |
| 3. Dr. Ravinder Kumar, Principal Scientist | Member |
| 4. Dr. Naimi Chand, Principal Scientist | Member |
| 5. Dr. J.K. Singh, Senior Scientist | Member |



6. Dr. Rajib Deb, Scientist (SS) Member
7. Shri Harish Ram, Administrative Officer & Rajbhasha Officer Member Secretary

Institutional Bio-Safety Committee (IBSC):

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

Institutional Animals Ethics Committee (IAEC):

1. Dr. Rajendra Prasad, Principal Scientist Chairman
2. Dr. Sushil Kumar, Principal Scientist Member
4. Dr. Naimi Chand, Principal Scientist Member
5. Dr. (Mrs.) Megha Pande, Scientist Member

Staff Welfare Committee:

1. Dr. Umesh Singh, Principal Scientist Chairman
2. Dr. A.S. Sirohi, Principal Scientist Member
3. Administrative Officer Member
4. Asstt. Finance & Account Officer Member
5. Smt. Anita Jain, Private Secretary Member
6. Secretary (Staff Side), IJSC Member
7. Sh. Dungar Singh, Skilled Supporting Staff Member
8. Asstt. Administrative Officer Member Secretary

Institute Deputation Committee:

1. Director Chairman
2. Dr. S.K. Dhoop Singh, Principal Scientist Member
3. Dr. Umesh Singh, Principal Scientist Member
4. Dr. Pramod Singh, Principal Scientist Member

Institute Technology Management Committee (ITMC):

1. Director Chairman
2. Dr. Shrikant Tyagi, Principal Scientist Member
3. Dr. Umesh Singh, Principal Scientist Member
4. Dr. Rajan Sharma, Principal Scientist Member
Dairy Chem. Div., NDRI, Karnal
5. Dr. Sushil Kumar, Principal Scientist & I/C, ITMU Member Secretary



Institute Technology Management Unit (ITMU):

- | | |
|---|------------------|
| 1. Director | Chairman |
| 2. Dr. Rajendra Prasad, Principal Scientist | Member |
| 3. Dr. Shrikant Tyagi, Principal Scientist | Member |
| 4. Dr. Sushil Kumar, Principal Scientist | Member Secretary |

Data Cell:

- | | |
|--------------------------------------|------------------|
| 1. PI, Frieswal Project | Officer Incharge |
| 2. PI, Indigenous Breeds Project | Member |
| 3. PI, Field Progeny Testing Project | Member |
| 4. Incharge, S.F. Lab. | Member |
| 5. I/C. ITMU | Member Secretary |

Institute Committee for Extension work:

- | | |
|--|------------------|
| 1. Dr. S.K. Dhoop Singh, Principal Scientist | Chairman |
| 2. Dr. Ravinder Kumar, Principal Scientist | Member |
| 3. Dr. J. K. Singh, Senior Scientist | Member |
| 3. Dr. Naresh Prasad, Scientist (SS) | Member |
| 4. Dr. Y.K. Soni, Scientist | Member |
| 5. Sh. Jitender Kumar, ACTO | Member Secretary |

Frozen Semen Stock Purchase/Sale Committee:

- | | |
|--|------------------|
| 1. Dr. Shrikant Tyagi, Principal Scientist | Chairman |
| 2. Dr. Umesh Singh, Principal Scientist | Member |
| 3. Dr. Sushil Kumar, Principal Scientist | Member |
| 4. Shri D.S. Verma, AF&AO | Member |
| 5. Shri Harish Ram, Administrative Officer | Member Secretary |

NODAL OFFICERS

S. No.	Name of Nodal Officer	Assignment
1.	Dr. Umesh Singh, Principal Scientist	<ul style="list-style-type: none">• Implementation of e-publishing of tender details on the Central Public Procurement Portal• 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
2.	Dr. Sushil Kumar, Principal Scientist	<ul style="list-style-type: none">• KRISHI
3.	Dr. Pramod Singh, Principal Scientist	<ul style="list-style-type: none">• HRD
4.	Dr. Sanjeev Kumar Verma, Principal Scientist	<ul style="list-style-type: none">• SCSP/TSP Scheme-Govt. of India
5.	Dr. Ravinder Kumar, Principal Scientist	<ul style="list-style-type: none">• Sending Advisory to the farmers
6.	Dr. Siddhartha Saha, Principal Scientist	<ul style="list-style-type: none">• IMS/FMS• INFLIBNET• CeRA
7.	Dr. J.K. Singh, Senior Scientist	<ul style="list-style-type: none">• CPGRAMS
8.	Sh. Harish Ram, Administrative Officer	<ul style="list-style-type: none">• PERMISNET-IRS-FMS• PMIS Database• Aadhar based biometric system• CPIO for Right to Information Act-2005
9.	Sh. Suresh Chand, Technical Officer	<ul style="list-style-type: none">• Aadhar Enabled Biometric Attendance System (AEBAS)

GLIMPSES OF DIFFERENT PROGRAMMES ORGANISED AT THE INSTITUTE



Live telecast of Hon'ble Prime Minister's interaction with farmers on June 19, 2018



Women Farmers' Day program on December 15, 2018



National Productivity Week 2019 during February 12-18, 2019



National Productivity Day on February 12, 2019



Painting Competition on the theme 'Circular Economy for Productivity & Sustainability' on February 13, 2019



Prize distribution to students during NPW-2019



Participation in Krishidham Expo - 2019



Agricultural Science Congress India Expo-2019



Live telecast of Inauguration of Prime Minister Kisan Samman Nidhi Yojna and organization of Kisan Goshthi on February 24, 2019



छायाचित्र: कृषि तकनीकी अभिकरण योजना अंतर्गत मुजफ्फरनगर के किसानों का भ्रमण



Inauguration and training session of training workshop on "Basic computer operation" for the Skilled Support Staff at CIRC, Meerut



Hindi Pratiyogita



Cultural event on foundation day



Vigilance week



Republic day celebration



हर कदम, हर डगर

किसानों का हमसफर

भारतीय कृषि अनुसंधान परिषद

*Agri*search with a human touch



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ग्रास फार्म रोड, पोस्ट बॉक्स सं.-17, मेरठ छावनी 250 001 (उ.प्र.), भारत

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