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ANNUAL REPORT

2015-16

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ICAR-Central Institute for Research on Cattle

(Indian Council of Agricultural Research)

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

Annual Report 2015-16

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Correct citation : Annual Report 2015 – 16
ICAR-Central Institute for Research on Cattle,
Meerut Cantt. – 250 001

Printed at : Yugantar Prakashan Pvt. Ltd.
WH-23 Mayapuri Industrial Area, Phase-I,
New Delhi-110064
Ph.: 011-28115949, 28116018 (O)
09811349619, 9953134595 (M)

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PREFACE

Livestock farming in India has a long tradition and is always considered as a rural based integrated system. It is rooted as an integral part of the majority of rural masses as it provides livelihood in terms of gainful employment, financial and nutritional security to the landless labourers, small and marginal farmers. Unlike the western countries, Indian livestock farming is considerably unorganized and rated as a household enterprise rather than a commercial venture. It is also well documented that nearly 69 percent of the workforce of the livestock rearing is contributed by the rural women.

India is bestowed with vast variety of livestock wealth as it maintains 11 per cent of the total world livestock population. According to 19th livestock census, India possessed 512.05 million livestock in 2012 comprising of 190.90 million cattle, 108.70 million buffalo, 65.07 million sheep, 135.17 million goat, 10.29 million pigs and the rest being constituted by other species such as yak, mithun, camel, horse, donkey and mule. India owns the largest cattle population of 190.90 million which constitutes 37.28 per cent of the national livestock population and 13.00 per cent of world cattle population. The country has rich cattle genetic diversity composed of 40 acknowledged breeds classified according to their utility as draft (28), dual (8) and milch (4). The estimates of breed wise cattle population revealed that the crossbred cattle constitute 20.81 per cent while the non-descript and defined cattle breeds constitute the rest of the population. Out of the 79.19 per cent, the non-descript cattle constitutes nearly 74.90 per cent of the total indigenous population while the rest 25.10 per cent covers the defined indigenous cattle breeds.

The country retains the pride of highest milk producer in the world and accounts for nearly 18.50 per cent of the world milk production. As per the economic survey 2015-16, the nation achieved the annual milk production of 146.30 MT during 2014-15 as compared to 137.69 MT 2013-14 showing a growth rate of 6.25 per cent. The major portion of national milk pool is shared by the buffalo and cattle and cattle play a momentous role in meeting the national demand of milk and milk products due to the consumer preference. Significant advancement has been achieved in the recent past for genetic improvement of cattle for increasing the milk production.

In spite of all these achievements, the cattle production system still provides scope for improving its production efficiency. The large number of non-descript cattle population can be converted into a reasonable number of high producing breed through upgrading with the famous indigenous dairy cattle breeds so as to reduce the competition for the limited available resources. Genetic improvement of defined indigenous cattle breeds for increasing their production efficiency and improving the economic viability of the crossbred cattle under small holding systems are some of the key issues to be addressed in near future. The inherent limitations like shortage of genetically proven breeding bulls, quality feed and fodder, land and water resources, established AI network are some other issues which are also to be resolved for improving the production efficiency. The development and application of semen sexing, MOET and genomic selection in cattle improvement programmes effectively are still underway. The changing climatic conditions due to global warming and the development of

mitigation strategies for reducing the role of livestock in accelerating the global warming are some of the challenging issues gaining more importance at present.

The Central Institute for Research on Cattle, a premiere Institute solely working on the genetic improvement of cattle plays a significant and pivotal role in improving the cattle production. The AICRP on cattle co-ordinated by the Institute primarily aims to evolve the national milch breed Frieswal for increasing the milk production while the indigenous breed project envisages the genetic improvement of famous indigenous cattle breeds viz., Gir, Sahiwal and Kankrej in both farm and field conditions and the field progeny testing programme aspires the genetic evaluation of crossbred cattle under field conditions.

The Institute also undertakes interdisciplinary research covering various aspects of physiological, nutritional, reproductive and managemental problems for enhancing the cattle production. The institute with its own strength on semen production will develop as a nodal institute for production and supply of superior male germplasm of different indigenous and crossbred cattle in near future. It will also act as a key player in the socio-economic upliftment of cattle owners by infusing superior germplasm in the farmer's herd for enhancing the milk and draught capacity. The Annual report 2015-16 provides a gist of the significant achievements and activities in the areas of research, extension and management made by the institute during the period. I trust that this report will act as a ready reference for the needy stakeholders who are actively engaged in cattle research.

The valuable support and encouragement given by the Secretary, DARE and Director General, ICAR, the Deputy Director General (Animal Science) and their team at the ICAR HQ are greatly acknowledged. The support and timely cooperation extended by the Director, Frieswal Project and the PIs of all co-operating centres of AICRP are duly acknowledged. The strenuous commitments and sincere efforts made by the Heads of units, scientists, administrative and technical staff of the Institute focussing on the progress of the cattle production is also highly appreciated. The sincere efforts made by the core committee in compilation and preparation of this annual report are tremendous and deserves special appreciation.

B.PRAKASH
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 with Sahiwal cattle. Considering importance of the Indigenous cattle breeds, for their adaptability, feed conversion efficiency and disease resistance etc., the Indigenous Breeds Project was undertaken 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 the Field Progeny Testing programme (FPT) was also started to undertake progeny testing of crossbred bulls under the 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. Since then the 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 9001:2008 certification and has well equipped Semen Freezing and Molecular Genetics laboratories besides feed testing facilities in Animal Nutrition laboratory.

VISION

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

MISSION

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

MANDATE

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

OBJECTIVES

AICRP on Cattle

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

ICAR-CIRC Main Scheme

1. To undertake research in the field of cattle breeding, feeding, management and reproduction to enhance productivity and profitability.

2. To plan, coordinate and monitor the research projects on cattle.

3. To serve as national data repository and provide consultancy for cattle production and reproduction.

FUTURE THRUST AREAS

1. Genetic improvement of other important indigenous breeds of cattle viz. Tharparkar, Rathi, Red Sindhi, etc.using conventional and modern breeding techniques and studies on draught animal power of important indigenous draught breeds.

2. Large scale production of quality cattle germplasm.

3. Development of optimum feeding and management practices including designing of shelter to suit the local environment for enhancing cattle productivity.

4. Sexing of male germplasm for production of calves of desired sex.

5. Validation of therapeutic importance of cow produces like milk, Punchgavaya, urine, dung etc.

6. Genomic selection of bulls and use of embryo transfer technology for elite bull production.

7. Biotechnological strategies including biotic and abiotic stress for understanding and improving cattle production and reproduction.

8. Comparative economics of productivity of Indian cattle breeds vis-à-vis crossbred cattle.

RESEARCH PROGRAMMES

AICRP on Cattle

1. Studies on genetic aspects of Holstein x Sahiwal crossbreds- **"Frieswal Project".**

2. Field recording of performance data for undertaking large scale progeny testing – **"Field Progeny Testing of Frieswal Bulls".**

3. Genetic studies on performance of important indigenous breeds (Gir, Kankrej and Sahiwal) of cattle and their improvement through selection – **"Indigenous Breeds Project".**

ICAR-CIRC Main Scheme

1. Increasing cattle productivity using latest breeding tools.

2. Enhancement of cattle productivity through reproductive techniques.

3. Use of nutritional and management interventions for optimization of cattle productivity.

4. HRD and technology dissemination.

INFRASTRUCTURE

Germplasm Resources

The Institute has undertaken research programmes related to genetic improvement of indigenous and crossbred cattle by identifying germplasm (G.P.) and data recording (D.R.) units in various government and non-government organizations. While Frieswal cattle resource is available at 36 Military Farms, the bull rearing unit is located

at Meerut under the administrative control of Directorate of Frieswal. Similarily, indigenous cattle genetic resources are available at different G.P. and D.R. units of respective breeds. The germplasm unit for Sahiwal is located at NDRI, Karnal (Haryana) while that of Gir, and Kankrej are located at Junagadh Agricultural University, Junagadh and SK Nagar 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 & Stem Cell Technology. Semen Freezing Laboratory of the Institute has state of the art facilities with a capacity to store 25 lakh doses of frozen semen.

Computer Centre/ ARIS cell

Internet connectivity was provided to all staff through Railtel under NKN, NIC, New Delhi for smooth functioning of office and scientific research work. The website of Institute was updated regularly and uploaded the tenders and other information on time. ARIS Cell also looked after repairing and maintenance of computers, printers, scanners and UPS etc. The wifi system was established in the main building and provided link to the attendance system.

Library

A total of 17 Indian and 06 International Journals were subscribed during the year 2015-16. During this period library procured 192 books (141 Hindi books and 51 scientific books) making a total of 2092 on its roll. Hindi (03) and English (2) daily newspapers along with literary magazines and Hindi/English employment newspaper were also made available to the readers in the library. Library facilities were also made available to sister organizations and students from Sardar Vallabh Bhai Patel University of Agricultrue & Technology, Meerut. Library organized one book exhibition during the period.

Semen Distribution Centre

The Institute has a semen distribution cum sale counter at the main gate. Semen of crossbred and indigenous cattle is made availbale to the stakeholders on all working days during office hours.

EXECUTIVE SUMMARY
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I. AICRP ON CATTLE

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Development of a crossbred strain of cattle - Frieswal project

The total population of Frieswal females at 36 Military Farms at the end of 31st March 2016 was 19473 including 10830 adult cows, 6695 young stocks and 1948 calves. The number of Frieswal females was highest at MF Ambala (2185) followed by Pimpri (1674) and Jalandhar (1196). At Bull Rearing Unit, Meerut, a total of 322 Frieswal bulls (including 267 adult, 53 young stock and 02 calves) and 3 Sahiwal young bulls were also maintained. The strength of elite cows at various Military Farms was 1176 which has increased by 6 % from previous year (1111).

Since inception of the project, a total of 1334 male calves born out from elite mating at Military Farms were received at BRU, Meerut for rearing as future bulls. MF Ambala had supplied highest number of male calves to BRU (309) followed by Meerut (246) and Pimpri (162). A total of 113 bull calves were received from different MFs during April 2015 to March 2016 in which, MF Ambala had supplied the highest number of male calves (26) followed by Lucknow (20) and Meerut (16).

Since inception of project, a total of 37,83,000 frozen semen doses (upto 31st March 2016) have been produced and 13,10,000 doses have been distributed to Military Farms. During the last year (2015-16) a total of 3,77,000 doses of semen were frozen and 76038 doses have been distributed to Military Farms. During the reporting period 54341 doses have been sold to para vets, State Animal Husbandry Departments, Livestock Development Boards and State Agriculture Universities and a revenue of Rs. 763387/- was generated. A total of 51450 doses of Frieswal young bull semen were also provided to Field Progeny Testing units for test mating. Thus, a total of 181829 doses of Frieswal semen were used under various programmes during the year.

The overall mean of age at first calving (AFC) in Frieswal cows was 31.98 months (972.18 days). The effects of farm and year of birth were significant on AFC while season of birth had no significant effect. The overall least squares means of 300 days milk yield (MY300), total milk yield (TMY), peak yield (PY) and lactation length (LL) were 3317.53 kg, 3332.46 kg, 15.13 kg and 326.30 days, respectively. The effects of farm, parity, season, year of calving and AFC were significant on these traits. Frieswal cows at MF Mhow produced the highest total milk yield of 3900.31 kg followed by Kanpur (3892.94 kg) and Lucknow (3824.54 kg). The least squares means of service period (SP), dry period (DP) and calving interval (CI) were 159.44, 117.98 and 439.93 days (14.47 months), respectively. The effects of farm, season, year of calving and parity were significant on SP, DP and CI.

Estimates of heritability for AFC (0.059±0.011), MY300 (0.046±0.009), TMY (0.052±0.009), and PY (0.049±0.008) were low. SP, DP and CI also had low heritability

estimates of 0.007±0.003, 0.011±0.004 and 0.012±0.004, respectively.

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विभिन्न सैन्य फार्मों में फ्रीजवाल प्रजाति की 19473 मादायें उपलब्ध थी जिनमें से 10830 वयस्क, 6695 वृद्धिशील युवा एवं 1948 बछड़ियाँ थी। फ्रीजवाल गायों की अधिक संख्या अम्बाला (2185), पिंपरी (1674) एवं जालंधर फॉर्म पर (1196) थी। साँड पालन इकाई मेरठ पर कुल 322 साँड़ों का पालन किया जा रहा था। विभिन्न सैन्य फार्मों पर संभ्रात एवं अधिक उत्पादनकारी गायों की कुल संख्या 1176 थी। परियोजना की शुरुआत से अब तक कुल 1134 बछड़े/साँड पालन इकाई पर प्राप्त किये जा चुके है। इस वर्ष विभिन्न फार्मों से कुल 113 बछड़े साँड पालन इकाई मेरठ में प्राप्त किये गये जिनमें सैन्य फार्म अम्बाला से 26, लखनऊ से 20 तथा मेरठ से 16 बछड़े थे। अब तक विभिन्न फार्मों से कुल 1334 साँड़ों को प्राप्त किया जा चुका है। सर्वाधिक बछड़े देने वाले फार्मों में अम्बाला (309), मेरठ (246) तथा पिंपरी (162) है।

परियोजना की शुरुआत से अब तक कुल 37,83,000 हिमीकृत वीर्य मात्राओं का उत्पादन किया जा चुका है जिसमें इस वर्ष 3,77,000 वीर्य की मात्राओं का उत्पादन हुआ। इनमें से इस वर्ष 76,038 वीर्य की मात्रा विभिन्न सैन्य फार्मों को प्रजनन के लिए वितरित की गई तथा 54,341 वीर्य की मात्राओं का विक्रय पैरावैट्स, विभिन्न राज्यों के पशुधन विभाग को कर कुल रु0 7,63,387/– की राजस्व की प्राप्ति की गई। क्षेत्र संतति परीक्षण परियोजना को कुल 51450 वीर्य मात्राऐं प्रजनन के लिए दी गई। इस प्रकार अब तक 1,81,829 वीर्य मात्राओं का उपयोग/विक्रय विभिन्न परियोजनाओं में किया गया।

फ्रीजवाल गायों में प्रथम ब्यात आयु कुल 31.98 माह (972.18 दिन) थी। संसेचन काल, शुष्ककाल एवं ब्यात अंतराल का न्यूनतम वर्ग मध्य क्रमशः 159.44, 117.98 एवं 439.93 दिन था। इन सभी पर फार्म, प्रसविता मौसम एवं जन्मवर्ष एवं दुग्धकाल संख्या का प्रभाव सार्थक था। इन गायों का सर्वाधिक दुग्ध उत्पादन सैन्य फार्म महू (3900 किग्रा) तथा इसके बाद सैन्य फार्म कानपुर (3892.94 किग्रा) एवं लखनऊ (3824. 54 किग्रा) पर था।

फ्रीजवाल गायों का 300 दिनों का दुग्ध उत्पादन, कुल दुग्ध उत्पादन, उच्चतम उत्पादन एवं दुग्धकाल क्रमशः 3317.53 किग्रा., 3332.46 किग्रा., 15.13 किग्रा. एवं 326.30 दिन था। इन सभी पर फार्म, जन्म के समय वर्ष एवं मौसम, दुग्ध संख्या एवं ब्यात आयु का प्रभाव सार्थक था।

पैत्रिकता आंकलन का मान प्रथम ब्यात पर आयु (0.059±0.011), कुल दुग्ध उत्पादन एवं (0.052±0.009), 300 दिनों का दुग्ध उत्पादन (0.046±0.009) तथा उच्चतम दुग्ध (0.049± 0.008) था। संसेचन काल, शुष्ककाल एवं ब्यात अंतराल का मान क्रमशः 0.007±0.003, 0.01± 10.004 एवं 0.012±0.0041 था। इन सभी गुणों का पैत्रिकता मान कम था।

Genetic Evaluation of Bulls

Two sets of bulls inducted in 2003 (25 bulls) and 2006 (8 bulls) were evaluated. Out

of twenty five bulls inducted in 2003, eighteen bulls exceeded the herd average and the topmost ranking bull had 1.86 per cent genetic superiority over the population mean. Out of the eight bulls inducted in 2006, five bulls exceeded the herd average and the top ranking bull had 3.97 per cent genetic superiority over the population mean.

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दो सैट (2003 तक एवं 2006) में लगाये साँड़ों की प्रजनन मान का आकलन सर्वोत्तम क्रमिक निष्पक्ष पूर्वानुमान विधि द्वारा न्यूनतम माध्य वर्ग का पैकेज (हार्वे) का उपयोग कर किया गया। कुल 25 साँड़ों का उत्पादन झुण्ड औसत से अधिक था एवं उनकी श्रेष्ठता 1.86 प्रतिशत से अधिक थी। 2006 में शामिल किये गये साँड़ों की श्रेष्ठता 3.97 प्रतिशत से अधिक थी।

प्रथम ब्यात उत्पादन आधारित जीवनकाल उत्पादन का आकलन गुणाकार प्रतिगमन विश्लेषण, मुख्य अंश प्रतिगमन एवं कृत्रिम तंत्रिका जाल विधि से किया गया। जिनके आकलन की सटीकता क्रमशः 64.53, 64.59 एवं 68.73 थी।

Genetic improvement of crossbred cattle under field conditions

Guru Angad Dev Veterinary & Animal Sciences University, Ludhiana

A total of 284 bulls have so far been introduced in 13 different sets and in all 133452 inseminations done in which 17171 female progenies born, out of which 4656 reached age at first calving.During the year 2015 a total of 3898 artificial inseminations were carried out with an overall conception rate of 46.3 %. Average first lactation 305 days milk yield of cows completed their first lactation in the reporting period (2015) was 3733.6 ± 27.1 kg and the average age at first calving was 1061.9 ±13.8 days. 32.6 % of the data was lost due to different causes and the sale of animals was the major cause of the loss of data. The average fat percentage of milk of the daughters of eighth, nineth, tenth and eleventh set of bulls ranged from 3.6 to 3.7 %.Some progressive dairy farmers after getting training and superior germplasm from the project have established crossbred herds. Present lactation milk yield of some herds is more than 6000 litres and peak yield is more than 40 litres a day. Four animal welfare camps and scientists-farmers-interactions were organized to make the dairy farmers aware about the importance of the field progeny testing programme and scientific breeding, feeding, management and health care practices for improving the production performance of their animals.

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लुधियाना ईकाई पर अब तक 13 विभिन्न सेटों में कुल 284 साँडों का प्रयोग किया जा चुका है। जिनसे 17171 बछड़ियॉ उत्पन्न की गयी हैं। जिनमें से 4656 बछड़ियॉ प्रथम ब्यॉत की उम्र पर पहुॅच चुकी हैं। गत वर्ष 2015 में कुल 3998 कृत्रिम गर्भाधान किये गये व सकल गर्भाधान की दर 46.3 प्रतिशत प्राप्त हुई। वर्ष 2015 में प्रथम ब्यॉत की बछड़ियों में 305 दिनों के दुग्ध उत्पादन का औसत 3733.6 किग्रा. रहा।

जबकि प्रथम ब्यॉत पर आयु 1061.9 दिन थी। इस इकाई पर विभिन्न कारणों से 32.6 प्रतिशत आंकडों की क्षति हुई। जिसमें मुख्य कारण पशुओं का बेचना था। आठवें, नौवें, दसवें व ग्यारहवें सेट के सांडों से उत्पन्न बछड़ियों के दूध का वसा औसत 3.6 से 3.7 प्रतिशत था। इस ईकाई के क्षेत्र में कुछ प्रगतिशील डेरी किसानों ने प्रशिक्षण व वीर्य प्राप्त कर उच्च कोटि की गायों का झुण्ड तैयार भी कर लिया है। जिसमें एक ब्यॉत में 6000 किग्रा. से अधिक दूध देने वाली गायें उपलब्ध हैं। कुछ गायें अधिकतम 40 किग्रा. प्रतिदिन दूध दे रही हैं। उपरोक्त परियोजना के विषय में किसानों को अवगत कराने हेतु गांव स्तर पर चार सामूहिक बैठकों का आयोजन किया गया, जिसमें किसानों को गाय पालन का तकनीकी ज्ञान प्रदान किया गया।

Kerala Veterinary and Animal Sciences University, Thrissur

A total of 268 bulls have so far been introduced in 14 different sets and a total of 107297 inseminations have been done in which 8231 female progenies born, out of which 1896 reached age at first calving. During the year 2015, a total of 3960 artificial inseminations were carried out with an overall conception rate of 43.9 %. Average first lactation 305 days milk yield of cows completed their first lactation in the reporting period (2015) was 2895.31 ± 57.66 kg and the average age at first calving was 1052.37 ±16.42 days.The milk yield showed increasing trend among the progenies of different sets and the average 305 days milk yield was 1958±26.90 kg (1st set) and 2723.79±69.38 kg (11th set). Average fat content of morning milk during the reporting period was 3.24, 3.41 and 3.61 per cent in 2nd, 5th and 8th month of lactation, respectively. Average age at first calving of the progenies was found to be 1052.37 ± 16.42 days compared to 1243.48 ± 27.36 days in contemporaries.The loss of data in the project was 2.02 % for 11th set, 4.37 % for 12th set and 6.46 % for 13th set of bulls till the end of report period.

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इस ईकाई पर विभिन्न चौदह सेटों में अभी तक 268 सांडों का प्रजनन हेतु प्रयोग किया जा चुका है। कुल 107297 कृत्रिम गर्भाधानों से 8231 बछड़ियॉ पैदा की गयी हैं। इनमें से 1896 बछियॉ प्रथम ब्यॉत की उम्र प्राप्त कर चुकी हैं। गत वर्ष 2015 में कुल 3960 कृत्रिम गर्भाधान के साथ सकल गर्भाधान दर 43.7 प्रतिशत दर्ज की गयी है। इस वर्ष में प्रथम ब्यॉत वाली बछियों का औसत दुग्ध उत्पादन 2895.01 किग्रा. तथा 1052 दिन प्रथम ब्यॉत की औसत आयु प्राप्त हुई है। इस प्रकार अभी तक जितने भी सेट से बछियां पैदा की गयी उनमें प्रतिवर्ष सेट में दुग्ध उत्पादन वृद्धि का स्तर चला आ रहा है। जैसा कि प्रथम सेट में 300 दिन का दुग्ध उत्पादन 1958 किग्रा. था जो अब ग्यारहवें सेट में बढ़कर 2723.79 किग्रा. पर पहुॅच गया है। 2, 5 व 8वें महीने के सुबह वाले दूध का औसत वसा 3.24, 3.41 व 3. 61 प्रतिशत रहा है। संततियों की प्रथम ब्यॉत पर औसत आयु 1052.37 दिन है, जबकि इनके समकालिनों में 1243.48 दिन थी। इस ईकाई पर ग्यारहवें सेट में 2.02 प्रतिशत आंकड़ों का ह्रास रहा है। वहीं बारहवें सेट में 4.37 प्रतिशत तथा तेरहवें सेट में 4.46 प्रतिशत का ह्रास हुआ है। यहॉ पर समकालिन संततियों से वर्तमान संततियों

में उत्पादन ज्यादा प्राप्त हो रहा है। इस वर्ष केवल 07 पशुओं में नवजात मृत्यु की समस्या पायी गयी है।

BAIF Research Development Foundation, Uruli-Kanchan, Pune

A total of 260 bulls have so far been introduced in 12 different sets and 100284 inseminations have been done in which 12267 female progenies born out, of which, 4418 reached age at first calving.During the year 2015, a total of 6632 artificial inseminations were carried out and the overall conception rate was 45.6 %. Average first lactation 305 days milk yield of cows completed their first lactation in the reporting period (2015) was 3126.04 kg and the average age at first calving was 940.97 days.Average fat percentages for the morning milk of 2nd, 5th and 8th month of lactation were 3.55, 3.60 and 3.65, respectively. The per cent loss of data was 35 for 10th set of bulls and 25.6 for 11th set of bulls till the end of report period. The average lactation yield of progenies was significantly higher than their contemporaries. During reporting period,a total of 292 progenies reached to their first lactation and 217 progenies completed their first lactation.

cQ vu|I/kku fodkl QkmaMs'ku] mjyh dpu] i|.k

बैफ पुणे, ईकाई पर 260 सांड बारह सेटों में प्रयोग किये जा चुके हैं। जिनसे 100284 कृत्रिम गर्भाधान से 12267 बछड़ियॉ उत्पन्न हुई तथा उनमें से 4418 बछियॉ प्रथम ब्यॉत को प्राप्त कर चुकी हैं। गतवर्ष 2015 में कुल 6632 कृत्रिम गर्भाधान से सकल गर्भाधान दर 45.6 प्रतिशत आंकी गयी है। गतवर्ष में 305 दिन के प्रथम दुग्ध स्रवनकाल का औसत 3126.06 किग्रा. रहा व प्रथम ब्यॉत की औसत आयु 940.97 दिन आंकी गयी है। सुबह के दूध में 2, 5 व 8वें महीन के स्रवनकाल में वसा का प्रतिशत 3.55, 3.60 व 3.65 प्रतिशत क्रमशः प्राप्त हुआ है। इस ईकाई पर विभिन्न कारणों से दसवें सेट में 35 प्रतिशत आंकड़ों की क्षति हुई जबकि ग्यारहवें सेट में 25. 6 प्रतिशत की क्षति दर्ज की गयी है। समकालिन बछियों से वर्तमान कालिन बछियों का उत्पादन अच्छा चला आ रहा है। गत वर्षों में 292 संततियॉ प्रथम ब्यॉत तक पहुॅचीं। जिनमें से 217 ने अपना प्रथम दुग्ध काल पूर्ण किया है।

G.B. Pant University of Agriculture and Technology, Pantnagar

A total of 55 bulls have so far been introduced in 5 different sets and 13589 inseminations have been done in which 2224 female progenies born out of which 364 have reached age at first calving. During the year 2015, a total of 4133 artificial inseminations were carried out and the overall conception rate was 54.7 %. Average first lactation 305 days milk yield of cows completed their first lactation in the reporting period (2015) was 2702.9±75.36 kg and the average age at first calving was 1110±1.8 days.The average 305 days milk yield of the progenies of first set of bull was 2533.0±65.2 kg and for second set of bull was 3016.2±93.5 kg with an overall FLMY of 2714.2±84.4 kg. Average fat percentage of morning milk during the reporting period was 3.7±0.02, and 3.63±0.04 in first and second set of bulls, respectively.The per cent loss of data was 18.2, 14.7 and 10.1 for first, second and third sets of bull, respectively. One heifer show and four training programs were conducted in the field in which, 422 farmers took active part.

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पन्तनगर ईकाई पर अभी तक पॉच सेटों में 40 सांडों के प्रयोग से 13589 कृत्रिम गर्भाधान से 2224 बछियॉ पैदा हुई है। जिनमें से 364 बछियॉ अपना प्रथम ब्यॉत प्राप्त कर चुकी हैं। गतवर्ष 2015 में कुल 4133 कृत्रिम गर्भाधान के साथ औसत सकल गर्भाधान दर 54.7 प्रतिशत आंकी गयी है। इस वर्ष में प्रथम ब्यॉत वाली बछड़ियों का 305 दिन का औसत दुग्ध उत्पादन 2702.9 किग्रा. रहा तथा प्रथम ब्यॉत आयु का औसत 1110 दिन रहा। प्रथम व द्वितीय सेट के सॉड़ों की संततियों का औसत उत्पादन क्रमशः 2533.0 व 3016 किग्रा. आंका गया है। दोनों सेटों का कुल औसत 2714.2 किग्रा. रहा है। इस ईकाई पर आंकडों की क्षति प्रथम, द्वितीय व तृतीय सेट में क्रमशः 18.2, 14.7 व 10.1 प्रतिशत दर्ज की गयी है। इस वर्ष क्षेत्र में दो औसर प्रदर्शनियॉ आयोजित की गयी जिसमें लगभग 422 किसानों ने रूचिपूर्वक भाग लिया।

Conservation and genetic improvement of indigenous cattle breeds

Gir breed

The herd strength of GP unit at the start of the year 2015 (as on 1st January, 2015) was 134 which included 94 females and 40 males. A total of 18 Gir bulls in three sets (six in first set, nine in second set and three in third set) have been put under semen collection, out of which, 14 bulls (six in first, seven in second and one in third set) were used for breeding so far. The opening balance of semen doses collected as on 1st January, 2015 was 20087 (10175 and 9912 for bulls of set I and II, respectively). The total numbers of semen doses produced from first, second and third set of Gir bulls during the year were 650, 38212 and 6649, respectively totaling to 45511. A total of 4380 doses were utilized for insemination and 1130 doses were sold and 60088 doses were available as on 31st December 2015 for future use. During the year 2015, a total of 2800 inseminations were carried out and 1472 pregnancies were confirmed resulting in an overall conception rate of 52.57 per cent which was higher than the overall conception rate of 48.63 per cent since inception of the project. The total number of inseminations carried out since inception for set-I, II and III were 11230, 6694, and 397, respectively resulting to a total of 18321 AIs. During the year 2015, a total of 625 daughters born which resulted in to a total of 3969 daughters since inception. A total of 59 daughters have completed their first lactation and 42 daughters are under recording.

xk; dh nw'kh uLyksa dk lj{k.k o vkuoa'kd lq/kkj

fxj uLy

गिर की जीव द्रव्य इकाई पर वर्ष 2015 में कुल गोवंश की संख्या 134 थी जिसमें 94 मादा एवं 40 नर थे। इस परियोजना में अबतक तीन समूह में 18 साँड़ों का उपयोग किया जा चुका है। जिसमें प्रथम समूह में 6 एवं द्वितीय समूह में 9 साँड़ों का उपयोग किया गया। उनमें से 14 साँड़ों के वीर्य को ही प्रजनन हेतु उपयोग किया गया। वर्ष 2015 के प्रारम्भ से इस परियोजना के अंतर्गत हिमीकृत वीर्य की कुल 20087 मात्राऐं उपलब्ध थी तथा इस वर्ष हिमीकृत वीर्य की कुल 45511 मात्राऐं तैयार की गयी जिनमें से 4380 मात्राऐं गर्भाधान हेतु प्रयोग की गयी व कुल 1130 मात्राऐं हितधारकों (स्टेकहोल्डरों)

को बेची गयी। 31.12.2015 तक 60088 हिमीकृत वीर्य की मात्राऐं उपलब्ध थी। वर्ष 2015 में कुल 2800 गायों में कृत्रिम गर्भाधान किया गया जिसमें से 1472 गाय गर्भित पायी गयी व गर्भाधारण दर 52.5 प्रतिशत पायी गयी जोकि परियोजना के प्रारम्भ से अब तक 48.63 प्रतिशत से ज्यादा है। प्रारम्भ से अब तक प्रथम, द्वितीय एवं तृतीय समूह में क्रमशः 11230, 6694 एवं 397 गर्भाधारण किए गए। इस इकाई पर कुल 18321 कृत्रिम गर्भाधारण किए गए है। वर्ष 2015 में कुल 625 बछड़ियाँ पैदा हुई अर्थात कार्यक्रम के प्रारम्भ ब्यात को पूरा कर लिया है तथा 42 बछड़ियों का प्रथम ब्यात की रिकॉर्डिंग की जा रही है।

Kankrej breed

The initial herd strength of Kankrej animals as on 1st January 2015 in the GP unit was 139 with 96 females and 43 males. Two sets of Kankrej bulls have been inducted so far, the first set consisted of eight bulls from Banas Dairy while the second set consisted of nine bulls. During the year 2015, a total of 44521 doses of frozen semen were produced from 12 bulls. A total of 4210 doses were utilized for insemination, 178 doses were sold and 2580 doses were discarded resulting in a balance of 117943 doses of frozen semen for future breeding.

During the reporting period, 2003 animals were inseminated, 908 were confirmed for pregnancy and 173 daughters born. The conception rate during the year 2015 was 45.33 per cent against overall conception rate of 46.19 per cent since inception of the project. The total numbers of daughters produced for the first and second set of bulls were 392 and 648, respectively resulting in 1040 daughters since inception of the project. A total of 29 daughters have completed their first lactation, four are under recording and the rest are heifers.

dkdjst uLy

वर्ष 2015 के प्रारम्भ में कांकरेज की जीवद्रव्य इकाई में कुल गोवंश की संख्या 139 थी जिसमें 96 मादा एवं 43 नर थे। इस परियोजना में अब तक दो समूहों में कुल 17 साँड़ों का उपयोग किया जा चुका है। जिसमें प्रथम समूह में बनास डेरी के 8 साँड़ थे एवं द्वितीय समूह में 9 साँड़ों का उपयोग किया गया। वर्ष 2015 के दौरान इस इकाई पर कुल 44521 हिमीकृत वीर्य की मात्राएँ 12 साँड़ों के द्वारा तैयार की गयी। जिसमें से 4210 हिमीकृत वीर्य की मात्राओं का उपयोग कृत्रिम गर्भाधान के लिए किया गया एवं 178 मात्राओं को हितधारकों को बेच दिया गया। तथा वर्ष के अंत में कुल 117943 हिमीकृत वीर्य की मात्राएँ उपलब्ध थी।

वर्ष 2015 में कुल 2003 गायों का कृत्रिम गर्भाधान किया गया जिसमें से 908 गायें गर्भित पायी गयी जिनसें 173 बछड़ियाँ पैदा हुई व गर्भाधारण दर 45.33 प्रतिशत पायी गयी जो कि परियोजना के प्रारम्भ से अब तक 46.19 प्रतिशत से ज्यादा है। प्रारम्भ से अब तक प्रथम एवं द्वितीय समूह में क्रमशः 392 एवं 648 गर्भधारण किए गए। इस इकाई पर कुल 1040 बछड़ियों की प्रथम ब्यात की रिकॉर्डिंग की जा रही है।

Sahiwal breed

During the year 2015, a total of 416 Sahiwal animals were maintained at the GP unit. The number of breedable females and

males above two years was 251 and 29, respectively. The total numbers of breedable females above two years of age in different DR units were 683 (308 in GLF-I, Hissar, 57 in GADVASU, 110 in Pantnagar, 89 in Anjora, Durg and 119 in Shri Gaushala, Bhiwani). So far fifteen Sahiwal bulls in two sets (8 in first set and 7 in second set) have been inducted in the project for progeny testing. During the year, 11890 doses were produced from the second set of bulls. A total of 8220 semen doses were utilized for breeding and 6418 doses were sold and at the end of the year 57066 doses were in stock for future use. During the reporting period, 1163 inseminations (307 in GLF-I, Hissar, 293 in Pantnagar, 289 in NDRI, Karnal, 109 in GADVASU, Ludhiana, 70 in Bhiwani and 95 in Durg unit) were carried out amounting to a total of 6481inseminations since the inception of the project.

During the year 2015, the conception rate for the second set of bulls was 42.65 per cent. The conception rates since inception for the first and second set of bulls were 36.30 and 41.28 amounting to an overall conception rate of 38.48 per cent. So far 885 Sahiwal daughters born under the project while during the report period 212 (06 and 206 for first and second set of bulls, respectively) daughters born. The number of daughters born in NDRI Karnal, GLF-I Hissar, GADVASU Ludhiana, Pantnagar, Durg and Bhiwani units were 55, 68, 10, 53, 05 and 21, respectively. In GP unit, a total of 51 animals reached age at first calving, 38 completed their first lactation (22 animals had lactation length less than 100 days and lactation milk yield less than 500 kg). In Pantnagar, 27 daughters calved, 14 completed their first lactation and the rest are in milking. The performance details of daughters from other units are yet to be received. The semen doses of second set of Sahiwal bulls were provided to Military Farm, Meerut for test mating w.e.f. November, 2014. Three male calves born out of the semen of second batch Sahiwal bulls at Military Farm, Meerut were selected as young bulls for rearing at BR unit at CIRC, Meerut.

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साहीवाल की जीवद्रव्य इकाई में वर्ष 2015 के प्रारम्भ में कुल गोवंश की संख्या 416 थी जिसमें से 251 मादा एवं 29 नर थे। साहीवाल की विभिन्न डाटा रिकॉर्डिंग इकाई पर दो वर्ष से ज्यादा उम्र की कुल 683 गाय (308 जी.एल. एफ.–1, हिसार, 57 गुरु अंगद देव पशु चिकित्सा एवं पशु विज्ञान विश्वविद्यालय, लुधियाना, 110 पंतनगर, 89 अँजोरा, दुर्ग एवं 119 श्री गौशाला, (भिवानी) थी। इस परियोजना में अब तक दो समूहों में कुल 15 साँड़ों का उपयोग किया गया है। जिसमें प्रथम समूह में 8 एवं द्वितीय समूह में 7 साँड़ों का उपयोग किया गया। इस वर्ष के दौरान इस इकाई पर कुल 11890 हिमीकृत वीर्य की मात्राएँ तैयार की गई। जिसमें से 8220 हिमीकृत वीर्य की मात्राओं का उपयोग कृत्रिम गर्भाधान के लिए किया गया एवं 6418 मात्राओं को हितधारकों को बेच दिया गया। वर्ष के अंत में कुल 57066 हिमीकृत वीर्य की मात्राएँ भविष्य में उपयोग के लिए उपलब्ध थी। इस परियोजना में वर्ष 2015 में 1163 कृत्रिम गर्भाधान (307 हिसार, 109 लुधियाना, 289 करनाल, 293 पंतनगर, 95 अँजोरा, दुर्ग एवं 70 भिवानी) किये गये व गर्भधारण दर 42.65 प्रतिशत थी। प्रारम्भ से अब तक कुल 6481 कृत्रिम गर्भाधान किये गये। समूहवार गर्भाधान दर 36.30 व 41.28 प्रतिशत थी। प्रारम्भ से अब तक कुल 885 बछड़ियाँ पैदा हुई जिनमें से वर्ष 2015 में 212

बछड़ियाँ (55 करनाल, 68 हिसार, 10 लुधियाना, 53 पंतनगर, 05 दुर्ग एवं 21 भिवानी) में पैदा हुई।

जीवद्रव्य इकाई करनाल में कुल 51 बछड़ियाँ प्रथम ब्यात में आई उनमें से 38 बछड़ियों ने प्रथम दुग्धकाल पूरा किया। पंतनगर में 27 बछड़ियाँ प्रथम ब्यात में आई व 14 बछड़ियों ने प्रथम दुग्धकाल पूरा किया। सैन्य फार्म, मेरठ में नवंबर 2014 से वीर्य कृत्रिम गर्भाधान के लिए दिया गया और वहाँ पर तीन अच्छे बछड़ें पैदा हुए उनको साँड़ के रुप में चयन कर उच्चकोटि के वीर्य के लिए साँड फार्म, मेरठ में पाला जा रहा है।

II. ICAR-CIRC MAIN SCHEME

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Studies on genetic aspects of Cattle

- An in-house built lamp assay was developed for rapid detection of cow components adulterated in buffalo milk/ meat.
- Two SNPs were identified in the promoter region of OAS1 gene in Frieswal and Sahiwal cattle by PCR-SSCP and sequencing
- The differential expression of Interferon stimulated genes at 18th day post AI in peripheral blood mononuclear cells was evaluated. In the nulliparous pregnant animals, the expression of OAS1, MX2, ISG15 ($p<0.01$) and MX1 ($p<0.05$) were higher than the non-pregnant animals. But for multiparous cows, pregnant and non-pregnant cows were similar for expression of interferon stimulated genes on day 18.
- A total of 237 bull calves were screened against five genetic diseases such as BLAD, DUMPS, FXID, CVM and BC. A carrier prevalence of 7.2% and 2.3% was noticed for BLAD and CVM, respectively. No gross abnormalities were detected for the 92 Karyotyped bulls. An easy and rapid method for detecting the BLAD carrier animals was developed.

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- गाय के दूध/माँस का भैंस के दूध/माँस में मिश्रण का पता लगाने हेतु लैम्प परीक्षा विधि का विकास किया गया।
- फ्रीजवाल एवं साहीवाल गायों में पी सी आर – एस एस सी पी एवं क्रमबंद्धन तकनीक से ओ ए एस जीन के प्रोत्साहक क्षेत्र में दो एस एन पी की पहचान की गई।
- इंटरफेरान प्रेरित जीनों की अंतरीय भावाभिव्यक्ति के लिऐ परिधि रक्त की मोनोन्यूक्लीयर कोशिकाओं में कृत्रिम गर्भाधान के 18 दिन बाद मूल्यांकन किया गया। पहली बार गर्भवती (nulliparous) बछडियों में ओ ए एस जीन की अभिव्यक्ति एम एस 2, आई एस जी 15 (पी <0.01) तथा एम एक्स (पी <0.05) की तुलना में अधिक थी एवं बहुप्रसिद्ध गायों (मल्टीपेरस) में 18 दिन बाद इंटरफेरान प्रेरित जीनों में अभिव्यक्ति का अन्तर सार्थक नहीं था।
- कुल 237 सांडों में ब्लैड, डम्पस, एफ एक्स आई डी एवं बी सी जैसे आनुवंशिक दोषों के लिए जॉच की गयी। ब्लैड एवं सी वी एम वाले दोष के सॉड़ों का प्रतिशत क्रमशः 7.2 एवं 2.3 था। 92 सॉड़ों के गुणसूत्र सामान्य

थे। आनुवंशिक दोष ब्लैड की जॉच करने के लिए एक सरल एवं तीव्र विधि का विकास किया गया।

Semen Production and quality control in Frieswal bulls

- The overall average semen volume (ml), sperm concentration (million/ml), initial motility (%) and post thaw motility (%) were 4.31±0.02, 965.87±5.68, 55.34 ±0.24 and 45.22±0.30, respectively in 7877 ejaculates collected from Frieswal bulls during April 2015-March 2016.
- Semen samples from163 bulls were evaluated for quality during the reported period. The Mean values of semen quality control parameters such as post thaw motility(%), Incubation test after 60 min(%), acrosome Integrity(%), HOST(%) and Concentration(millions/straw) in frozen semen samples were 51.65±0.284, 37.11±0.479, 47.31 ±0.426, 69.27±0.429 and 25.82±0.132, respectively.
- Live spermatozoa and overall abnormalities in new (young) and problem bulls were 74.46±3.224, 16.89±1.335 and 66.42±08.553, 44.82±6.772, respectively.
- Frozen semen doses from 117 Frieswal bulls were subjected to bacterial load estimation by pour plate method. The mean colony count was 1620± 140.77cfu/ml.

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- फ्रीजवाल साँड़ों से अप्रैल 2015 से मार्च 2016 के माध्यम प्राप्त 7877 स्खलनों में औसत वीर्य आयतन (मि.ली.), शुक्राणु सांद्रता (मिलियन/मि.ली.), आरंभिक गतिशीलता (प्रतिशत) एवं पोस्टथा गतिशीलता (प्रतिशत) क्रमशः 4.31±0.02, 965.87±5.68, 55.34±0.24 व 45.22±0.30 थी।
- इस अवधि के दौरान साँड़ों में वीर्य की गुणवता का परीक्षण किया गया। पोस्टथा गतिशीलता (प्रतिशत), साठ मिनट के ऊष्मायन के पश्चात गतिशीलता (प्रतिशत), होस्ट (प्रतिशत), अविकल एक्रोसोम (प्रतिशत) व शुक्राणु सांद्रता (मिलियन/स्ट्रा) क्रमशः 51.65±0.284, 37.11±0.479, 47.31±0.426, 69.27±0.429 व 28.82±0.132 थी।
- नए तथा समस्या ग्रस्त साँड़ों में जीवित शुक्राणु (प्रतिशत) तथा कुल शुक्राणु विसंगतियाँ (प्रतिशत) क्रमशः 74.46±3.224 व 16.89±1.335 और 66.42±08.553 व 44.82±6.772 थी।
- इस अवधि के दौरान 117 साँड़ों के हिमीकृत वीर्य में जीवाणुओं की संख्या का परीक्षण किया गया। वीर्य के नमूनों में जीवाणुओं की औसत संख्या 1620±140.77 थी।

Effect of housing system on physiological and semen quality attributes in bulls

The effect of sheds with two different designs on physiological responses and semen quality parameters of breeding bulls revealed better physiological responses and semen quality attributes in bulls kept in modified sheds than traditional sheds.

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- साँड़ों के दो समूहों को विभिन्न प्रकार के आवासों (पारंपरिक एवं संशोधित) में रखने पर पाया गया कि उनकी शारीरिक प्रतिक्रियाएँ एवं वीर्य की गुणवत्ता संशोधित आवास वाले साँड़ों में बेहतर थी।

Embro transfer in Sahiwal cows

- Sahiwal cows were super-ovulated and used as donor. Three animals yielded 10 embryos which were transferred to 8 recipients.

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- देशी नस्ल की साहीवाल गायों में सुपर–ओवलेसन द्वारा 10 भ्रुण एकत्रित किए गए एवं उनको 8 प्रापक गायों में प्रत्यारोपित किया गया।

Enhancing reproductive efficiency by reproductive techniques, nutrition and management interventions

- Feeding experiment on adult Frieswal bulls indicated that increased concentration of Zn from 40 (diet 1) to 60 (diet 2) and 80 ppm(diet 3) in diets have significant effect on sperm concentration (million/ml) which increased from 837.88 in diet 1 to 913.65 in diet 2 and 965.08 in diet 3 in good bulls.
- Post thaw motility (PTM %) also significantly increased from 46.04 in diet 1 to 49.57 in diet 2 and 49.93 in diet 3 in good bulls
- There was significant increase in per cent motility of the sperms with increasing period from initial 59.02% to 69.61% in II sperm cycle and 68.11 in III sperm cycle in good bulls.
- The PTM (%) also increased from 28.33 at the start of the experiment to 50.00 and 40.00 by the end of II and III sperm cycle in poor bulls.
- Feeding experiment on adult Frieswal bulls also carried out with 55 (D1), 65 (D2) and 80 (D3) ppm Mn in diet. The samples and data of the experiment are under analysis.
- Feed testing facility to various military dairy farms (24) was provided and during 2015-16, a total of 1065 feed samples were analyzed for proximate composition.

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- अच्छे वयस्क फ्रीजवाल साँडों पर किये गये पशु पोषण प्रयोग से यह पाया गया कि उनके आहार में जब जस्ते की मात्रा को 40 (आहार–1) से बढ़ा कर 60 (आहार–2) एवं 80 (आहार–3) पी.पी.एम. कर दी गयी तो उनके वीर्य में शुक्राणुओं की संख्या 837.88 (आहार–1) से बढ़कर 913.65 (आहार–2) व 965.08 (आहार–3) मिलयन / मि.ली. हो गयी।
- उपरोक्त साँड़ों में वीर्य हिमीकरण के उपरान्त की शुक्राणु गतिशीलता भी क्रमशः 46.04 से बढ़कर 49.57 व 49.93 प्रतिशत हो गई।
- इन्ही साँड़ों में उपरोक्त अनुपूरक आहार पर बढ़ते समयांतराल के साथ शुक्राणुओं की

प्रतिशत गतिशीलता शुरूआत के 59.02 के मुकाबले बढ़कर दूसरे व तीसरे शुक्राणु चक्र के अंत में 69.61 व 68.11 पायी गई।

- कम गुणवत्ता वाले साँड़ों में भी अधिक जस्ते वाले अनुपूरक आहार पर बढ़ते समयांतराल के साथ हिमीकरण के उपरांत शुक्राणु गतिशीलता शुरूआत 28.33 प्रतिशत के मुकाबले दूसरे व तीसरे शुक्राणु चक्र के अंत में बढ़कर 50 व 40 प्रतिशत पायी गयी।

- व्यस्क फ्रीज़वाल साँड़ों के आहार में मैगनीज के विभिन्न स्तरों 55, 65 व 80 पी.पी.एम. के अध्ययन के लिये भी पशु पोषण प्रयोग किये गये। प्रयोग से सम्बधित नमूने व ऑकडें प्राप्त कर लिये गये हैं, जिसका विश्लेषण कार्य चल रहा है।

- पशु पोषण प्रयोगशाला द्वारा विभिन्न सैन्य फार्मो (24) से प्राप्त दाने के अवयवों का विश्लेषण कर उनकी रिपोर्ट प्रदान की गई। वर्ष 2015–16 के दौरान कुल 1065 नमूनों का विश्लेषण किया गया।

Augmenting the reproductive efficiency of cattle in rural areas

- Experiments with individual feeding of Frieswal heifers indicated that the average daily gain ranged from 440 to 490 g/day and their body weight at the time of first estrus exhibition ranged from 266 to 288 kg. At the time of calving their mean age ranged from 902 to 938 days. The animals exhibited first post-partum heat within 56 to 64 days, while the animals in group feeding exhibited after 102 days indicating the superiority of individual feeding for better reproductive performance.

- Feeding of combined preparation of progesterone &oestrogen along with mineral mixture was efficient to overcome anestrus in Frieswal heifers and cows.

- Four infertility camps were organized and 151 animals were examined for various infertility as well as general health related problems and out of them 34% were anestrus, 14% were repeat breeders and 52% animals had general health related problems.

- Intravaginal progesterone containing device, TRIU-B showed 100% estrus induction response which can be a good option for overcoming the problem of anestrus in Frieswal heifers and cows.

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- फ्रीजवाल बछियों की व्यक्तिगत खिलाई पिलाई के दौरान उनका औसत शरीर भार ग्रहण 440 से 490 ग्राम प्रतिदिन, प्रथम मद प्रदर्शन के समय शरीर भार 266 से 288 किग्रा तथा ब्याने के समय औसत उम्र 902 से 938 दिन ज्ञात हुए। इन पशुओं में ब्याने के पश्चात प्रथम मद प्रदर्शन 56 से 64 दिनों के दौरान हुआ। उपरोक्त मापदंड के अनुसार सामूहिक खिलाई पिलाई की अपेक्षा व्यक्तिगत खिलाई पिलाई बेहतर जनन क्षमता के लिए श्रेष्ठ है।

- खनिज मिश्रण के साथ प्रोजेस्टेरोन एवं एस्ट्रोजन हार्मोन का संयुक्त मिश्रण फ्रीज़वाल गायों में मदहीनता के प्रबंधन हेतु एक कारगर विधि साबित हुई।

- इस अवधि में 4 बांझपन निवारण शिविर आयोजित किए गए जिनमें 151 पशुओं का

विभिन्न बीमारियों के लिए परीक्षण किया गया, जिसमें कुल मिलाकर 34 प्रतिशत मादा पशुओं में मदहीनता, 14 प्रतिशत पशु रिपीट ब्रीडर तथा 52 प्रतिशत पशुओं में अन्य स्वास्थ्य सम्बन्धी समस्याएँ पाई गई।

- फ्रीज़वाल गायों में मद उद्दीपन हेतु ट्रायू–बी नामक प्रोजेस्टेरोन हार्मोन युक्त अन्तः योनि उपकरण के उपयोग से शत–प्रतिशत परिणाम प्राप्त हुए, जो कि मदहीनता के उपचार हेतु एक बेहतरीन विकल्प हो सकता है।

Extension Activities

- During 2015-16, the Institute participated in three Kisan Melas and Exhibitions organized by different institutions. Major activities and transferable technologies developed by the ICAR-Central Institute for Research on Cattle were depicted at Institute exhibition stall. Approximately 4200 farmers received technological information in above Melas. Animal Infertility camps and training programme for dairy farmers were organized by ICAR-CIRC with the help of different companies like Intas Pharma Ltd., Intervet, Pharmvik Jaipur, Kargil India Pvt. Ltd. etc. Scientists of the institute visited adopted Gaushalas and fields of progressive farmers. The institute organized a progressive farmers' meet on 25th June, 2015 in which 40 progressive farmers participated. One day training programme on Commercial Dairy was organized by the institute on 02.09.2015. In addition to this, institute also organized special training programme for beneficiaries of Kamdhenu Dairy Yojana and awareness training programme on value addition in milk on 24.09.2015. The institute celebrated 'Jai Kisan Jai Vigyan' Week from 23.12.2015 to 29.12.2015. The institute also celebrated Kisan Samman Divas on 23.12.2015 in Kalanjari village selected under Mera Gaon Mera Gaurav scheme.

- The institute won first prize in Virat Kisan Mela-2016 organized by Department of Agriculture, Government of Uttar Pradesh held at Meerut. Dr. Ravinder Kumar, Senior Scientist participated as Animal Husbandry Expert in "Hello Kisan" programme telecasted on DD Channel dated 02.07.2015 and answered the questions of farmers about successful livestock breeding, infertility prevention and other technological information.

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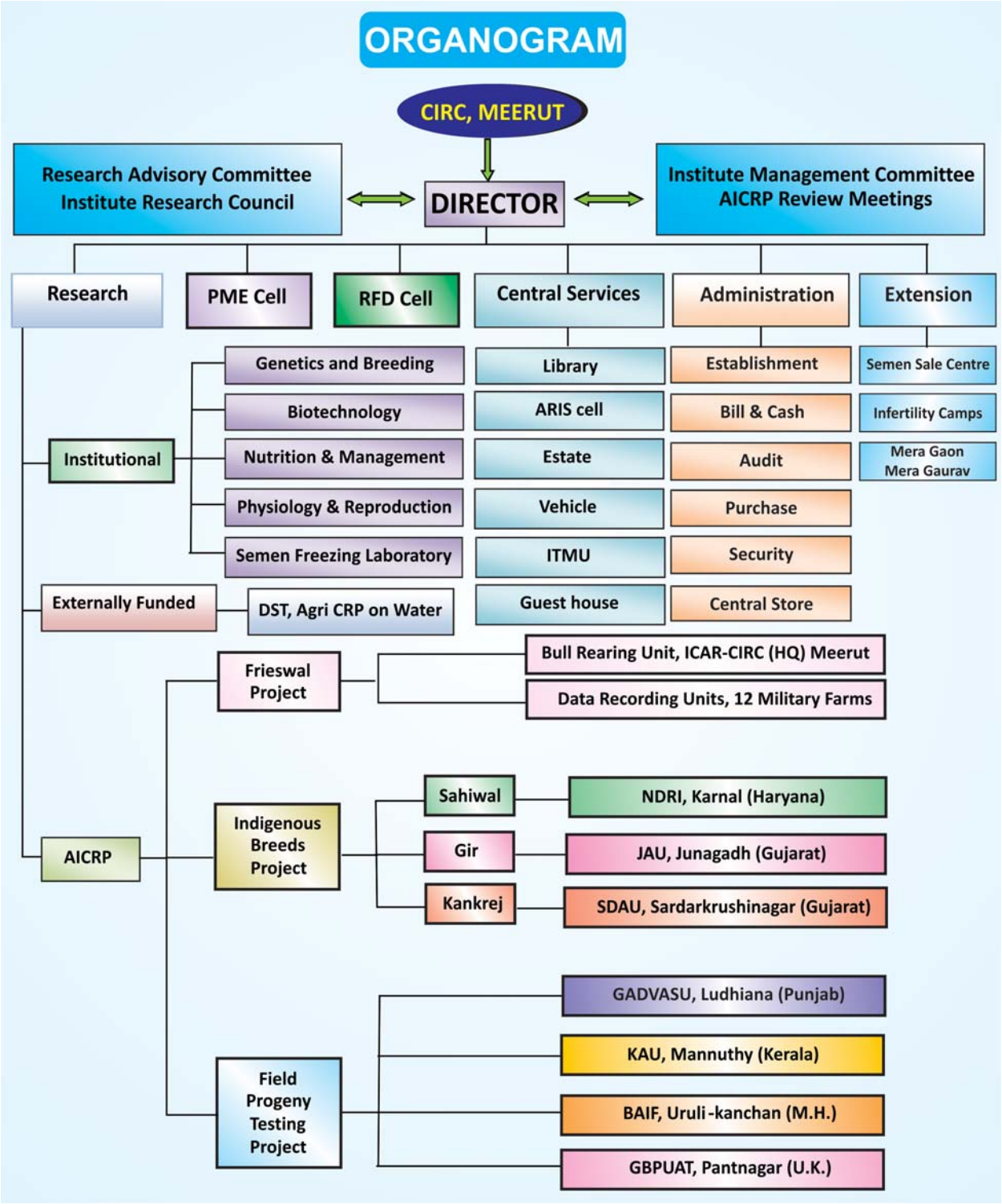
- वर्ष 2015–16 में संस्थान ने विभिन्न संस्थानों द्वारा आयोजित तीन किसान मेलों एवं प्रदर्शनियों में भाग लिया। इन मेलों में केन्द्रीय गोवंश अनुसंधान संस्थान द्वारा अनुसंधान कार्य एवं तकनीकि प्रदर्शन इत्यादि के बारे में बताया गया। उपरोक्त मेलों में लगभग 4200 किसानों ने तकनीकि ज्ञान प्राप्त किया। विभिन्न कम्पनियों जैसे कि इन्टास फार्मा लिमिटेड, इन्टरवेट, फार्म–विक, जयपुर, कारगिल इन्डिया प्राईवेट लिमिटेड आदि के सहयोग से पशु बांझपन निवारण कैम्प एवं डेयरी किसानों के लिए प्रशिक्षण कार्यक्रम आयोजित किये गये। संस्थान के वैज्ञानिकों के द्वारा अंगीकृत की गई गौशालाओं एवं विकासशील किसानों के यहाँ भ्रमण किया गया। संस्थान में 25 जून 2015 को एक प्रगतिशील किसान मिलन कार्यक्रम आयोजित किया जिसमें विभिन्न गॉवों के 40 विकासशील किसानों ने भाग लिया। संस्थान के द्वारा एक दिवसीय

व्यवसायिक डेयरी प्रशिक्षण कार्यक्रम दिनांक 2.09.2015 को आयोजित किया गया। इसके अलावा कामधेनु डेयरी योजना के लाभार्थियों हेतु 24.09.2015 को विशेष प्रशिक्षण कार्यक्रम का भी आयोजन किया गया। दिनांक 24 नवम्बर 2015 को एक दिवसीय जागरूकता प्रशिक्षण कार्यक्रम, दुग्ध मूल्य वर्धन पर दिया गया। संस्थान द्वारा दिनांक 23 दिसम्बर से 29 दिसम्बर 2015 तक जय किसान, जय विज्ञान सप्ताह का आयोजन किया गया। इसी वर्ष मेरा गॉव मेरा गौरव योजना के अर्न्तगत चयनित गॉव कलन्जरी में दिनांक 23 दिसम्बर 2015 को किसान सम्मान दिवस मनाया गया।

- संस्थान ने कृषि विभाग उत्तर प्रदेश सरकार द्वारा आयोजित विराट किसान मेला–2016 में प्रदर्शनी के लिए प्रथम स्थान प्राप्त किया। संस्थान के डॉ. रविन्द्र कुमार, वरिष्ठ वैज्ञानिक द्वारा 2 जुलाई 2015 को डी.डी. किसान चैनल के हैलो किसान कार्यक्रम में सफल पशुपालन व बॉझपन निवारण इत्यादि विषय पर किसानों के सवालों का जवाब दिया गया तथा तकनीकि ज्ञान वर्धन किया।


ORGANOGRAM
CIRC, MEERUT
Research Advisory Committee
Institute Research Council
DIRECTOR
Institute Management Committee
AICRP Review Meetings
Research
PME Cell
RFD Cell
Central Services
Administration
Extension
Institutional
Genetics and Breeding
Biotechnology
Nutrition & Management
Physiology & Reproduction
Semen Freezing Laboratory
Library
ARIS cell
Estate
Vehicle
ITMU
Guest house
Establishment
Bill & Cash
Audit
Purchase
Security
Central Store
Semen Sale Centre
Infertility Camps
Mera Gaon Mera Gaurav
Externally Funded
DST, Agri CRP on Water
AICRP
Frieswal Project
Bull Rearing Unit, ICAR-CIRC (HQ) Meerut
Data Recording Units, 12 Military Farms
Indigenous Breeds Project
Sahiwal
Gir
Kankrej
NDRI, Karnal (Haryana)
JAU, Junagadh (Gujarat)
SDAU, Sardarkrushinagar (Gujarat)
Field Progeny Testing Project
GADVASU, Ludhiana (Punjab)
KAU, Mannuthy (Kerala)
BAIF, Uruli-kanchan (M.H.)
GBPUAT, Pantnagar (U.K.)

STAFF POSITION

Sl.No.	Category	Sanctioned	Filled	Vacant
1.	R.M.P.	01	01	00
2.	Scientific	40	22	18
3.	Technical	09	08	01
4.	Administrative	14	13	01
5.	Supporting	10	10	00
	Total	**74**	**54**	**20**

FINANCIAL STATEMENT

Plan Expenditure for the year 2015-16

S. No.	Head of Accounts	Code -166 ICAR-CIRC Main Scheme		Code - 167 AICRP - Cattle		Code -211 IP & TMU Intellectual Property and Technology Management		Code - 116 IIWM, Bhuhneswar Project "Consortia Researach Platform (CRP) on Water"		ICAR- IIWM, (Bhubaneshwar) Efficient Ground Water Management - Rasulpur Village		TOTAL PLAN	
		RE Allocation 2015-16	Expenditure 2015-16	RE Allocation 2015-16	Expenditure 2015-16	RE Allocation 2015-16	Expenditure 2015-16	RE Allocation 2015-16	Expenditure 2015-16	RE Allocation 2015-16	Expenditure 2015-16	Allocation 2015-16	Expenditure 2015-16
	CAPITAL	0	0										
1	Minor Works	0	0							400000	397998	400000	397998
2	Equipments	6480000	4968028	2370000	2370000					800000		9650000	7338028
3	Information Technology	620000	564215	640000	640000							1260000	1204215
4	Library Books and Journals	1000000	953447									1000000	953447
5	Furniture & fixtures	320000	317287	680000	680000							1000000	997287
6	Others	80000	0									80000	0
	Total – CAPITAL	**8500000**	**6802977**	**3690000**	**3690000**	**0**	**0**	**0**	**0**	**1200000**	**397998**	**13390000**	**10890975**
2	i. Establishment Charges	0	0	26100000	26100000							26100000	26100000
	ii. Wages	0	0									0	0
	iii. Overtime Allowance	0	0									0	0
	Total – Establishment Expenses (Grant in Aid - Salaries)	0	0	26100000	26100000	0	0	0	0	0	0	26100000	26100000
3	**T.A.**											0	0
	A. Domestic TA / Transfer TA	300000	291389	590000	590000	100000	4958	63000	17159	25000		1078000	903506
	B. Foreign TA	0	0									0	0
	Total – Traveling Allowance	300000	291389	590000	590000	100000	4958	63000	17159	25000	0	1078000	903506
4	Research & Operatinal Expenses											0	0
	A. Research Expenses	3500000	3454186	26485000	26485000			267000	208090	100000		30352000	30147276
	B. Operational Expenses	3985000	3949562	15630000	15630000	500000	463138	354000		100000		20569000	20042700
	Total - Res & Oper Expenses	7485000	7403748	42115000	42115000	500000	463138	621000	208090	200000	0	50921000	50189976
5	**Administrative Expenses**											0	0
	A. Infrastructure	1200000	1198990	1190000	1190000							2390000	2388990
	B. Communication		0									0	0
	C. Repair & Maintenance											0	0
	i. Equipments, Vehicles & Others	400000	382620	400000	400000							800000	782620
	ii. Office building	700000	697162	200000	200000							900000	897162
	iii. Residential building	100000	100000									100000	100000
	iv. Minor Works	0	0									0	0
	D. Others (excluding TA)	900000	884785	715000	715000			63000	14086	70000	50000	1748000	1663871
	Total - Administrative Expenses	3300000	3263557	2505000	2505000	0	0	63000	14086	70000	50000	5938000	5832643
6	Miscellaneous Expenses											0	0
	A. HRD	160000	159295							125000		285000	159295
	B. Other Miscellaneous	255000	238229									255000	238229
	Total - Miscellaneous Expenses	**415000**	**397524**	**0**	**0**	**0**	**0**	**0**	**0**	**125000**	**0**	540000	397524
	Total —Grants in Aid - General	**11500000**	**11356218**	**71310000**	**71310000**	**600000**	**468096**	**747000**	**239335**	**420000**	**50000**	**84577000**	**83423649**
	Grand Total (Capital + Establishment+General)	**20000000**	**18159195**	**75000000**	**75000000**	**600000**	**468096**	**747000**	**239335**	**1620000**	**447998**	**97967000**	**94314624**

Institute Non-Plan expenditure for the year 2015-16

(Amount in Rupees)

S. No.	Head	Allocation Govt. Grant 2015-16	Allocation Internal Resource + Additional amount provided by HQ out of Council's share (2015-16)	TOTAL ALLOCATION 2015-16	Expenditure (Govt.Grant) 2015-16	Expenditure from (Revenue Generation) 2015-16	TOTAL EXPENDITURE 2015-16
1	2	3	4	5 (3 + 4)	6	7	8 (6 + 7)
1	**CAPITAL**						
i	Equipments	200000.00	0.00	200000.00	191950.00	0.00	191950.00
ii	Furniture & fixtures	100000.00	0.00	100000.00	95075.00	0.00	95075.00
	Total – CAPITAL	300000.00	0.00	300000.00	287025.00	0.00	287025.00
2	**Establishment Expenses(Salaries)**						
	i. Establishment Charges	57100000.00	0.00	57100000.00	56923082.00	0.00	56923082.00
	ii. Overtime Allowance	0.00	0.00	0.00		0.00	0.00
	Total – Establishment Expenses	57100000.00	0.00	57100000.00	56923082.00	0.00	56923082.00
3	**Pension & Other Retirement Benefits**	3150000.00	0.00	3150000.00	3140804.00	0.00	3140804.00
4	**T.A.**						**0.00**
	A. Domestic TA / Transfer TA	600000.00	0.00	600000.00	543955.00	0.00	543955.00
	B. Foreign TA	0.00	0.00	0.00		0.00	0.00
	Total – Traveling Allowance	600000.00	0.00	600000.00	543955.00	0.00	543955.00
5	**Research & Operatinal Expenses**						
	A. Research Expenses	750000.00	700000.00	1450000.00	750000.00	614566.00	1364566.00
	B. Operational Expenses	600000.00	300000.00	900000.00	600000.00	6080.00	606080.00
	Total - Research & Operational Expenses	1350000.00	1000000.00	2350000.00	1350000.00	620646.00	1970646.00
6	**Administrative Expenses**						
	A. Infrastructure	2744000.00	906000.00	3650000.00	2744000.00	899759.00	3643759.00
	B. Communication	200000.00	0.00	200000.00	171275.00	0.00	171275.00
	C.Repair & Maintenance						0.00
	i. Equipments,Vehicles & Others	500000.00	400000.00	900000.00	500000.00	108716.00	608716.00
	ii. Office building	600000.00		600000.00	570406.00		570406.00
	iii.Residential building	300000.00	0.00	300000.00	297727.00	0.00	297727.00
	iv. Minor Works	200000.00	0.00	200000.00	198276.00	0.00	198276.00
	D. Others (excluding TA)	1000000.00	0.00	1000000.00	859161.00	0.00	859161.00
	Total - Administrative Expenses	5544000.00	1306000.00	6850000.00	5340845.00	1008475.00	6349320.00
7	**Miscellaneous Expenses**						
	C. Publicity & Exhibitions	50000.00	0.00	50000.00	31450.00	0.00	31450.00
	E. Other Miscellaneous	400000.00	0.00	400000.00	320111.00	0.00	320111.00
	Total - Miscellaneous Expenses	450000.00	0.00	450000.00	351561.00	0.00	351561.00
	Total —Grants in Aid - General	**11094000.00**	**2306000.00**	**13400000.00**	**10727165.00**	**1629121.00**	**12356286.00**
	Grand Total (Capital + Establishment+General)	**68494000.00**	**2306000.00**	**70800000.00**	**67937272.00**	**1629121.00**	**69566393.00**
8	**Loans and Advances**	0.00	500000.00	500000.00	0.00	166500.00	166500.00

DST Project on "Molecular characterization and analysis of genetic polymorphism in integrin alpha beta 6 receptor gene associated with food-and-mouth disease virus (FMDV) cell tropism in cattle", 2015-16

S. No.	Head of Account	Budget Approved	Opening Balance as on 1.4.15	Fund Received during 2015-16	Total fund available during 2015-16	Expenditure
1	2	3	4	5	6 (4+5)	7
	Recurring					
1	Fellowship	764000	35895	680000	715895	700000
2	Consumables	200000		190000	190000	189930
3	Contingencies	25000		15000	15000	12259
4	Travel	25000		15000	15000	14400
5	Overhead	100000		100000	100000	100000
	Total	**1114000**	**35895**	**1000000**	**1035895**	**1016589**

DST Project on "Cataloging of miRNA transcripts during thermal stresa and their crosstalk with heatshock protein 70mRNA in Cattle" Project Code YSS/2014/000279 DST-SERB, 2015-16

2015-2016

S. No.	Head of Account	Budget Approved	Fund Received	Expenditure
1	2	3	4	5
	Recurring			
1	Manpower Budget	168000	168000	47148
2	Consumable	437000	437000	417949
3	Travel	10000	10000	5507
4	Other Costs/Contingency	35000	35000	33808
5	Overhead Costs	100000	100000	**100000**
	Total	**750000**	**750000**	**604412**

Resource generation during 2015-16

Target Fixed by Council: Rs. 1547000

Achievement: Rs. 1365842

RESEARCH ACHIEVEMENTS

(I) AICRP ON CATTLE

(A) STUDIES ON GENETIC ASPECTS OF HOLSTEIN- SAHIWAL CROSS-BREDS- Frieswal Project

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

Herd Strength

The total population (31st March 2016) of Frieswal females at 36 Military Farms located in various agro-climatic regions of the country was 19473 including 10830 adult cows, 6695 young stocks and 1948 calves. The number of Frieswal females was highest at MF Ambala (2185) followed by Pimpri (1674) and Meerut (1151). Bull Rearing Unit, Meerut had 322 Frieswal bulls (including 267 adult, 53 young stock and 02 calves) and 3 Sahiwal young bulls. A total of 1176 elite Frieswal cows (10.86% of the adult cows) were maintained for nominated matings. MF Ambala (101) had the highest number of elite cows followed by Meerut (100) and Lucknow (97).

Since inception, a total of 1334 male calves, born out by elite matings at 29 Military Farms in different years were received at BRU Meerut for selection of young bulls for future breeding. MF Ambala supplied highest number of male calves (309) followed by Meerut (246) and Pimpri (162). Based on breed characteristics and physical conformity, a total of 113 bull calves were received at Bull Rearing Unit (BRU) during April 2015 to March 2016. MF Ambala supplied the highest number of male calves (26) followed by Lucknow (20) and Meerut (16) during this year.

Multiplication and Dissemination of Frieswal Germplasm

Since inception of the project, a total of 37,83,000 doses (upto 31st March 2016) of Frieswal semen have been produced at semen Freezing Laboratory (including 3,77,000 doses in 2015-16), out of which 13,10,000 doses (including 76038 doses in

Frieswal bulls

Table 1. Female herd strength of Frieswal cattle at various Military Farms as on 31.03.2016

Farm	Adults	YS-II	YS-I	Calves	Total
Meerut	622	266	155	108	1151
Agra	235	153	45	43	476
Lucknow	455	126	99	71	751
Bareilly	236	88	46	43	413
Kanpur	159	89	29	22	299
Jabalpur	347	109	105	64	625
Namkum	348	148	105	63	664
Mhow	140	34	28	9	211
Allahabad	225	71	31	34	361
Ranikhet	58	0	0	0	58
Ambala	1133	497	255	300	2185
Jalandhar	616	287	167	126	1196
Ferozpur	260	145	41	53	499
Pathankot	258	105	67	56	486
Dagshai	159	0	0	0	159
Yol	117	31	19	28	195
Belgaum	292	139	47	56	534
Deolali	353	103	144	82	682
Secunderabad	528	180	130	108	1000
Pimpri	926	357	217	174	1674
Gwalior	144	61	23	22	250
Jhansi	235	99	52	42	428
Ahmednagar	396	143	101	43	683
Panitola	168	51	39	24	282
Binnaguri	154	48	28	16	246
Dimapur	197	39	22	50	308
Missamari	328	94	60	43	525
Bengdubi	373	214	101	77	765
Guwahati	309	128	68	55	560
Jorhat	48	42	26	3	119
Panagarh	117	61	33	21	232
Udhampur	62	17	9	3	91
Jammu	381	168	101	75	725
Karu	19	8	5	3	35
Kargil	62	17	9	5	93
Nowshera	316	84	86	26	512
Total	**10830**	**4202**	**2493**	**1948**	**19473**

Table 2. The number of elite cows at various Military Farms (31.03.2016)

S. No.	Command/Farm	Number
	Southern	
1	PIMPRI	96
2	BELGAUM	30
3	DEOLALI	16
4	AHMEDNAGAR	26
5	SECUNDRABAD	55
6	JHANSI	39
7	GWALIOR	17
	Total	**279**
	Western	
1	AMBALA	101
2	JALANDHAR	37
3	FEROZPUR	27
4	PATHANKOT	36
5	DAGSHAI	12
6	YOL	09
	Total	**222**
	Central	
1	MEERUT	100
2	AGRA	45
3	BAREILLY	37
4	LUCKNOW	97
5	KANPUR	45
6	ALLAHABAD	68
7	JABALPUR	54
8	NAMKUM	22
9	MHOW	38
	Total	**506**
	Northern	
1.	Jammu	72
2.	Udhampur	07
3.	Nowshera	08
	Total	**87**
	Eastern	
1.	Panagarh	14
2.	Guwahati	25
3.	Bengdubi	25
4.	Panitola	17
5.	Dimapur	14
	Total	**82**
	Grand Total	**1176**

Table 3. Farm wise Frieswal male calves received at BRU Meerut (31.03.2016)

S. No.	Command/Farm	Number
	Southern	
1	PIMPRI	09
2	AHMEDNAGAR	01
3	JHANSI	02
4	GWALIOR	01
4	DEOLALI	03
6	SECUNDERABAD	01
	Total	**17**
	Western	
1	AMBALA	26
	Total	**26**
	Central	
1	MEERUT	16
2	AGRA	03
4	LUCKNOW	20
5	KANPUR	03
6	NAMKUM	01
7.	ALLAHABAD	05
8.	JABALPUR	06
	Total	**54**
	Northern	
1	JAMMU	11
	Total	**11**
	Eastern	
1	BENGDUBI	05
	Total	05
	Grand Total	**113**

2015-16) have been distributed to Military Farms. This year 54341 doses have been sold to para vets, state Animal Husbandry Departments, Livestock Development Boards, State Agriculture Universities and a revenue of Rs. 763387/- was generated. Also, 51450 doses were provided to Field Progeny Testing Units for test matings. Thus a total of 1,81,829 doses of Frieswal semen were used under various programmes during the year.

Performance evaluation of Frieswal animals

A total of 48,050 lactation records of Frieswal cows maintained over a period of 25 years from 1991 to 2015 and progeny of 180 bulls 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 Model 1 and 2 of LSMLMW – PC Package (Harvey, 1990) 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 were 3317.53 and 3332.46 kg, respectively. The peak yield (PY) of the Frieswal herd averaged 15.13 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 Mhow (3900.31 Kg) produced the highest 300 days milk yield followed by those maintained at Kanpur (3892.94) and Lucknow (3824.54 kg). Frieswal cows at Kanpur (4030.19 kg) had the highest total lactation milk yield followed by those at Allahabad (3896.16 kg) and Mhow (3884.31 kg). The peak yield was highest at MF Allahabad (17.97 kg) followed by Kanpur (16.80 kg) and Agra (16.76kg). PY ranged from 11.76 kg at MF Panagarh to 17.97 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 (3384.51 kg) followed by those calved in post monsoon (3376.37 kg), summer (3268.10 kg) and rainy (3241.16 kg) season. 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 those animals which calved in winter was highest (3392.26 and 15.83 kg) followed by those calved in post monsoon (3354.82 and 15.42 kg) and summer (3332.94 and 14.79 kg). The animals which calved during the rainy season had the lowest TLMY and PY (3249.80 and 14.46 kg, respectively). There was lot of fluctuation in total lactation milk yield during various years and it ranged from 2633.44 kg to 4030.19 kg. Higher PY was observed in those animals which calved in the year 2003 (16.11 kg).

The average lactation length (LL) of the Frieswal cows was 326.30 days. The effects of farm, parity and season and year of calving and regression of AFC were also significant on lactation length as in the case of other traits. Lactation length was longest at MF Rajouri (352.71 days) followed by at MF Panitola (346.33 days). All the Military Farms had lactation length higher than 300 days. The cows calved during summer season had the longest lactation length (334.71 days).

Reproductive performance

The overall mean of age at first calving (AFC) was 972.18 days (31.98 months). The effects of farm, season and year of birth were significant on AFC. The animals at MF Dimapur (29.28 months/ 890.28 days) had shorter age at first calving followed by Namkum (30.15 months/916.54 days) and Lucknow (30.32 months/921.63 days). The

longest AFC was recorded at MF Rajouri (34.71 months/1055.29 days) followed by Gwalior (33.65 months/ 1023.09 days). Large variation in AFC reflects the scope for its improvement by way of improving general management practices including feeding standards, timely heat detection and artificial insemination. Declining trend in AFC noticed over the years indicated a desirable improvement in this economically significant trait.

Service period (SP), Dry period (DP) and Calving interval (CI) were also evaluated. The average SP, DP and CI were 159.44, 117.98 and 439.93 days (14.46 months), 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 Bengdubi (138.65 days) followed by Secunderabad (144.11 days) and Mhow (145.72 days). Longest service period was observed in cows at MF Missamari (195.65 days). Similar trend was observed in the case of calving interval also, as expected. The shortest calving interval was observed in cows maintained at MF Bengdubi (418.81 days) followed by those kept at Secunderabad (421.92 days) and Mhow (425.33 days). The longest CI was also noticed at MF Misamari (476.09 days). MF Mhow had the shortest dry period (97.28 days) followed by MF Jabalpur (104.90 days) and Bengdubi (105.79 days). Longest DP was found in the cows at MF Missamari (140.10 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 (140.57 days) followed by those calved in rainy (153.05 days), winter (167.46 days) and summer (176.67 days) season. Seasonal variation in the reproductive traits also showed similar pattern and post monsoon calvers had the shortest DP and CI (109.17 and 421.67 days) while summer calvers had the longest DP and CI (125.86 and 456.79 days). There was no definite trend in SP and CI over the years. Longest SP was found during 1994 (188.41 days) and shortest during 2014 (96.70 days). The cows calved during 1999 had longest (134.59 days) dry period and thereafter a declining trend in dry period was observed. It reflected that attempts were being made for improving the reproductive traits at Military Farms over the years.

Estimation of Genetic parameters

Estimates of heritability for AFC (0.059±0.011), MY300 (0.046±0.009), TMY (0.052±0.009), and PY (0.049±0.008) were low. The SP, DP and CI also had low heritability estimatesof 0.007±0.003, 0.011±0.004 and 0.012±0.004, respectively.

Genetic evaluation of Frieswal bulls

Two sets of bulls inducted in 2003 (25 bulls) and 2006 (8 bulls) were evaluated. Breeding values of bulls were estimated by best linear unbiased prediction procedure using least squares and maximum likelihood computer package (Harvey, 1990). The first lactation records of 1563 and 739 cows in set 2003 and 2006, respectively were used in the analysis. Out of twenty five bulls inducted in 2003, eighteen bulls exceeded the herd average and the topmost ranking bull had 1.86 per cent genetic superiority over the population mean. Out of the eight bulls inducted in 2006, five bulls exceeded the herd average and the top ranking bull had 3.97 per cent genetic superiority over the population mean. So far, 105 bulls have been evaluated.

Prediction of Life time Milk Yield from first lactation traits

First lactation records (5171) of Frieswal cows comprising of AFC, LMY, PY, LL, SP and DP were analyzed to predict the lifetime milk production using multiple regression analysis (MRA), Principal Component regression(PCR) and artificial neural network (ANN).Step wise regression analysis was done to find out the best prediction model and the model equation derived was Y=14433+-304.97(PY)+ -1.86(AFC)+ -21.45LL+1.00(Parity*FLTMY). The R^2 and root mean square error values of the model were 64.53% and 2994.10, respectively. Further principal components were derived from first lactation traits (AFC, LL, DP, SP, TMY, PY) and used for prediction of life time milk yield. The first five principal components explained almost 100 per cent of variation. So the sixth principal component was excluded from the regression model and they predicted the life time milk yield, with almost the same accuracy of multiple linear regression model (R^2=64.59% and RMSE=2992.85). In order to train ANN, four variables which were used in the best predicted equation of MRA (PY, AFC, LL and (Parity*FLTMY)) were introduced as input variables. In the present study, a multilayer feed forward neural network with backpropagation of error learning mechanism was developed using Neural Network Toolbox (NNT) of MATLAB 7.0. The network was tested with 1 and 2 hidden layers with 2–20 neurons in each hidden layer. The best results were obtained with the combination of 2 hidden layers with 4 and 3 neurons, respectively, and the ANN prediction based on training set gave an accuracy of 68.40 % and simulation with test set gave an accuracy of 68.73 %. The RMSE values for training and test set were 2829.75 and 2803.69, respectively. In the present study, it was found that the accuracy of prediction of life time milk yield from ANN analysis was higher than from MRA and PCR.

(B) GENETIC IMPROVEMENT OF CROSSBRED CATTLE UNDER FIELD CONDITIONS-Field Progeny Testing of Frieswal bulls

The crossbred cattle in different agro-climatic region of the country are being improved through utilization of high quality germplasm of genetically superior Frieswal breeding bulls under the Field Progeny Testing programme of this Institute. A total of 261 bulls have so far been introduced in 14 different sets and 3,55,353 inseminations had been done in which 37,308 female progenies born, out of which, 1,0234 have reached to AFC with overall conception rate of 43.5%. Presently the programme is implemented in collaboration with Kerala Veterinary and Animal Sciences University(KVASU), Thrissur, Kerala, Guru Angad Dev Veterinary & Animal Sciences University, Ludhiana, Punjab, (GADVASU), BAIF Development Research Foundation, Uruli-Kanchan, Pune and G B Pant University of Agriculture & Technology(GBPUA&T), Pantnagar, Uttarakhand.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 has increased by 40.6% at GADVASU, 39.0% at KVASU, 11% at BAIF and 19% at Pantnagar unit. The AFC of the Frieswal progenies has reduced by 30% at GADVASU, 16.5% at KVASU, 12.3% at BAIF and 28% at Pantnagar unit.

Guru Angad Dev Veterinary & Animal Sciences University (GADVASU), Ludhiana, Punjab

The Field Progeny Testing programme is covering adult population of about 14135 cows and 5421breedable heifers. The insemination (AI) was undertaken in 86 adopted villages through 30 A.I. centres in Ludhiana district. Since inception of the project at this unit, a total of 284 Frieswal bulls have been inducted in thirteen different sets and 133452 AIs were carried out, of which, 128561 were followed for pregnancy diagnosis and 56343 pregnancies were confirmed. The overall conception rate was 43.8% on total inseminations (Table-4). A total of 3053 daughters (184 from 1st, 154 from 2nd, 397 from 3rd, 361 from 4th, 361 from 5th, 278 from 6th set, 351 from 7th, 326 from 8th, 558 from 9th sets and 83 from 10th set of bulls) have completed first lactation among the 17171 female calves born.The average 1st lactation 305 days lactation milk yield of the daughters from sixth set of bulls showed increasing trend. The average first lactation 305 days milk yields of the crossbred progenies in the adopted villages in the year 1993 was 2449.7 kg which increased to 3793 kg during the year 2015. The age at first calving showed a positive trend as it decreased from 1192 days in 1st set to 832 days in 10th set with a remarkable reduction of about 360 days.

Visit to GADVASU field Unit by Director ICAR-CIRC

Table 4. Information regarding different sets at GADVASU, Ludhiana since inception.

Set No	Date of start	Total bulls used	Total insemi-nations	Total A.I.'s followed	Pregnancies confirmed	Conception Rate %	Followed for calving	Female calves	
								Born	Reached AFC
1	1.4.95	18	7595	7355	3065	41.7	3000	855	227
2	1.1.97	10	5150	4865	2132	43.8	2000	789	210
3	1.1.99	23	18006	17159	8258	48.1	8000	1844	562
4	16.12.01	30	12548	11504	5720	49.7	5720	1368	490
5	1.4.03	22	10409	10154	4362	43.0	4362	1497	478
6	1.2.05	25	8265	8105	3476	42.9	3476	1181	359
7	1.8.06	22	9710	9710	3999	41.1	3999	1120	448
8	1.1.08	16	9611	9611	3898	40.6	3898	1186	461
9	1.7.09	24	14581	14581	5679	38.9	5679	1671	848
10	1.3.11	21	12971	12971	5604	43.2	5604	2072	489
11	1.8.12	28	15662	15662	7008	44.7	7008	2500	84
12	1.2.14	15	6662	6662	3039	45.6	2442	1088	
13	1.8.15	30	2282	222	103	46.4			
	Total	284	133452	128561	56343	43.8	55188	17171	4656

Table 5. Set wise progeny performance at GADVASU, Ludhiana

Set No.	Progeny completed 1st lactation	Average 1st lactation 305 days milk yield (kg)	Average age at first calving (days)	Average fat percentage
1	184	2697.8±40.1	1192.1±23.6	3.7±0.02
2	154	2827.1±48.7	1145.6±20.3	3.8±0.02
3	397	2878.7±25.5	1191.9±13.2	3.8±0.02
4	361	2896.8±26.0	1168.2±14.9	3.8±0.01
5	361	2855.9±25.9	1174.9±14.6	3.7±0.01
6	278	3051.8±24.5	1115.9±14.2	3.6±0.10
7	351	3305.4±28.9	1082.2±12.2	3.6±0.03
8	326	3556.6±31.2	1068.8±15.9	3.7±0.00
9	558	3726.7±25.3	993.8±7.4	3.7±0.00
10	83	3793.3±53.6	832.8±10.4	3.6±0.00

Inseminations with the 12th set of 15 crossbred bulls have been completed. During the year, a total of 3898 AI were conducted with the frozen semen of 13th set crossbred bulls. A total of 184, 154, 397, 361, 361, 278, 351, 326, 558 and 83 progenies of 1st, 2nd, 3rd 4th 5th, 6th, 7th, 8th, ,9th and 10th set of test bulls completed their first lactation 305 days milk production and their average first lactation 305 days milk production (Table 5, Fig. 1). Four village level group meetings were organized to make the dairy farmers aware about the importance of the field progeny testing programme. Farmers were advised on scientific breeding, feeding, management and health care practices for improving the production performance of their animals. In all 32.6% of the data was lost due to different causes and sale of the animals was the major cause of loss of data.

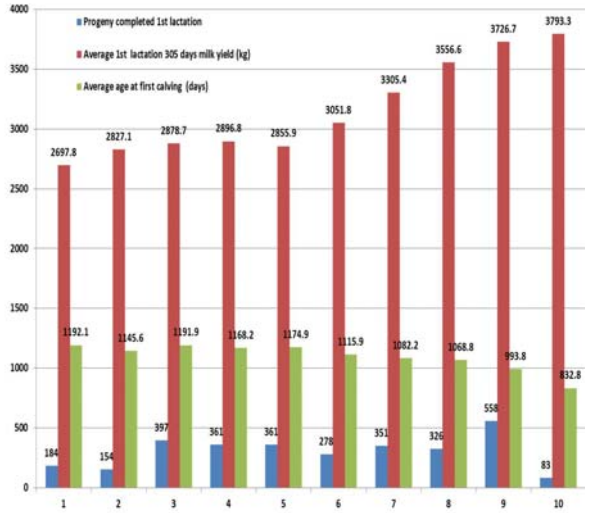


Fig. 1. Set wise progeny performance at GADVASU, Ludhiana

Socio economic status of farmers

The production performance of animals according to different categories of farmers (Table 6) showed that the farmers with fodder production had higher milk yield of their crossbred cows than the cows maintained by farmers without fodder production. Crossbred cows maintained by farmers having adequate fodder supply produced 3738.4±27.5 kg. during first lactation against 3526.8±147.1 kg of milk by the farmers having little or no green fodder supply. Commercial farmers obtained higher milk yield per cow (3736.0±27.4 kg) than the non-commercial farmers (3574.1±152.9 kg) Highest milk production (4516.5±127.2 kg)

was recorded by owners having college level education. Educated owners had more awareness and practiced dairying on scientific lines for getting higher productivity. The farmers having herd size of more than ten animals had the maximum lactation milk yield (4055.6±65.0 kg). It was also observed that the farmers having 5 to 10 acres of land holding constitute 55.5 per cent of animal owners and produced maximum milk of

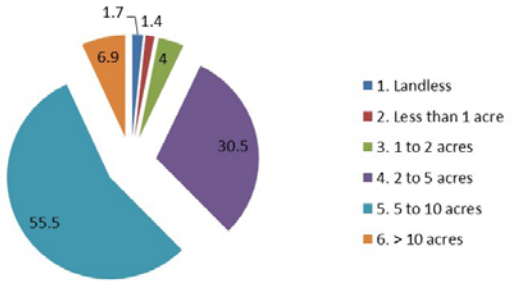


Fig. 2. Land holding of animal owners participating in the project

Table 6. Production performance of animals according to different categories of farmers

Category	No.	Percentage	1st lact. 305-days milk yield (kg.)
Overall mean	**348**	**100**	**3733.6±27.1**
Feeding System			
1. With fodder	340	97.7	3738.5±27.5
2. Without fodder	8	2.3	3526.8±147.1
Type of farmer			
1. Commercial	343	98.6	3736.0±27.4
2. Non-commercial	5	1.4	3574.1±152.9
Education			
1. Illiterate	8	2.3	3529.3±151.6
2. Up to primary	37	10.6	3795.6±74.6
3 Up to matric	276	79.3	3679.6±28.2
4. Up to secondary	8	2.3	3656.7±145.4
5. College level	19	5.5	4516.5±127.2
Herd size			
1. 0 to 3	77	22.1	3700.4±42.3
2. 4 to 5	106	30.5	3596.6±44.3
3. 6 to 10	96	27.6	3680.2±54.5
4. > 10	69	19.8	4055.6±65.0
Land holding			
1. Landless	6	1.7	3468.9±156.2
2. Less than 1 acre	5	1.4	3671.5±199.3
3. 1 to 2 acres	14	4.0	3706.4±137.3
4. 2 to 5 acres	106	30.5	3667.4±45.3
5. 5 to 10 acres	193	55.5	3798.3±36.9
6. > 10 acres	24	6.9	3608.9±122.9
Occupation of owner			
1. Agric. Farmer	286	82.1	3669.8±27.3
2. Agric. labour	8	2.3	3424.8±121.2
3. Service	2	0.6	3605.1±326.3
4. Business	2	0.6	3634.9±170.0
5. Dairying	50	14.4	4157.1±80.6

3798.3±36.9 kg (Figure 2). Only 14.4% of the owners had dairy as their whole time occupation. The milk production of the cows reared by such farmers was 4157.1±80.9 kg which was significantly higher than the milk production of animals of owners having occupations of agricultural labour, service and business. The milk production of the cows reared by the agricultural farmers (3669.8±27.3 kg) was also higher than agricultural labour, service and business. This could be due to the fact that the agricultural farmers gave 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 (KVASU)Thrissur, Kerala

Field progeny testing program at this unit is running through seven field units and six artificial insemination centers along with three livestock farms of KVASU. First set of bulls were inducted in 1992 and at present 14thset of bulls is in progress. 268 bulls have so far been inducted in 14 different sets. A total of 107297 artificial inseminations have been carried out and 64176 inseminations were followed for pregnancy diagnosis and 25959 pregnancies were confirmed since inception with an overall conception rate of 43.90% (Table-7). A total of 1512 daughters from first ten sets have completed their first lactation records. The milk yield showed almost increasing trend among the progenies of different sets (Table-8) and the average 305 days milk yield was 1958 kg (1st set) and 2723 kg (10th set). The average age at first calving of progenies of the test bulls and contemporaries calved during report period was 948.67 and 1250.10 days, respectively. The progeny born from test bulls of the scheme produced 500 liters more milk per lactation than other cow in the area and farmers got extra income of Rs. 16000/- per year per cow. The project contributed more than 10000 female progenies of high genetic merit to the state.

Frieswal heifer at FPT, KVASU unit, Thrissur

Inseminations of 12th set and 13th set of bulls were completed during the year. Recording of first lactation milk yield of cows of 9th set of bulls were completed till the end of reporting period.The number of semen doses used under the project during the period was 3960.The average conception rate of 13th batch was 46.22 %. Predicted average birth weight of female calves was 30.85±0.30 kg. Average age at first calving of the progenies was 1052.37±16.42 days in comparison with 1243.48±27.36 days in contemporaries. Average first lactation 305 days milk yield of cows completed first lactation in the year 2015 was 2895.31±57.66 kg.The loss of data was 2.02 % for 11th set, 4.37% for 12th set and 6.46% for 13th set of bulls till the end of the report period.

Socio economic status of farmers

Socio economic status of the new farmers during the period and the performance of progenies in different groups is presented in the Table 9. Socio- economic factors of the animal owners influenced the first lactation yield of progenies. Owners of progenies which had completed first lactation were

Table 7. Information regarding different sets at KVASU, Thrissur since inception

Set No	Date of start	Total bulls used	Total insemi-nations	Total A.I.'s followed	Pregnancies confirmed	Conception Rate %	Followed for calving	Females calves	
								Born	Reached AFC
1	1.1.92	12	23351	6722	2420	36.0	1902	956	319
2	1.4.94	11	12817	4800	1680	35.0	1300	603	240
3	1.9.95	11	9331	3942	1324	33.6	1065	757	89
4	1.11.98	15	11750	3753	1501	39.9	1489	676	178
5	9.11.01	19	3437	2361	1136	34.8	847	401	139
6	24.6.03	20	8173	7683	2582	33.6	1689	746	216
7	16.3.05	24	5759	5211	2281	43.7	1298	597	180
8	30.8.06	22	5703	5514	2472	44.8	1538	768	160
9	5.2.08	16	3393	3131	1181	37.7	801	394	81
10	1.7.09	24	5781	5612	2124	37.8	1324	664	158
11	25.5.11	21	4820	4401	2006	45.6	1240	642	131
12	10.10.12	28	6045	5531	2357	42.6	1298	640	5
13	14.3.14	15	5211	4850	2603	41.9	778	387	0
14	22.7.15	30	1726	665	292	43.9	0	0	0
	Total	**268**	**107297**	**64176**	**25959**	**43.9**	**16569**	**8231**	**1896**

Table 8. Set wise progeny performance at KVASU, Thrissur unit

Set No.	Progeny records	1st 305 days milk yield (kg)	Age at first calving (days)	Average milk fat (%)
1	296	1958.4 ± 27.0	1136.4 ± 13.0	3.46 ± 0.20
2	223	1976.8 ± 32.7	1125.9 ± 17.7	4.26 ± 0.21
3	85	2098.2 ± 42.8	1204.7 ± 26.8	3.97 ± 0.31
4	159	2190.7 ± 38.2	1195.4 ± 17.6	4.15 ± 0.26
5	125	2209.7 ± 42.0	1160.3 ± 17.0	3.91 ± 0.34
6	187	2466.0 ± 44.0	1129.0 ± 13.0	3.89 ± 0.25
7	158	2433.7 ± 51.9	1144.3 ± 16.6	3.86 ± 0.43
8	98	2659.47 ± 41.2	1095.9 ± 21.25	3.8 ± 0.39
9	59	2696.4 ± 71.80	1112.15 ± 47.82	3.7 ± 0.34
10	106	2761.5 ± 47.41	1021.10 ± 17.44	3.5 ± 0.38
11	17	2723.79 ± 69.38	948.67 ±12.57	3.7 ± 0.39

classified into five different groups based on their occupation and it was found that 83.54 % of the progeny owners were agriculture labours. Agriculture farmers accounted for

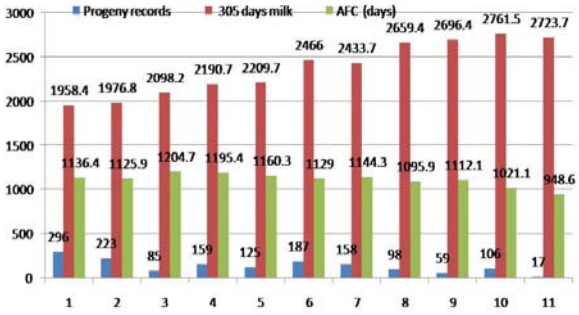


Fig. 3. Set wise progeny performance (milk yield and age at first calving) at FPT, KVASU, Thrissur Unit

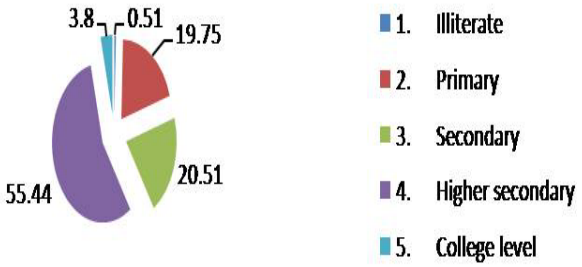


Fig. 4. Education Status of Owners participating in the project

12.15% of progenies and the other occupational groups of owners were negligible.

The educational status of the owners of the progenies wasalsoanalysed .The high literacy rate of the state is also reflected in the educational status of owners. More than 55% of the owners had an educational qualification of higher secondary and 3.8% college qualifications.

Table 9. Socio economic status of owners of progenies and the first lactation milk yield

Category	No.	Percentage	Average 1st lact.305 days milk yield (kg)
Feeding System			
1. With fodder	76	19.24	2854.36
2. Without fodder	319	80.76	2797.70
Education			
1. Illiterate	2	0.51	—
2. Primary	78	19.75	2590.94
3. Secondary	81	20.51	2676.92
4. Higher secondary	219	55.44	2994.60
5. College level	15	3.80	—
Land holding			
1. Landless	0	0.00	—
2. Below 10 cents	33	8.35	2996.00
3. 10 -49 cents	110	27.85	2692.50
4. 50-99 cents	78	19.75	2823.50
5. 1 acre-2 acres	92	23.29	2984.50
6. 2 -3 acres	59	14.94	3407.50
7. 3 -4 acres	14	3.54	2207.50
8. >4 acres	9	2.28	2672.50
Occupation of farmer			
1. Farmers (Agriculture)	48	12.15	2838.10
2. Agric. Labour	330	83.54	2694.44
3. Govt Job	10	2.53	—
4. Pvt. Job	2	0.51	3085.01
5. Business	5	1.27	—

Around 56% of animal owners had less than 1 acre land. Less than 20% farmers had more than one hectare of land. Number of cattle present in houses was taken as herd size. 61% of the owners of progenies had herd strength of 3 or less. The milk of progenies of these small holder system was higher than that of other groups. The herd size of more than 10 was observed only with 2.03% owners and the first lactation yield was lowest in this group. An analysis of different groups of cattle in the progeny testing herd of Kerala Veterinary and Animal Sciences University showed that cows accounted for around 51% of the population whereas, the dry cows and heifers accounted for approximately 16% and calves 32.30 %. This shows that the replacement stock is available in the population.

Fig. 5. Land holding of animal owners participating in the project

BAIF Development Research Foundation, Central Research Station,Uruli-Kanchan

Till the reporting period semen doses from 260 bulls had been used for breeding the field animals and 11 bull batches completed test inseminations. The 12th bull batch introduced in August 2015 is in progress for test inseminations. From these bull batches a total of 1,00,284 AI were performed out of which 92,111 were followed for pregnancy confirmation and 41,798 pregnancies were recorded with average conception rate of 46.40 per cent. From these pregnant animals 26,562 were followed for progeny birth, 12,267 female progeny were born till the reporting period and out of that 4,418 reached to age at first calving (Table- 10).

Visit at BAIF FPT unit by PI & Co-PI from CIRC

The crossbred population in the region is dominated by the grades of Holstein Friesian breed. Selection of breeding bulls on progeny performance to maintain and improve the milk production of field animals is therefore essential. It is thus necessary to assess the progeny performance of bulls under wide range of feeding and management regimes in the field conditions so that potential bulls can be selected based on field progeny performance of the crossbreds.

During the reporting period a total of 6632 artificial inseminations were performed from the bull batches 11th and 12th, out of that 3410 inseminations were followed for pregnancy diagnosis. A total of 2819 pregnancies were confirmed with average conception rate of 45.59 per cent.The first lactation 305 days milk production performance of 248 daughters of sixth set, 192 daughters of seventh set, 265 daughters of eighth set and 177 daughters of 9th set of test bulls were 3008.7 kg, 3094.1 kg, 3199.9 kg and 3028.9 kg, respectively and the corresponding estimates for average age at first calving were 32.8, 32.5, 31.1, and 28.5 months,

Table 10. Information regarding different sets of bulls at BAIF, Pune since inception.

Set No	Bull batch starting date	Total bulls used	Total A.I. done	Total A.I.'s followed	Pregnancies confirmed	Conception Rate %	Followed for calving	Females calves	
								Born	Reached AFC
1	July1995	20	16118	15063	7001	46.48	4868	2344	1563
2	Feb.1998	19	21321	17239	7673	44.51	3815	1756	514
3	July 2001	20	7461	7380	3398	46.04	2626	1201	364
4	July 2003	20	5249	5162	2162	41.88	1493	731	289
5	Feb. 2005	25	6806	6638	2989	45.03	1969	856	394
6	Sept. 2006	22	6533	6327	2899	45.82	1993	885	371
7	Feb. 2008	16	4902	4902	2169	44.25	1561	733	313
8*	Aug. 2009	24	6893	6867	2987	43.50	1997	878	369
9*	April 2011	21	6364	6364	3109	48.85	2270	1010	241
10*	Aug. 2012	28	9270	9030	4190	46.40	2509	1182	08
11**	March 2014	15	7139	7139	3221	45.12	1461	691	00
12	Aug. 2015	30	2240	873	345	39.52	00	00	00
	Total	**260**	**100284**	**92111**	**41798**	**46.40**	**26562**	**12267**	**4426**

Table 11. Set wise progeny performance at BAIF, Pune unit

Set No.	Progeny records	1st lactation 305 DMY (kg)	Average AFC (months)	Average milk fat (%)
1	1237	2930.34±23.21	32.55±0.06	3.5±0.36
2	362	2848.46±39.02	33.17±0.19	3.6±0.32
3	247	2965.52±37.98	32.94±0.28	3.6±0.34
4	193	2972.06±41.13	32.86±0.24	3.6±0.31
5	285	2986.98±33.12	32.99±0.21	3.6±0.29
6	248	3008.78±26.78	32.83±0.28	3.6±0.38
7	192	3094.02±37.81	32.55±0.30	3.6±0.32
8	265	3199.94±32.67	31.10±0.28	3.60±0.37
9	177	3028.95±30.80	28.57±0.33	3.60±0.38

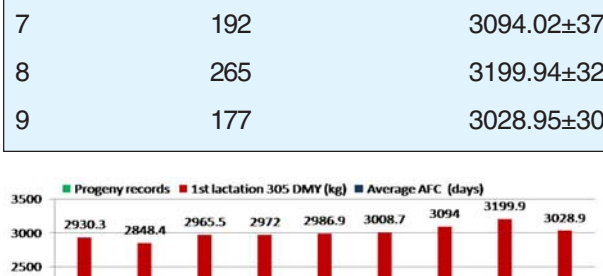


Fig. 6. Set wise progeny performance (milk yield and AFC) at BAIF, Pune

respectively. The average fat in milk of the daughters of sixth, seventh, eighth and ninth set of bulls was 3.6 per cent (Table- 11).

Socio economic status of farmers

Regarding socio-economic status of farmers at this unit, it was noticed that out of total 1480 farmers, 40.41 per cent had education upto primary level, 37.09 per cent

upto secondary, 8.51 per cent higher secondary and 4.59 per cent graduate and above. The proportion of illiterate cow owners was 9.39 per cent. The average herd size in field progeny testing area was 6.04. In this, more than 3/4th share was of Holstein-Friesian crossbred population (88.77%) followed by Jersey crossbred population (9.63%). The percentage of non-descript animals was 1.12. The Gir animals' contribution in the overall population was found to be below 1 per cent. Among all, 55.88 per cent animals were in milking stage and 44.12 per cent heifers. In milking animals 35.46 per cent were of one to three lactations, 18.24 per cent 4th to 6th lactations and 1.69 per cent animals were in 7th lactation and above. Majority of herd owners (48.79%) had permanent or semi-permanent, 20.13 per cent owners temporary type and 31.08 per cent thatched type of housing to their animals. None of the animal was found kept without shelter. Occupation wise 90.95 per cent of

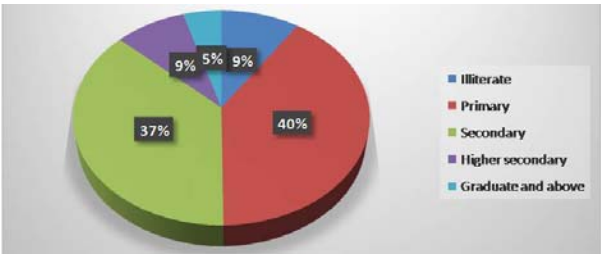


Fig. 7. Education Status of farmers participating in the project

cattle owners were agriculturists and almost all (95.74%) owned land. Nearly 60 per cent farmers had land up to 5 acres and the percentage of farmers having land more than 10 acres was 10.74. Among landholders, more than 2/3rd (69.53%) cattle owners were found cultivating different fodder crops. The proportion of landless and didn't have land under fodder crop was 4.26 and 30.47, respectively. The fodder crops generally grown and available to animals were Jowar straw, Bajra straw, sugarcane tops, lucerne and maize. In concentrate, they feed ready-made feed purchased from market.

Table 12. Status of farmers participating in the project

A. Educated status of farmers participating in the project

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

B. Land holding wise frequency of farmers

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

C. Main occupation of farmers participating in the project

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

D. Types of cattle housing

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

GB Pant University of Agriculture & Technology (GBPUA&T), Pantnagar, Uttarakhand

The unit started in XI Plan in the year 2009 and is presently running through 7 A.I. centers of U.S.Nagar and Nainital districts of Uttarakhand. A total of 25,016 frozen semen doses from 55 bulls (3000 from 10 bulls of 1st set; 2906 from 6 bulls of 2nd set, 4410 from 9 bulls of 3rd set, 7350 from 15 bulls of 4th set and 7350 from 15 bulls of 5th set) were received for carrying out test A.I. A total of 55 bulls have so far been introduced in 5 different sets and total of 13589 insemination have been done in which 2224 female progenies born out of which 364 have reached age at first calving (Table-13).

Frieswal heifers' show at GBPUA&T, Pantnagar

During the year 2015, a total of 4093 AI were carried out, 2701 were followed for pregnancy diagnosis with 2237 confirmed pregnancies leading to a CR of 54.7%. A total of 732 daughters (732 of 4th set) born and a total of 172 daughters (31 of Ist set, 133 of 2nd set and 8 of 3rd set) completed first

Table 13. Information regarding different sets at GBPUA&T, Pantnagar since inception

Set No.	Date of start	Total bull used	Total Insemination	Total A.I. followed	Pregnancies confirmed	Followed for calving	Female calves	
							Born	Reached AFC
1	20.1.10	10	1784	1750	1030	997	340	182
2	16.3.11	6	2303	2258	1546	1529	542	174
3	25.7.12	9	2473	2243	1405	1382	573	8
4	05.2.14	15	5205	3602	2922	1746	769	-
5	22.7.15	15	1824	822	450	-	-	-
	Total	**55**	**13589**	**10675**	**7353**	**5654**	**2224**	**364**

Table 14. Comparative performance of 4 different units of FPT project during the reporting period (1.1.2015 to 31.12.2015)

Particulars	KVASU Thrissur	GADVASU Ludhiana	BAIF Pune	GBPUAT Pantnagar
Total Artificial inseminations	3960	3898	6433	4133
Pregnancies confirmed	1703	862	2819	2237
Conception rate %	43.9	46.3	45.6	54.7
Total calving	977	1984	1456	1665
Female calves born	475	986	688	732
Female calves reached AFC	163	558	292	172
Female calves completed 1st lactation	67	348	217	122
Average 305 days milk yield (kg)	**2895.3**	**3733.6**	**3126.0**	**2702.9**
Average AFC(days)	**1052.7**	**1061.9**	**940.9**	**1110**
Total loss of data (%)	6.46	32.60	25.68	10.80

lactation. An overall First lactation milk yield of 2714.2 ±84.4 kg and average milk fat of 3.67 ±0.03% were recorded. A total at 3 training programs and 1 heifer show were organized in field wherein 422 farmers took active part to understand the programme.

(C) CONSERVATION AND GENETIC IMPROVEMENT OF INDIGENOUS CATTLE BREEDS–Indigenous Breeds Project

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

The project is being operated in the home tracts of three indigenous cattle breeds viz., Gir, Kankrej and Sahiwal in collaboration with various State Veterinary /Agricultural Universities and ICAR institutes, State Government Farms, NGOs and Gaushalas. The project is primarily aimed to conserve, propagate and improve the genetic potential of these three important indigenous cattle milch breeds. The technical programme of the project envisages the establishment of germplasm (GP) and data recording units (DR) for each breed by registering the animals maintained under farm and field conditions. The young bulls born out of nominated mating of elite cows with high genetic merit bulls at the germplasm centre are progeny tested using animal and farm facilities existing at the Data Recording Units/ associated herds.

As per the technical programme of the project, for each breed of cattle about 75 elite breedable females are maintained at the GP unit and about 750 breedable females identified at about 5 DR units (herds) involving farmer's animals in the breeding tract. The young bulls born out of nominated mating in the germplasm unit are utilized for breeding the females registered in the DR units and around 60 to 70 females are mated by each young bull so as to get the first lactation milk production records of at least 20 progenies per bull. The information on growth, reproduction, milk production and survivability are recorded for performance evaluation, selection and genetic improvement of recommended indigenous cattle breeds.

(a) GIR BREED

The GP unit of Gir cattle is located at Cattle Breeding Farm, Junagadh Agricultural University, Junagadh. The DR units of the breed are located in 11 farmer herds and three associated herds and a total of 10673 breedable females have been identified and registered in the project.

Herd strength

The herd strength of GP unit at the start of the year 2015 (as on 1st January, 2015) was 134, which included 94 females and 40 males.The numbers of female and male calves born during the year 2015 were 18 and 13, respectively. At the end of the year, the number of breedable females aged above 2.5 years was 80 which included 36 milch and 20 dry cows. During the year 2015, the GP unit maintained 12 breeding bulls out of which three were sold. The unit also maintained 24 young bulls above one year of age. The total

Gir cow

herd strength of GP unit as on 31st December 2015 was 161 out of which 117 were females and 44 were males.

The initial herd strength of the DR unit at CBF, Junagadh as on 1st January 2015 was 391 consisting of 289 female and 102 male animals. A total of 100 normal calving resulted in 45 female and 55 male calves during the year. At the end of the year, the DR unit maintained 470 animals consisting of 316 female and 154 male animals. The unit maintained 178 breedable females aged above 2.5 years and 106 young bulls above one year of age.

Bulls inducted and frozen semen doses produced

In the project, 18 Gir bulls in three sets (six in first set, nine in second set and three in third set) have been put under semen collection, out of which, 14 bulls (six in first, seven in second and one in third set) were used for breeding so far. The opening balance of semen doses collected as on 1st January, 2015 was 20087 (10175 and 9912 for bulls of 1st set and 2nd set, respectively). The total numbers of semen doses produced from first, second and third set of Gir bulls during the year were 650, 38212 and 6649, respectively totaling to 45511. A total of 4380 doses were utilized for insemination (20 of 1st, 3730 of 2nd and 630 of 3rdset) and 1130 doses were sold (100 of 1st set and 1030 of 2ndset) and 60088 doses were available as

Gir bull

Table. 14. Breed wise details of semen doses collected and utilized during the year 2015

Breed	Set No.	Bulls inducted	Semen doses		Total	Doses utilized during 2015				Balance as on 31-12-2015
			Balance as on 31-12-2014	Produced during 2015		Utilized for breeding/ supplied	Sold	Discarded/ Other	Total	
Sahiwal	I	8	25409	0	25409	437	785	0	1222	24187
	II	7	34405	11890	46295	7783	5633	-	13416	32879
	Total	**15**	**59814**	**11890**	**71704**	**8220**	**6418**	**0**	**14638**	**57066**
Gir	I	6	10175	650	10825	20	100	-	120	10705
	II	9	9912	38212	48124	3730	1030	0	4760	43364
	III	3	0	6649	6649	630	0	0	630	6019
	Total	**18**	**20087**	**45511**	**65598**	**4380**	**1130**	**0**	**5510**	**60088**
Kankrej*	II	8	65852	27351	93203	3600	60	1245	4905	88298
	III	9	14538	17170	31708	610	118	1335	2063	29645
	Total	**17**	**80390**	**44521**	**124911**	**4210**	**178**	**2580**	**6968**	**117943**
Overall	**50**	**160291**	**101922**	**262213**	**16810**	**7726**	**2580**	**27116**	**235097**	

*Semen doses of first set Kankrej bulls were procured from Banas dairy farm

Table 15. Breed wise details of insemination carried out, conception and daughter born (Sahiwal DR unit included)

Breed	Set No.	Bulls inducted	AI done			Conception			Daughters born		
			Up to December 2014	During 2015	Total	Up to December 2014	During 2015	Total	Up to December 2014	During 2015	Total
Sahiwal	I	8	3642	0	3642	1322 (36.30)	0 (0.0)	1322 (36.30)	577	6	583
	II	7	1676	1163	2839	676 (40.33)	496 (42.65)	1172 (41.28)	96	206	302
	Overall	15	5318	1163	6481	1998 (37.57)	496 (42.65)	2494 (38.48)	673	212	885
Gir	I	6	11168	62	11230	5655 (50.64)	96	5751 (51.21)	2825	106	2931
	II	9	4353	2341	6694	1782 (40.94)	1327 (56.69)	3109 (46.44)	519	519	1038
	III	3	0	397	397	0 (0.0)	49 (12.34)	49 (12.34)	0	0	0
	Overall	18	15521	2800	18321	7437 (47.92)	1472 (52.57)	8909 (48.63)	3344	625	3969
Kankrej	I	8	2178	0	2178	1138 (52.25)	0(0.0)	1138 (52.25)	392	0	392
	II	9	4606	2003	6609	2013 (43.70)	908 (45.33)	2921 (44.20)	475	173	648
	Overall	17	6784	2003	8787	3151 (46.45)	908 (45.33)	4059 (46.19)	867	173	1040

Figures in parentheses indicate conception rate in percentage

Table 16. Number of breedable females and number of calves born at the Germplasm units

Breed	No. of breedable females	Calves Born	
		Male	Female
Sahiwal	251	66	55
Gir	80	13	18
Kankrej	70	17	31

on 31st December 2015 for future use (Table-15 & 16).

Insemination carried out, conception rate and daughters born

The details of insemination carried out, conception and daughters born are presented in table-17. During the year 2015 a total of 2800 inseminations were carried out and 1472 pregnancies were confirmed resulting to an overall conception rate of 52.57 per cent which was higher than the overall conception rate of 48.63 per cent since inception of the project. The total number of inseminations carried out since inception for 1st, 2nd& 3rdset were 11230, 6694, and 397, respectively resulting to a total of 18321. During the year 2015, a total of 625 daughters were produced which resulted in to a total of 3969 daughters since inception. The numbers of normal male and female calving in GP and DR units of CBF, Junagadh were 63 and 68, respectively with a male female ratio of 48.09: 51.91.

Productive and reproductive performance

The details of productive and reproductive performance of Gir cattle maintained under GP and DR units of CBF, Junagadh are presented in table-18.

Germplasm unit

The overall average first lactation milk yield was 2545.6 kg (300 days) while average milk yield for all lactation was 3393.60 kg. The average lactation length and peak yield were 413.60 days and 14.10 kg, respectively. The overall age at first calving, first service period, first dry period and calving interval were 1341.00, 134.20, 55.30 and 459.50days, respectively. The wet and dry averages of the GP unit were 6.87 and 4.12 kg, respectively.

Data recording unit

The average age at first calving of Gir cattle maintained under DR unit of CBF, Junagadh was 1421.20 days while average estimates for first service period, first dry period and calving interval were 131.00, 101.80 and 441.90 days, respectively. The averages for first and all lactation milk yields were 2333.20 and 2088.60 kg, respectively with an average first lactation length of 335.40 days. The average first lactation peak yield was 13.00 kg while the wet and dry averages were 6.03 and 3.16 kg, respectively. The GP unit excelled the performance of DR unit as it maintained only the elite females.

(b) KANKREJ BREED

The GP unit of Kankrej cattle is located at Livestock Research Station, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar, Gujarat and 5 DR units consisting of organized farms and farmers herds have been identified under the project.

Kankrej cow

Herd strength

The initial herd strength of Kankrej animals as on 1st January 2015 in the GP unit was 139 with 96 females and 43 males. The total number of breedable females above 2.5 years was 67 and the number of animals in milking was 24. The unit also had 20 Kankrej bulls for breeding purpose. During the year 2015, a total of 48 calves born with the male: female ratio of 35.42 and 64.58. The total number of female animals maintained at the end of the year was 115 consisting of 30 calves up to 12 months, 15 heifers of 1-2 year age and 70 females above 2.5 years. As on 31st December, 2015, the GP unit maintained 19 breeding bulls and 13 young bulls aged above one year of age.

The total herd strength of DR unit of Kankrej cattle at LRS, Sardarkrushinagar as on 31st December, 2015 was 124 animals. The total numbers of female and male animals were 5 and 19, respectively. The unit maintained 63 adult breedable females in which 26 were in milking. A total of 39 calves consisting of 22 female and 17 males were born during the year. A total of 3063 breedable females were identified under the project at organized farm (63) and 11 field units (3000).

Bulls inducted and frozen semen doses produced

Two sets of Kankrej bulls have been inducted so far, the first set consisted of eight bulls from Banas Dairy while the second set consisted of nine bulls. The opening balance

Kankrej bull

of semen doses as on 01st January 2015 was 80390 and during the year 2015, a total of 44521 doses of frozen semen were produced from 12 bulls. A total of 4210 doses were utilized for insemination, 178 doses were sold and 2580 doses were discarded resulting to a balance of 117943 doses of frozen semen for future breeding.

Inseminations carried out, conception rate and daughters born

During the reporting period, 2003 animals were inseminated, 908 animals were confirmed for pregnancy and 173 daughters born. The conception rate during the year 2015 was estimated as 45.33 per cent against overall conception rate of 46.19 per cent since inception of the project. The total numbers of daughters produced by the first and second set of bulls were 392 and 648, respectively resulting in 1040 daughters since inception of the project. The numbers of normal male and female calving in the GP and DR unit of LRS, Sardarkrushinagar during 2015 were 33 and 52, respectively with a male female ratio of 38.82:61.18 and the overall percentage of abnormal calving was only 2.30.

Productive and reproductive performance

The details of productive and reproductive performance of Kankrej cattle maintained under GP and DR unit of LRS, Sardarkrushinagar are presented in table-18.

Germplasm unit

The overall average estimates for age at first calving, first service period, first dry period, calving interval were 1246.61, 159.25, 124.60 and 441.24 days, respectively while average estimates for first lactation milk yield, all lactation milk yield and first peak yield were 2755.94, 3063.16 and 11.74 kg, respectively. The average first lactation milk yield was lower than all lactation milk yield indicating improvement in the milk production in the subsequent lactations in Kankrej cattle. The average first lactation length of the herd was 338.73 while the wet and dry averages were 9.64 and 6.33 kg, respectively.

Data recording unit

The Kankrej cows maintained in the DR unit produced an overall average first and all lactation milk yields of 2331.89 and 2257.70 kg, respectively. The first lactation length was 304.50 days. The average estimates for reproductive traits viz., age at first calving, first service period, first dry period and calving interval were 1270.43, 132.34, 160.60 and 430.71days, respectively. The first lactation peak yield was 11.14 kg while the wet and dry averages of the herd were8.68 and 4.83 kg, respectively.

(c) SAHIWAL BREED

The GP unit of Sahiwal breed is located at the National Dairy Research Institute, Karnal and five DR units are located at i) Government Livestock Farm-I, Hissar, ii) GADVASU, Ludhiana, iii) Shri Gaushala Trust, Bhiwani, iv) G.B. Pant University of Agricultural and Technology, Pantnagar, Uttarkhand and (v) Veterinary College, Anjora, Durg, Chhattisgarh.

Table 18. Productive and reproductive performance of Indigenous cattle breeds

Traits	Gir		Kankrej		Sahiwal				
	GP unit	DR unit	GP unit	DR unit	GP unit	DR units			
	CBF, JAU, Junagadh	CBF, Junagadh	LRS, Sardarkrushi nagar	LRS, Sardarkrushi nagar	NDRI, Karnal	GADVASU, Ludhiana	GLF-I, Hissar	GBPUA&T, Pantnagar	Shri Gaushala Bhiwani
Age at first calving (days)	1341.00 ± 117.30 (04)	1421.20 ± 39.10 (19)	1246.61 ± 29.22 (18)	1270.43 ± 77.96 (07)	1146.90 ± 29.10 (43)	1342.75 ± 68.46 (04)	1503.00 ± 30.00 (19)	1227.20 ± 26.36 (67)	1580.00 ± 0.25 (4)
First lactation milk yield (kg)	2545.6 ± 883.20 (04)	2333.20 ± 209.40 (09)	2755.94 ± 220.03 (11)	2331.89 ± 128.03 (08)	2574.80 ± 366.70 (16)	1630.77 ± 220.79 (09)	2060.00 ± 116.00 (25)	1636.76 ± 39.03 (27)	2846.00 ± 281.00 (05)
Lactation milk yield (kg)	3393.60 ± 225.80 (28)	2088.60 ± 135.90 (31)	3063.16 ± 217.71 (24)	2257.70 ± 117.80 (30)	-	1627.18 ± 99.63 (26)	2273.00 ± 48.00 (133)	1682.25 ± 52.52 (47)	2504.00 ± 248.09 (22)
First lactation length (Days)	413.60 ± 16.00 (28)	335.40 ± 13.40 (31)	338.73 ± 20.30 (11)	304.50 ± 17.94 (08)	332.50 ± 26.80 (16)	317.33 ± 34.79 (09)	339.00 ± 11.00 (25)	290.11 ± 07.66 (27)	264.00 ± 27.59 (05)
First peak yield (kg)	14.10 ± 0.50 (28)	13.00 ± 0.40 (31)	11.74 ± 0.36 (11)	11.14 ± 0.44 (08)	12.50 ± 0.90 (16)	10.42 ± 0.73 (09)	08.50 ± 0.30 (25)	09.85 ± 01.32 (67)	13.40 ± 0.25 (05)
First dry period (days)	55.30 ± 08.00(19)	101.80 ± 14.60 (22)	124.60 ± 27.53 (05)	160.60 ± 20.64 (05)	120.90 ± 41.70 (07)	186.30 ± 43.62 (03)	174.40 ± 12.70 (18)	150.58 ± 19.44 (17)	180.71 ± 22.56 (07)
First service period (days)	134.20 ± 12.50 (19)	131.00 ± 11.20 (22)	159.25 ± 23.91 (12)	132.34 ± 11.93 (06)	155.30 ± 31.60 (07)	141.13 ± 34.29 (06)	147.00 ± 22.00 (08)	145.50 ± 08.80 (20)	98.78 ± 14.49 (09)
Calving interval(d)	459.50 ± 24.60 (19)	441.90 ± 17.40 (22)	441.24 ± 15.89 (25)	430.71 ± 12.22 (28)	437.70 ± 33.50 (07)	423.40 ± 58.67 (12)	506.00 ± 14.00 (21)	428.85 ± 06.27 (14)	440.00 ± 24.86 (08)
Wet average (kg)	6.87	6.03	9.64	8.68	7.30	5.81	7.00	5.64	7.48
Dry average (kg)	4.12	3.16	6.33	4.83	3.20	3.89	4.30	3.81	3.27

Figures in parentheses indicate number of observations

Sahiwal cow herd

Herd strength

During the year 2015, a total of 416 Sahiwal animals were maintained at the GP unit. The numbers of breedable females and males above two years were 251 and 29, respectively. The male and female calves born during the year 2015 in the GP unit were 66 and 55, respectively. The total numbers of breedable females above two years of age registered in different DR units were 683 (308 in GLF-I, Hisar, 57 in GADVASU, 110 in Pantnagar, 89 in Anjora, Durg and 119 in Shri Gaushala, Bhiwani).

Bulls inducted and frozen semen doses produced

So far, fifteen Sahiwal bulls in two sets (8 in 1st set and 7 in 2nd set) have been inducted in the project for progeny testing. The opening balance of frozen semen doses as on 01st January 2014 was 59814 and during the year 11890 doses were produced from the second set of bulls. A total of 8220 semen doses were utilized for breeding and 6418 doses were sold and at the end of the year 57066 doses were in stock for future use.

Insemination carried out, conception rate and daughters born

During the reporting period 1163 inseminations (307 in GLF-I, Hisar, 293 in Pantnagar, 289 in NDRI, Karnal, 109 in GADVASU, Ludhiana, 70 in Bhiwani and 95 in Durg unit) were carried out, thus, making total inseminations of 6481 since inception of the project. During the year 2015, the conception rate for the second set of bulls was 42.65 per cent. The conception rates since inception for the first and second set of bulls were 36.30 and 41.28 amounting to an overall conception rate of 38.48 per cent. So far 885 Sahiwal daughters were produced under the project while during the report period 212 (06 and 206 for 1st and 2nd set of bulls, respectively) daughters born. The number of daughters born at NDRI Karnal, GLF-I Hissar, GADVASU Ludhiana, Pantnagar, Durg and Bhiwani units were 55, 68, 10, 53, 05 and 21, respectively.

Productive and reproductive performance

The details of productive and reproductive performance of Sahiwal cattle maintained under GP and different DR units are presented in table-18.

Germplasm unit

The overall average estimates for age at first calving, first service period, first dry period and calving interval of Sahiwal cows maintained at GP unit of NDRI, Karnal were 1146.9, 155.3, 120.9 and 437.7 days, respectively while average estimates for first lactation 305 day milk yield and first peak yield were 2574.8 and 12.5 kg, respectively. The average first lactation length of the herd was 332.5 days while the wet and dry averages were 7.3 and 3.2 kg, respectively.

Data recording units

Among the different DR units, the Sahiwal herd maintained at Pantnagar showed lowest

age at first calving of 1227.20 days. However the first service period was lowest (98.78 days) in Shri Gaushala, Bhiwani followed by GADVASU, Ludhiana (141.13days). The first dry period was lowest (150.58 days) in Pantnagar. The highest first lactation milk yield of 2846.0 kg was recorded in Shri Gaushala, Bhiwani followed by GLF, Hissar (2060.0 kg) while the lowest yield of 1630.77 kg was recorded in GADVASU, Ludhiana. The average first lactation length estimates of Sahiwal cows at GLF-1, Hissar, Pantnagar and GADVASU, Ludhiana were 339.00, 290.11 and 317.33 days, respectively. The wet averages of milk yield in different DR units ranged between 5.64 (GBPUA&T, Pantnagar) and 7.48 kg (Shri Gaushala, Bhiwani) while the range of dry average was 3.27 (Shri Gaushala, Bhiwani) to 4.30 kg (GLF, Hissar).

(II) INSTITUTIONAL PROGRAMMES

(A) MOLECULAR CHARACTERIZATION

Differential expression and SNP identification of OAS1 gene related to establishment of pregnancy in Sahiwal and Frieswal cattle

Genomic DNA isolated from blood samples of 250 (82 Sahiwal and 168 Frieswal) animals were used in the study. The promoter region of the 2,5-oligoadenylate synthetase 1 (OAS1) gene was screened for identification of single nucleotide polymorphisms. Two primer pairs were used to amplify the targeted region based on the Gen Bank reference sequence (bovine OAS1Y gene; Accession No. ENSBTAG00000039861) using primer 3 software. The PCR programme was made with the following conditions-initial denaturation at 94^{0}C for 5 min, followed by 35 cycles of 94^{0}C for 30sec, annealing temperature (65 and 60^{0}C) for 30 sec, 72^{0}C for 1 min and a final extension at 72^{0}C for 10 min. After the PCR, the required product sizes were amplified. The PCR-SSCP method was used to scan for mutations within the amplified regions. Aliquots (10µL) of the PCR products were mixed with equal amount of denaturing solution (95% formamide, 25 mM EDTA, 0.025% xylene cyanol, and 0.025% bromophenol blue), heated at 95^{0}C for 5 min, and immediately chilled on ice. The denatured DNA was subjected to 10% polyacrylamide gel (acrylamide: bisacrylamide = 29:1) electrophoresis (PAGE) in 1× Tris/Borate/EDTA buffer with a constant voltage of 90 V for 18 h at a constant temperature. The gel was stained with 0.1% silver nitrate. The first part of promoter region revealed a monomorphic pattern where as five patterns were observed in the second part of promoter

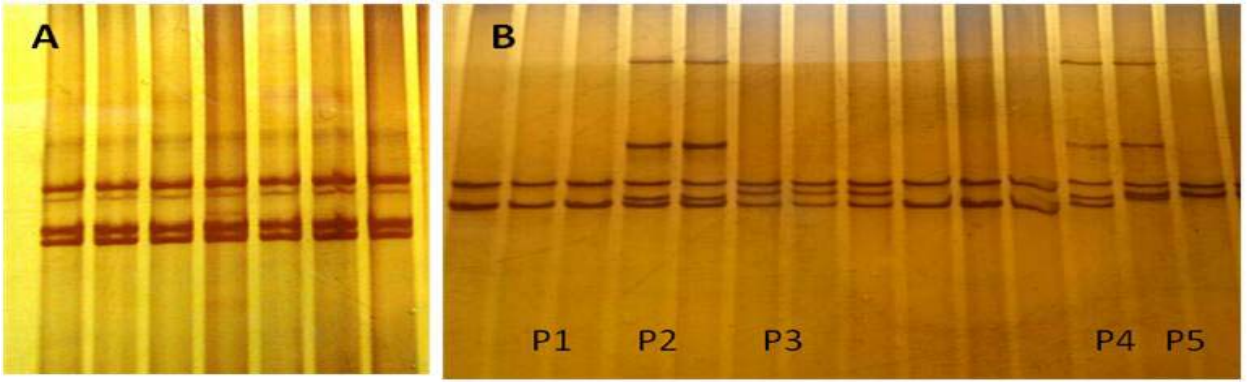


Fig. 8. Illustration of PCR-SSCP carried out in the promoter region of OAS1 gene. A. Monomorphic pattern in Promoter region(first part) B. Variation identified in promoter region (second part)

region as shown in Fig 8. Two SNPs were identified [rs715937117(A/T) and rs480985443 (A/G)] by sequencing of representative samples .

The differential expressions of Interferon stimulated genes [2-5 oligoadenylate synthetase 1(OAS1), Myxovirus resistance gene 1 (MX1) and 2(MX2), and interferon-stimulated gene 15 kDa protein (ISG15)] at 18th day post AI in peripheral blood mononuclear cells were also evaluated. The study was conducted in Sahiwal and Frieswal cattle maintained at Military Farm, Meerut, Uttar Pradesh. Blood samples were collected from 25 animals, which included both nulliparous and multiparous Frieswal and Sahiwal animals. The respective genes were assayed by using real time reverse transcriptase-polymerase chain reaction. In the nulliparous pregnant animals, the expression of OAS1, ISG15, MX2 ($p<0.01$) and MX1 ($p<0.05$) were higher than the non-pregnant animals (Fig9A). For multiparous cows, however, pregnant and non-pregnant cows were similar for expression of interferon stimulated genes on day 18 (Fig 9B).So, the interferon stimulated gene based method could be used as an alternate strategy for early diagnosis of pregnancy, but only in nulliparous animals.

Screening of Frieswal bulls and bull calves for genetic diseases

A total of 92 Frieswal bull calves were screened against Bovine Leukocyte Adhesion Deficiency (BLAD), Deficiency of Uridine Monophosphate Synthase (DUMPS), Bovine Citrullinaemia (BC), Factor XI Deficiency (FXID) and Complex vertebral Malformation (CVM using PCR-RFLP technique). The same bulls have been subjected to Karyotype analysis. The PCR products were digested with Taq1, Ava I and Ava II restriction enzyme for BLAD, DUMPS and BC respectively (Table 19). Polymerase Chain Reaction- Primer-Introduced Restriction Analysis (PCR-PIRA) was utilized to detect CVM genotypes. The digested products and PCR product of FXID were analyzed by agarose gel electrophoresis stained with ethidium bromide. Genotyping was done based on the banding pattern in the agarose gel. CVM genotyping was carried after running the digested product on PAGE (Fig10). A carrier prevalence of 11.95 and 2.3 per cent was noticed for BLAD and

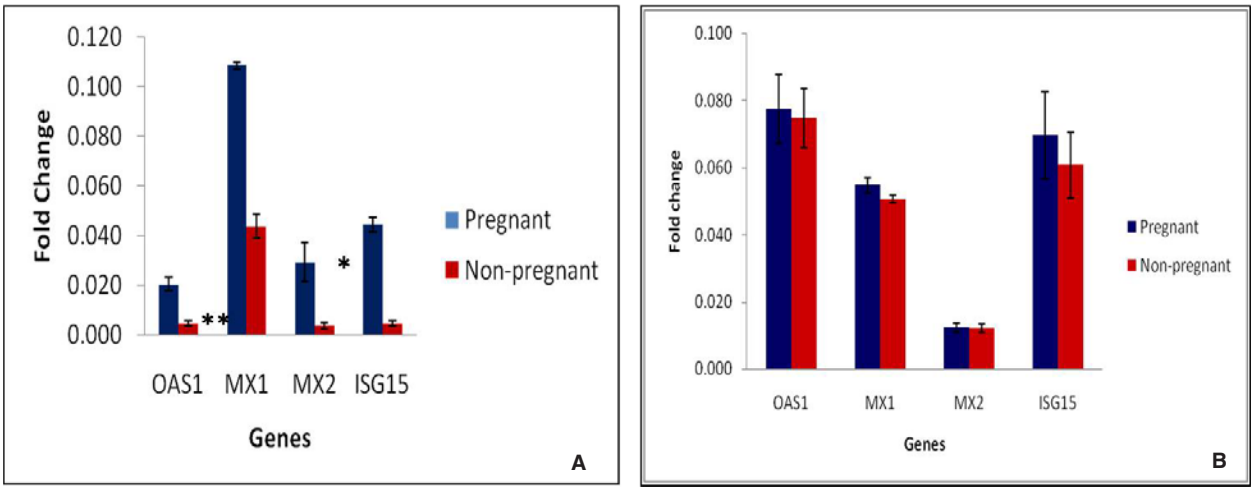


Fig. 9. Relative expression of Interferon stimulated genes at day18 post AI. A) Nulliparous animals B) Multiparous animals. **p<0.01 and *p<0.05

Table 19. Primers, Annealing temperature (TA), PCR product size and restriction enzymes (RE) used for identification of BLAD, DUMPS, Bovine Citrullinaemia Factor XI Deficiency and CVM.

Genetic disorder	Primer sequence (5'→3')	TA (°C)	PCR product size (bp)	RE
BLAD	F-5-'GAATAGGCATCCTGCATCATATCCACCA R-5'-CTTGGGGTTTCAGGGGAAGATGGAGTAG	65°C	357bp	Taq1
BC	F-5'-GGCCAGGGACCGTGTTCATTGAGGACATC R-5'TTCCTGGGACCCCGTGAGACACATACTTG	65°C	198bp	AvaII
DUMPS	F-AGGGTCTTAGTGGAGCAGGT R-GGCTTACCTCCTGCTTCTAACTG	65°C	282bp	Aval
FACTOR XI	F-CCCACTGGCTAGGAATCGTT R-CAA GGC AAT GTC ATA TCC AC	60°C	244 bp	_
CVM	F-5'CACAATTTGTAGGTCTCAATGCA R- 5'CGATGAAAAAGGAACCAAAAGGG	60°C	287 bp	Nil

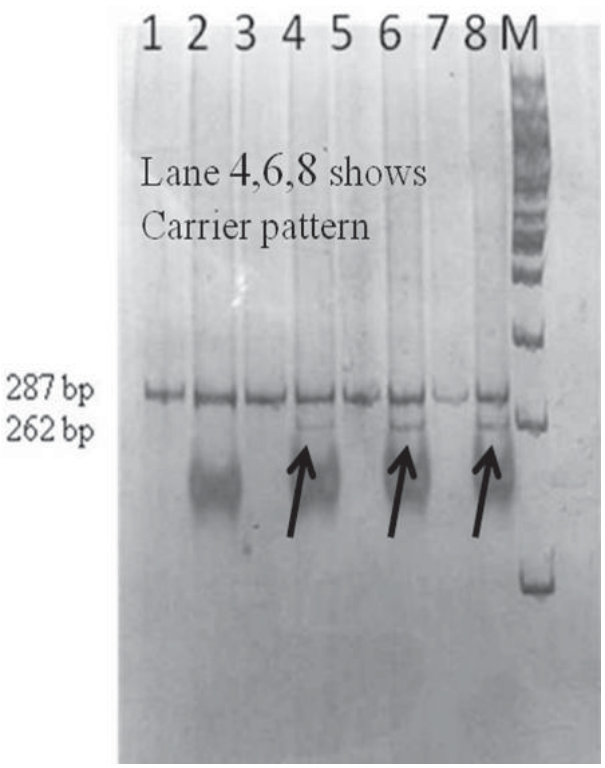


Fig. 10. Illustration of CVM genotypes with NsiI Restriction enzyme separated in PAGE. Lane 1,3,5,7; non-digested PCR products. Lane 2,4,6,8; digested products with NsiI enzyme. The normal genotype (Lane 2) and carrier genotypes (Lane 4,6,8) can be seen

CVM, respectively in Frieswal bull calves while no carriers were noticed for other genetic disorders studied.

Karyotyping of same 92 bull calves was done after lymphocyte culturing for 72 hrs followed by mitotic arrest using cholchicin. The cells were spread on the slide, stained by Geimsa stain and visualized under microscope (Fig 11). No abnormal karyotype was detected in any of the calves karyotyped.

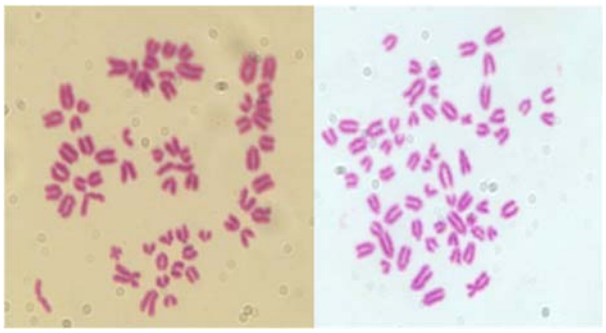


Fig. 11.Metaphase spreads using Geimsa stain

A new fast and economical method for genotyping of BLAD was developed and the same has been applied for patent (1073/DEL/2015). The method eliminated the use

of Restriction digestion of the PCR product. This method used a combination of four primer sets with a optimized reaction condition in the PCR. The cyclic reaction was followed by gel separation which could discriminate carrier genotypes (Fig 12).

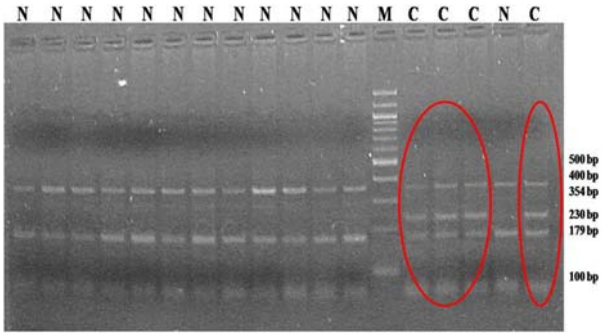


Fig. 12. Genotyping of BLAD using modified protocol. Presence of 230bp discriminates carrier from normal

Expression of fertility associated genes in sperm transcriptome of different breeds of cattle – A comparative approach

Different semen quality parameters such as PTM, HOST, acrosome integrity, live and dead were analysed for Sahiwal and Frieswal bulls. Spermatozoal RNA was extracted using combinational approach. cDNA was sythesised and Realtime PCR were successfully done for genes PLCzeta, SOD, PRM1, PRM3 and AKAP4 with expected sizes (Fig 13). Lack of amplification for Primers CDH1, V.kit and CD4 indicated lack of contamination from somatic cells as well as leukocytes ensuring pure spermatozoal origin of the purified RNA (Fig 14).

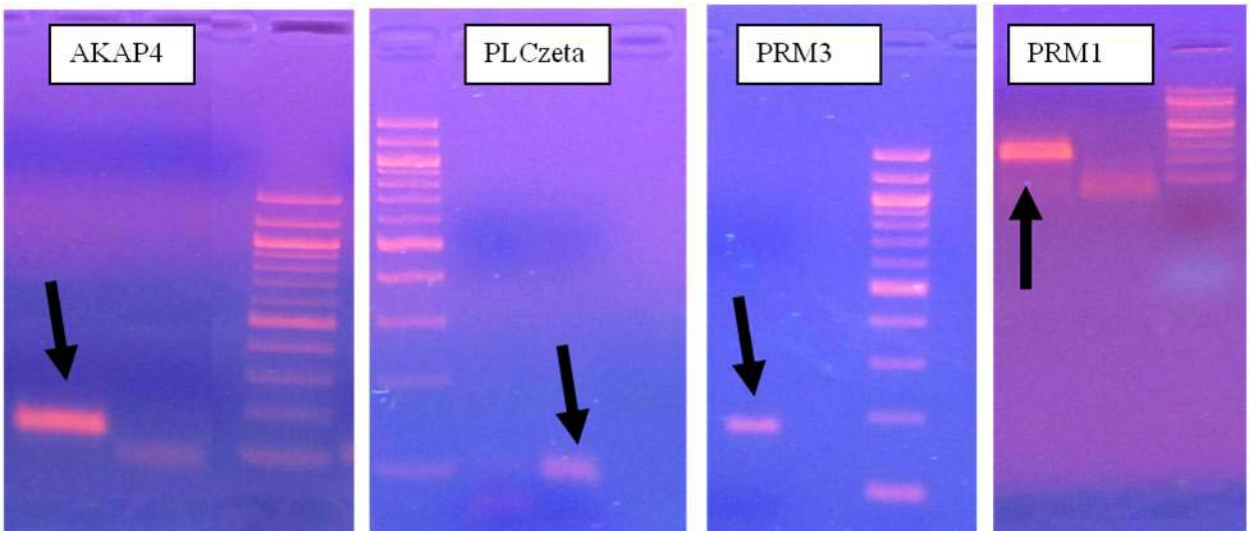


Fig. 13. Amplification of AKAP4, PLCzeta and PRM3 primers

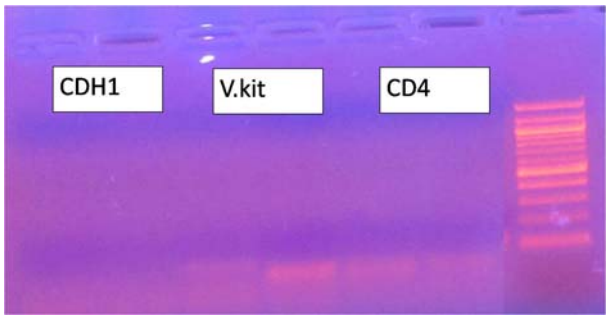


Fig. 14. No amplification observed at expected sizes of CDH1, V.kit and CD4 primers

Development of an in-house built lamp assay for rapid detection of cow components adulterated in buffalo milk/ meat

A study was conducted to develop a technique so called loop-mediated isothermal amplification (LAMP) for rapid and specific detection of cow specific DNA segment under isothermal conditions. The

technique requires a set of conditions and primers different from those used for normal PCRs. The LAMP reaction typically occurs over 30 to 60 min with temperatures ranging from 60 to 65°C under isothermal conditions and can be conducted with a simple heating block instead of a thermocycler thus avoiding the standard lengthy PCR protocols. LAMP assays have now been reported for detection of various pathogens; however, its application for species identification is not yet reported so far. An in-house built rapid, economical and user-friendly LAMP assay protocol was developed to identify the buffalo milk/meat samples adulterated with cow milk/meat. The developed LAMP assay (Fig 15) can be used for the rapid detection of cow milk/meat DNA in buffalo samples and can be easily adapted in laboratories.

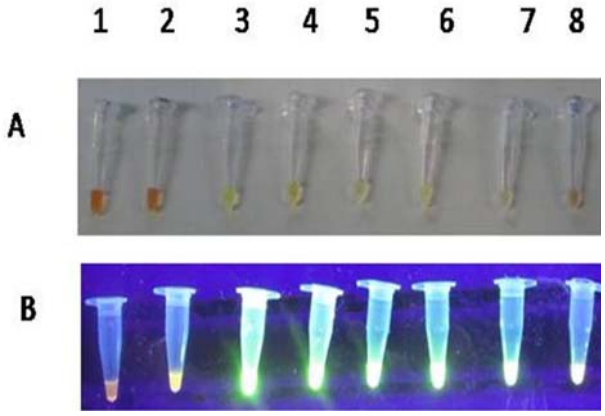


Fig. 15. LAMP assay for detecting cow milk mixed in buffalo milk samples. (A): Visible and (B) UV light; Lane 1: no template control (NTC); Lane 2: 100% buffalo milk; Lane 3: 100% cow milk; Lane 4: 50% cow and 50% buffalo; Lane 5:10% cow and 90% buffalo; Lane 6: 8% cow and 92% buffalo; Lane 7: 5% cow and 95% buffalo; Lane 8: 3% cow and 97% buffalo; Lane 9:1% cow and 99% buffalo

(B) SEMEN PRODUCTION AND PRESERVATION

Semen Production Performance of Frieswal bulls

Germplasm production

The overall average semen volume (ml), sperm concentration (million/ml), initial motility (%) and post thaw motility (%) were 4.31 ±0.02, 965.87 ±5.68, 55.34 ±0.24 and 45.22± 0.30, respectively in 7877 ejaculates collected from Frieswal bulls during April 2015-March 2016. The semen quality in Frieswal bulls of different age groups is presented in Table 20. The percentage of ejaculates in 1,2,3,4 and 5 age groups were 19.8, 33.7, 30.8, 12.3 and 3.5, respectively. It was observed that the volume of semen in second ejaculate was lesser than the first ejaculate in all the age groups. The volume of semen from first ejaculate was least in younger bulls than older ones; however, maximum was from aged bulls. No particular trend was observed for spermatozoa

Table 20. Mean ± SE of semen quality parameters of Frieswal bulls

Age group	Ejaculate No.	Semen volume (ml)	Sperm Concentration (million/ml)	Initial motility (%)	Post thaw motility (%)
1 (19-30m)	1	3.72±0.04	960.66±12.53	46.12±0.52	43.12±0.85
	2	3.52±0.27	980.67±78.23	61.28±3.25	45.00±3.32
2 (31-42m)	1	4.67±0.04	967.97±10.66	52.74±0.44	43.51±0.63
	2	4.43±0.07	712.49 ±20.78	64.39±0.86	46.40±0.94
3 (43-54m)	1	4.43±0.04	1144.00±11.99	57.67±0.50	45.39±0.62
	2	3.70±0.06	932.89±17.70	65.46±0.74	48.13±0.77
4 (55-66m)	1	4.58±0.06	1036.00±18.47	57.29±0.77	43.71±1.09
	2	4.22±0.10	748.30±29.84	63.25±1.24	50.46±1.45
5 (>67m)	1	5.15±0.11	849.03±33.55	49.67±1.39	40.71±2.94
	2	4.17±0.21	692.76±61.55	61.43±2.56	45.00±3.18

concentration in the ejaculates of these bulls. Highest concentration of spermatozoa per ml of semen was found in the first ejaculate of 3rd age group.Whereas, second ejaculate of these bulls recorded maximum average initial motility.Average post thaw motility of second ejaculate was better than the first ejaculate.

Quality Assessment of Frieswal Bull Semen

Semen samples from163 bulls were evaluated for quality during the reported period. Upon initial evaluation, 65.28 % ejaculates were rejected straightway before freezing on the grounds of low progressive motility, weak and sluggish progression, contaminants and other reasons and only 34.72% ejaculates met the required standards were frozen in 0.25 ml mini straws. Sixty per cent of frozen samples passed the post-thaw criteria with a base line of minimum 50% motility. A total of 3,77,000 semen doses were produced during this period. The representative samples from frozen semen stock were subjected to motility and quality evaluation based on Hypo-osmotic swelling test (HOST), Incubation test (30 min. & 60min.), acrosome integrity, concentration (10^6/ml) of sperm cells (Table 21).

Table 21. Mean ± SE of semen quality control parameters in frozen semen samples (n=204) of Frieswal bulls

Parameters	Value
Average post thaw motility of passed samples (%)	51.65±0.28
Incubation test (%)- Initial motility	51.65±0.28
After 30 min.	45.50±0.39
After 60 min.	37.11±0.47
HOST (%)	47.31±0.43
Acrosome Integrity (%)	69.27±0.43
Concentration (million/straw)	25.82±0.13
Microbial Load (cfu/ml)	1620±140.77

Forty one new bulls were included in semen collection and the semen samples were assessed for viability and morphological abnormalities by eosin nigrosin stain. Nineteen problem bulls were tested for their quality control estimates (Table 22).

Standard Plate Count

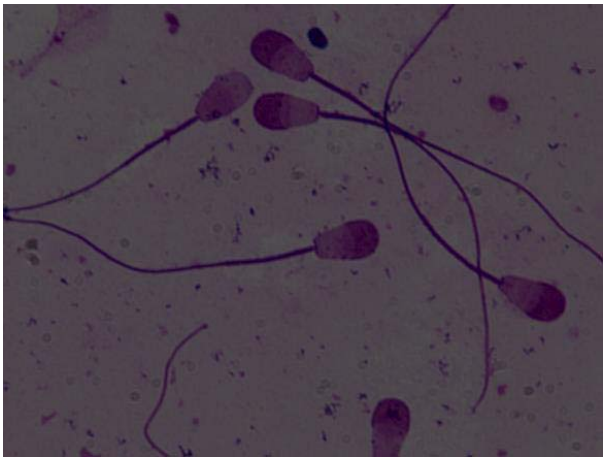
A total of 204 frozen semen doses from 117 Frieswal bulls were subjected to bacterial load estimation by pour plate method. The mean colony count was 1620± 140.77cfu/ml. Eleven samples (5.39%) had bacterial counts of more than 5000 cfu/ml and were rejected (Table 23).

Table 22. Quality control estimates for viability and morphology of Frieswal bull semen (neat semen)

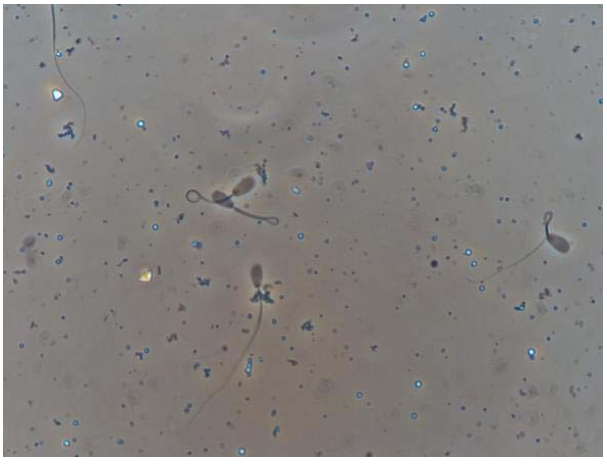
Parameters (%)	New bulls (n=41)	Problem bulls (n=19)
Live	74.46±3.22	66.42±08.55
Dead	25.54±3.22	33.58±08.55
Abnormal head	4.76±0.69	15.22±06.75
Abnormal mid piece	9.67±1.11	22.43±04.64
Abnormal tail	2.46±0.56	07.17±01.91
Overall abnormality	16.89±1.34	44.82±06.77

Table 23. Microbial load in semen samples of Frieswal bulls and various factors that affect the quality standards

Sample	Total cfu/ml
Frozen semen	1620± 140.774 cfu/ml
AV	nil
Dilutor	nil
Distilled water	nil
Freezing lab	4
Processing lab	8
AV preparation room	6
straws	nil
eggs	nil
LAF	nil
Pass box	nil



Giemsa staining showing Acrosome integrity



HOST response

Effect of different housing systems on physiological, behavioural and semen production performance of Frieswal bulls

The study was conducted to assess the effect of sheds with two different designs available at BRU, Meerut on physiological responses and semen quality parameters of breeding bulls during summer season (June-August). Ten adult Frieswal bulls were randomly distributed into two groups i.e. in traditional (TG) and modified (MG) design sheds. The sides of individual pens in TG (east-west oriented) and MG (north-south oriented) were covered and open, respectively with equal floor space/bull in both sheds. Average THI (Table 24) did not vary over the periods and was higher ($P<0.05$) in the afternoon than in the morning in both types of the sheds. Average rectal temperature (RT) and respiration rate (RR) in bulls of both sheds increased significantly ($P<0.05$) in the afternoon (2.00 to 4.00 PM) than in the morning (8.00 to 9.00 AM). Heart rate (HR) increased during afternoon period in TG; however, it did not differ significantly in MG. Average RR, body coat and scrotal temperature were higher ($P<0.05$) even after shower than in morning in TG, however, no difference was observed for these parameters in MG. Improvement in initial progressive motility was recorded in bulls of modified sheds after fourth fortnight (Table

A Frieswal bull

Table 24. Mean±SE values of THI inside the experimental sheds

Fortnight	Traditional shed (TG)		Modified shed (MG)	
	Morning	Afternoon	Morning	Afternoon
I	85.46±0.42	89.56±1.92	84.38±0.43	87.83±2.10
II	82.05±1.02[b]	85.20±1.17[a]	81.10±1.07[b]	83.98±1.06[a]
III	80.74±0.78[b]	85.72±0.94[a]	80.26±0.67[b]	83.92±0.80[a]
IV	82.32±0.53[b]	85.08±0.66[a]	81.56±0.30[b]	83.32±0.58[a]
V	83.66±0.75	83.80±1.09	83.01±0.38	83.44±0.99
Overall	82.85±0.80[b]	85.87±0.97[a]	82.06±0.73[b]	84.49±0.84[a]

Means with different superscripts between columns under one group differ significantly (P<0.05)

Table 25. Mean±SE values of semen characteristics of experimental bulls

Fortnight	Semen volume (ml)		Sperm concentration (million/ml)		Sperm motility (%)	
	TG	MG	TG	MG	TG	MG
I	4.09±0.37	4.32±0.27	1162.52±99.13	960.19±105.70	64.85±2.31	68.06±2.43
II	3.67±0.40	4.11±0.34	995.59±78.83	776.95±70.52	61.11±2.74	67.37±2.52
III	4.11±0.28	4.78±0.36	1012.85±110.60	923.04±116.08	65.38±2.17	67.83±1.40
IV	4.01±0.34	4.40±0.33	1055.86±119.26	833.40±88.98	48.21±3.64	56.00±4.20
V	4.59±0.45	5.14±0.54	1185.22±152.97	924.44±141.23	46.11±5.73[b]	64.38±4.74[a]
Overall	4.09±0.15	4.55±0.18	1082.41±38.77[a]	883.60±33.89[b]	57.10±4.15	64.70±2.28

Means with different superscripts between groups under one parameter differ significantly (P<0.05)

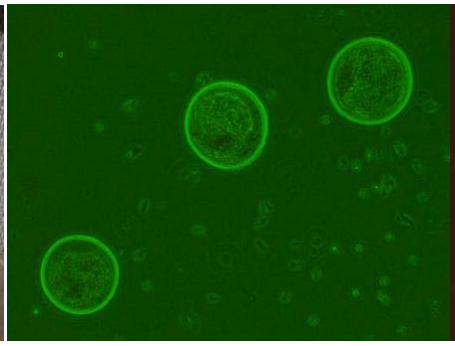
25). The present study revealed better physiological responses and semen quality attributes in bulls kept in modified sheds with open sides of individual pens.

Multiple Ovulation and Embryo Transfer (MOET) in Cattle –A Pilot Study

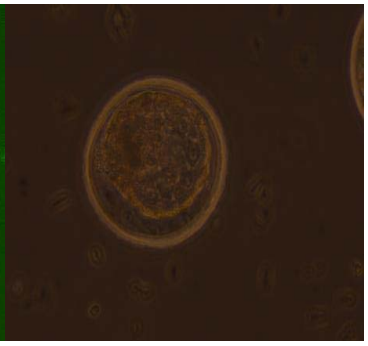
The embryo transfer technology was initiated at Military dairy farm, Meerut Cantt. for conservation and multiplication of Sahiwal cattle. Four Sahiwal cows were superovulated and used as donors. All the animals responded well and yielded an average of 6.25 CL per animal and 2.25 unovulatory follicles. Three animals yielded 10 embryos (06 blastocysts and 04 morulae). Nine embryos were transferred to 8 recipients. The work is in progress.

Flushing embryo from donor cow

Embryo searching



Morula and blastocysts



A good quality blastocyst

(C) AUGMENTATION OF REPRODUCTIVE EFFICIENCY

Enhancing reproductive efficiency in Frieswal heifers by various reproductive techniques, nutrition and management interventions

The work started at MF Meerut in two groups of Frieswal heifers. First group had 15 Frieswal heifers having mean age & body weight of 287.00 ± 5.90 days and 145.87±3.36 kg, respectively. Animals were fed individually as per the MF feeding scale consisting of dry roughage (3.0 to 5.0 kg), green fodder (8-12 kg) and concentrate (2.5-3.5 kg) per day as per the stage of growing heifers. The average daily gain was 446.8g per day from induction in the experiment to the time of estrus. The heifers in this group exhibited their first estrus at 519.40±12.73 days and at the time of exhibition of estrus their mean body weight was 266.20±5.84 kg. In all, 14 animals calved and the mean age at calving was 902.57±13.73 days. The first post-partum estrus was exhibited after 63.53±9.61 days of calving and 11 conceived (8 calved and 2 aborted) while one animal died during the period.

The experiment was again repeated in the second group of 14 Frieswal heifers having mean age of 288.07±5.90 days and body weight of 146.64±6.78 kg respectively. These heifers were maintained separately in a shed at MF Meerut and were fed individually as per MF feeding schedule. In this group heifers exhibited their first estrus at 642.07±26.32 days at mean body weight of 287.67±3.38 kg. Once the animlas achieved the body weight of 300 kg, they were inseminated with frozen thawed Frieswal semen. They calved at the age of 938.23±18.61 days and exhibited their first post-partum estrus after 55.71±7.82 days.

Reproductive parameters of these animals were compared with the other 11 contemporary heifers of similar age group maintained separately in group feeding practiced at MF (control). In control animals the mean age at the time of exhibition of estrus was 667.18±32.84 days and body weight was 301.46±11.61 kg. Their age at first calving was 966.18±40.59 days which was much higher than the experimental groups. Also they exhibited their first post-partum estrus at 97.88±19.13 days and took 118.00±49.27 days for conception from first heat as compared to experimental animals where these values ranged from 56 to 64 days & 86 to 90 days, respectively. The initial body weight of heifers of the first experimental group was 148.34±3.99 kg and in second experiment, the mean body weight was 128.50±2.84 kg. The second group of

animals had 20 kg lower body weight as compared to first group. Both the groups were maintained on Military farm feeding scale and gained a body weight of 403.22 (first group) and 387.50 (second group) kg after 20 months of feeding. After calving, the respective body weights in two groups were 354.41 and 346.66 kg. During lactation phase all the cows maintained their body weight and at no stage of lactation were in negative growth. By the ninth month of lactation mean body weights were 403.09 and 387.40 kg, respectively. The average daily gain was 180.29 and 150.88 g respectively.The above experiments indicated superiority of individual feeding over group feeding for better reproductive performance.

Augmenting the reproductive efficiency of cattle in organized farms and field near Meerut

Four infertility camps were organized at Villages; Pooth Khas, Tikri, Rohta and Majra wherein a total of 151 animals were examined for various infertility as well as general health problems. Out of them 34% were anestrus, 14% were repeat breeders and 52% animals had general health problems. Out of 17 anestrus animals followed after treatment, 10 (59%) came into estrus.

An infertility camp was also orgainsed at Gopal gaushala, Meerut with 3 followup visits. A total of 66 animals were examined and treated for different reproductive disorders. Out of them 41% were anestrus and 12% repeat breeders. Almost 70% (19/27) of the anestrus animals came into heat after mineral supplementation and hormonal treatment.

Experiments were conducted at Military farm, Meerut for improving reproducive efficiency in Frieswal cattle. In the experiment 25 anestrus Frieswal heifers (age > 22 months and body wt. > 240 kg) were divided into 3 groups to assess the estrus induction response by various means. Animals in Group 1(n=11) received intramuscular injections of Tonophosphan along with VETADE on alternate days at 5 occasions. In Group 2 (n=8), animals received single intramuscular injections of Receptal followed by Lutalyse 7 days later. Animals in Group 3 (n=6) served as control and received no hormonal treatment. All the animals were observed for two cycles and the percentage of the animals exhibited estrus in Groups 1, 2 and 3 were 64%, 62.5% and 17%, respectively. Another experiment was conducted on 18 postpartum anestrus Frieswal cows (aged 4-6 yrs.) to assess the comparative response of TRIU-B (intravaginal progesterone containing device) (Group 1, n=8) and oral supplementation of Progesterone + oestrogen (Group 2, n=10). All the animals were observed for 2 cycles and response was recorded. In TRIU-B group all animals exhibited post partum estrus, while only 30% responded by oral feeding of progesterone + oestrogen.

An experiment was also conducted at Military farm, Meerut on 29 delayed pubertal anestrus Frieswal heifers to know the effect of TRIU-B and Tonophosphan + VETADE on estrus induction. Animals in Group 1 (n=8) were given TRIU-B intravaginal progesterone implant, Group 2 (n=11) were treated with Tonophosphan + VETADE and animals in Group 3 (n=10) served as control and received no treatment. Estrus induction response observed was 100%, 45% and 30% in Groups 1, 2 and 3, respectively.

(D) IMPROVEMENT OF CATTLE THROUGH NUTRITIONAL MANIPULATION

Effect of different levels of micro-minerals on qualitative and quantitative attributes of semen in Frieswal bulls

Effect of different levels of Manganese

Under this project, forty two (42) Frieswal bulls were selected and based on the previous semen production data, were divided into two categories viz., good and poor. Bulls of each category were further divided into 3 groups of seven animals each. Different groups of animals of both categories were offered 20 Kg seasonal green fodder, wheat straw (ad lib) and 3.6 Kg of specific concentrate mixtures with 55 ppm (D1), 65 ppm (D2) and 80 (D3) ppm Mn on DM basis (Table 26).

Beginning from the month of September 2015, a feeding trial was continued for six months, during which individual animal was given feed as per the feeding schedule of military farm. A daily record of feed intake was maintained for individual animal. For estimation of micro-minerals, samples of blood plasma from individual bull were collected at the start of the experiment and at two months interval. The body weights of the experimental bulls were monitored at monthly intervals except in case of disease/ emergency. The samples were collected as per the farm schedule. For the determination of digestibility of different nutrients, a digestibility trial was also conducted.

Table 26. Ingredient composition of concentrate mixtures (%) having 3 levels of Mn on supplementation with $MnSO_4$

Ingredients	Type of Concentrate Mixture		
	D1	D2	D3
Maize	35	35	35
Wheat bran	32	32	32
Groundnut cake	14	14	14
Mustard oil cake	16	16	16
Mineral mixture*	2.0	2.0	2.0
Common Salt	1.0	1.0	1.0
Level of Mn (ppm, calculated)	*55*	*65*	*80*

Mineral mixture of D2 and D3 diet contained additional quantity of 5.77 and 13.46g $MnSO_4.H_2O$ per Kg of mineral mixture.

During the experimental feeding, the average body weights increased in all the groups. The trend of change in body weights has been depicted in Fig. 15. Initial average body weights (Kg) of good bulls fed different diets were 625.6 (G1), 474.8 (G2) and 499.6 (G3) on diets with concentrate D1, D2 and D3 respectively. While the Initial average body weights (Kg) of poor bulls fed similar diets were 577.4 (P1), 462.5 (P2) and 433.6 (P3) Kg on diets with respective concentrates. During entire feeding trial, there was 107.9, 122.8, 131.3, 100.6, 143.8 and 137.6 Kg in average increase of body weights with corresponding average ADG (g/d) of 506.4, 576.7, 616.4, 472.3, 675.3 and 645.9

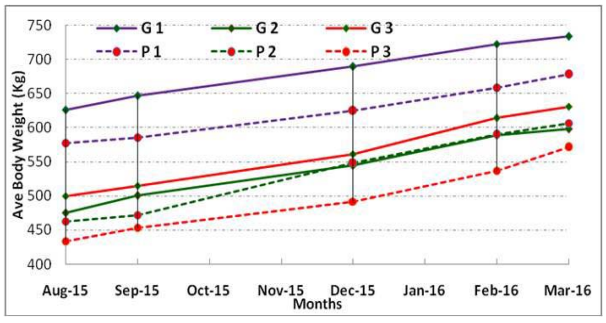


Fig. 15. Trend of average body weights (Kg) of different groups of good (G) and poor (P) bulls offered diets with concentrates having 3 levels of Mn on supplementation with $MnSO_4$

in G1, G2, G3, P1, P2 and P3 groups of bulls, respectively (Fig.16).

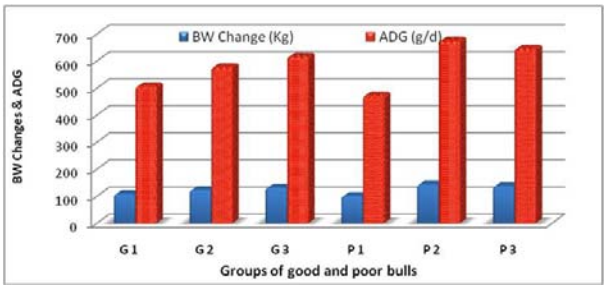


Fig. 16. Changes in BW (Kg) and ADG (g/d) of different groups of good (G) and poor (P) bulls offered diets with concentrates having 3 levels of Mn on supplementation with $MnSO_4$

During the experimental feeding, the intake of DM through concentrate and green fodder remained similar, while it varied in case of wheat straw in all groups of good and poor bulls. The total intake of DM ranged from 9.07 to 10.90 Kg, and DM per 100 Kg BW ranged from 1.54 to 1.77 Kg across the groups of good and poor bulls collectively (Table 27).

Likewise, during the digestibility trial, the intake of DM through concentrate and green fodder remained similar, while it varied in case of wheat straw in all groups of good and poor bulls. The total intake of DM ranged from 8.73 to 10.15 Kg across the groups of good and poor bulls collectively. The coefficients of DM digestibility were 0.541, 0.565, 0.559, 0.536, 0.564 and 0.587 in G1, G2, G3, P1, P2 and P3 groups of bulls, respectively.

Effect of different levels of Zinc

An experiment was initiated on Frieswal bulls to study the effect of feeding different levels of Zn as zinc suphate on the quantitative and qualitative attributes of semen. Forty two (42) Frieswal bulls were selected and based on the previous semen production data, they were divided into two categories viz., good and poor. Bulls of each category were further divided into 3 groups of seven animals each. Different groups of animals of both categories were offered 20 Kg seasonal green fodder, wheat straw (ad lib) and 3.6 Kg of specific concentrate mixtures with 40 ppm (D1), 60 ppm (D2) and 80 (D3) ppm Zn on DM basis (Table 28). Beginning from the month of September 2014, a feeding trial was continued for six months, during which individual animal was fed as per the feeding schedule of military farm. A daily record of feed intake was maintained for individual animal. For estimation of micro-minerals, samples of blood plasma from individual bull were collected at the start of the experiment and at two months interval. The body weights of the experimental bulls were monitored at monthly interval except in case of disease/ emergency. The semen samples were also

Table 27. DM intake indifferent groups of good (G) and poor (P) bulls offered diets with concentrates having 3 levels of Mn on supplementation with $MnSO_4$

Bull type	Groups	Ave daily DM Intake (Kg)				
		Conc	Green	WS	Total	Per 100 kg BW
GOOD	G 1	3.23	2.41	5.26	10.90	1.57
	G 2	3.23	2.41	3.59	9.23	1.68
	G 3	3.23	2.41	3.70	9.34	1.64
POOR	P 1	3.23	2.41	4.08	9.72	1.54
	P 2	3.23	2.41	3.66	9.29	1.69
	P 3	3.23	2.41	3.43	9.07	1.77

collected as per the farm schedule. For the determination of digestibility of different nutrients, a digestibility trial was conducted during the month of March 2015.

The ingredient composition of the concentrate and rate of addition of zinc sulphate is given in table 28. The chemical composition of the feed, fodder and concentrate mixtures used in experiment and digestability trial is presented in table 29.

The body weight of the experimental bulls is given in table 30 and depicted in Fig.17. During the experiment body weight of experimental bulls increased in all the groups. Initial average body weights of good bulls

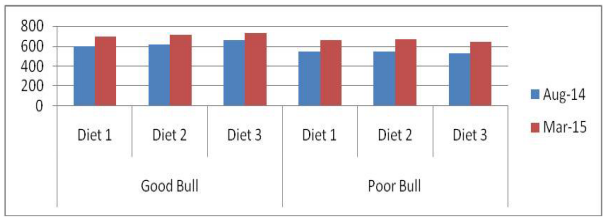


Fig. 17. Graphical illustration of initial and final average body weights (Kg) of the bulls during experimental feeding with different levels of $ZnSO_4$

were 601±38.29, 619±56.63 and 655±33.04 kg for diet 1, diet 2 and diet 3 groups, respectively. While initial average body weights of poor bulls fed different diets were 543±42.68, 543±40.94 and 528±24.99 kg on diet 1, diet 2 and diet 3, respectively. Body weight after 6 months feeding trail was

Table 28. Ingredient composition of concentrate mixtures (%)

Type of concentrate	Wheat bran	Maize	Groundnut cake	Mustard oil cake	Mineral mixture*	Salt
Type I (D1)	32	35	14	16	2	1
Type II (D2)	32	35	14	16	2	1
Type III (D3)	32	35	14	16	2	1

*Mineral mixture type II and type III contained additional quantity of 13.0 and 26.0 g $ZnSO_4.7H_2O$ per kg of mineral mixture.

Table 29. Chemical composition of feeds and concentrate (%)

Constituents	Wheat straw	Green fodder (Berseem)	Concentrate type I (D1)	Concentrate type II (D2)	Concentrate type III (D3)
Dry matter	90.28	11.25	90.39	90.36	90.46
Crude protein	6.13	21.44	16.8	17.59	16.89
Crude fibre	47.26	30.4	9.8	8.36	9.29
Ether extract	0.99	2.32	3.9	3.85	4.05
NDF	77.24	56.96	45.6	41.48	42.28
ADF	46.49	28.34	9.64	8.61	8.1
Hemicellulose	30.75	18.61	35.96	32.87	34.18
Cellulose	39.56	20.49	6.97	6.37	6.25
Lignin	6.93	7.85	2.67	2.24	1.85
Ash	7.62	12.21	8.21	8.02	7.94
AIA	5.75	1.96	1.93	1.92	1.87

Table 30. Body weights of experimental bulls fed diets supplemented with different levels of $ZnSO_4$

Category of bulls	Type of Diet	Initial Body Weight (Kg) (Aug-14)	Final Body Weight (Kg) (Mar-15)
Good Bull	Diet 1	601±38.29	692±30.45
	Diet 2	619±56.63	710±50.48
	Diet 3	655±33.04	734±30.56
Poor Bull	Diet 1	543±42.68	662±35.12
	Diet 2	543±40.94	672±29.69
	Diet 3	528±24.99	641±19.48

692±30.45, 710±50.48 and 734±30.56 kg fed on diet 1, diet 2 and diet 3, respectively in good bulls and 662±35.12, 672±29.69 and 641±19.48 kg fed on diet 1, diet 2 and diet 3, respectively in poor bulls.

Intake and digestibility of different nutrients in the experimental bulls fed on different diets was estimated (Table 31). The total DM intake of good bulls including dry fodder, green fodder and concentrate on different diets was 9.85, 10.59 and 9.51 kg on diet 1, diet 2 and diet 3, respectively. While total DM intake of poor bulls fed different diets was 10.24, 10.70 and 9.58 kg on diet 1, diet 2 and diet 3, respectively. Total DM intake

Table 31. Intake and digestibility of nutrients of experimental bulls fed diets supplemented with different levels of $ZnSO_4$

Parameters	Good bulls				Poor bulls			
	Diet I	Diet II	Diet III	Overall	Diet I	Diet II	Diet III	Overall
Body weight (kg)	684.4	719.80	690.80	698.33	670.40	680.20	629.80	660.13
DMI wheat straw (kg)	3.79	4.45	3.44	3.89	4.07	4.56	3.49	4.04
DMI green (kg)	2.81	2.87	2.80	2.82	2.81	2.89	3.49	4.04
DMI conc. (kg)	3.25	3.25	3.25	3.25	3.25	3.25	3.25	3.25
Total DMI (kg)	9.85	10.59	9.51	9.98	10.24	10.70	9.58	10.30
DMI (kg/100kg BW)	1.43	1.47	1.38	1.42	1.52	1.58	1.52	1.54
DMI (g/kg $W^{0.75}$)	73.64	76.48	70.64	73.56	77.42	80.81	76.29	78.17
CPI Wheat straw(g)	228.60	276.60	211.40	238.86	255.60	285.80	223.40	254.93
CPI green (g)	606.00^{a}	616.60^{b}	602.8^{a}	608.46	605.60	620.00	609.60	611.73
Total CPI (g)	1381.40^{ab}	1465.20^{b}	1364.20^{a}	1403.6	1408.2^{ab}	1477.00^{b}	1383.0^{a}	1422.73
CPI (g/100kgBW)	202.00	205.80	198.60	202.13	212.80	218.60	220.60	217.33
CPI (g/kg $W^{0.75}$)	10.34	10.64	10.15	10.37	10.76	11.13	11.02	10.97
Digestibility (%)								
Dry matter	59.42	59.60	60.89	59.97	59.96	61.03	60.19	60.39
Crude protein	62.10	65.01	66.21	64.44	66.51	64.88	66.88	66.09
Crude fibre	56.33	61.16	52.15	56.54	58.93	62.90	66.21	62.68
Ether extract	70.04	68.34	70.45	69.61	79.21^{b}	72.65^{a}	71.52^{a}	74.46
NDF	55.09	57.65	54.12	55.62	56.22	56.48	54.35	55.68
ADF	43.17^{ab}	47.07^{b}	38.96^{a}	43.05	42.70	46.40	41.51	43.53
Cellulose	50.03^{ab}	52.80^{b}	47.22^{a}	50.01	49.06	52.90	48.06	50.00
Hemicellulose	66.15	68.05	68.48	67.56	69.57	67.75	67.24	68.18

Values bearing unlike superscripts in sub rows differ significantly (P<0.05)

per 100 kg body weight of good bulls fed different diets was 1.43, 1.47 and 1.38 kg on diet 1, diet 2 and diet 3, respectively. While total DM intake per 100 kg body weight of poor bulls fed different diets was 1.52, 1.58 and 1.52 kg on diet 1, diet 2 and diet 3, respectively. Likewise, the DM intake per kg metabolic weight was 73.64, 76.48 and 70.64 gram on diet 1, diet 2 and diet 3, respectively. While DM intake per kg metabolic weight of poor bulls fed different diets was 77.42, 80.81 and 76.29.28 gram on diet 1, diet 2 and diet 3, respectively.

The total crude protein (CP) intake from dry, green and concentrate mixture was 13.81.4, 1465.2 and 1364.2 g/d in good bulls on diet 1, diet 2 and diet 3, respectively. Similarly, the total CP intake in poor bulls was 1408.2, 1477.0 and 1383.0 g/day, respectively. The CPI g/kg $W^{0.75}$ in different groups ranged from 10.15 to 11.13 and the differences were non-significant among the groups.

The digestibility of nutrients in different groups ranged from 59.42-61.03% for DM, 62.10 -66.88% for CP, 52.15- 66.21% for CF, 68.34- 79.21% for EE, 54.35- 56.22% for NDF, 38.96- 46.40% for ADF, 47.22-52.80% for cellulose and 66.15-68.05 for hemicellulose. In general, the digestibility of nutrients did not differ significantly among the groups but significant differences were observed in digestibility of nutrients for EE in poor bulls, ADF and cellulose in good bulls (Table 31).

Table 32. Effect of diets with different level of Zn and period on semen quality of bulls

Bull type	Parameters	Diets				Periods				
		I	II	III	Overall	Initial	I sperm cycle	II sperm cycle	III sperm cycle	Overall
Good	Volume (ml)	5.00 (205)	5.18 (297)	5.15 (387)	5.11	5.23^{ab} (134)	5.36^{b} (223)	4.99^{a} (309)	5.03^{ab} (223)	5.15
	Concentration (mill/ml)	837.88^{a} (205)	913.65^{b} (297)	965.08^{b} (387)	905.53	919.97 (134)	932.15 (223)	896.45 (309)	934.74 (223)	920.82
	Motility (%)	68.78^{b} (205)	66.33^{a} (297)	66.33^{a} (297)	66.60	59.02^{a} (134)	63.81^{b} (223)	69.61^{c} (309)	68.11^{c} (223)	65.13
	PTM (%)	46.04^{a} (134)	49.57^{b} (174)	49.93^{ab} (209)	47.51	47.71^{a} (57)	49.83^{b} (124)	48.20^{b} (217)	44.17^{a} (119)	47.47
Poor	Volume (ml)	4.49^{b} (120)	5.43^{b} (177)	4.34^{a} (129)	5.08	5.27 (99)	5.11 (158)	5.16 (116)	4.92 (53)	5.11
	Concentration (mill/ml)	800.30^{b} (120)	730.42^{b} (177)	593.89^{a} (129)	708.20	715.6 (99)	745.32 (158)	650.84 (116)	713.77 (53)	706.38
	Motility (%)	36.66^{c} (120)	29.95^{b} (177)	25.51^{a} (128)	29.70	20.90^{a} (99)	26.89^{ab} (158)	25.51^{ab} (116)	31.15^{b} (52)	26.11
	PTM (%)	44.78 (23)	30.00 (2)	35.00 (2)	36.59	28.33^{a} (6)	46.66^{ab} (12)	50.00^{b} (7)	40.00^{ab} (2)	41.24

Values bearing unlike superscripts in sub rows differ significantly (P<0.05)

The analysis of data of semen quality indicated that increased concentration of $ZnSO_4$ from 40 to 60 and 80 ppm in diets had significant effect on sperm concentration (million/ml) which increased from 837.88 in diet 1 to 913.65 in diet 2 and 965.08 in diet 3 in good bulls. Similarly post thaw motility (PTM %) also significantly increased from 46.04 in diet 1 to 49.57 in diet 2 and 49.93 in diet 3 in good bulls (Table 32). The poor bulls did not respond positively in increased semen quality parameters like good bulls with increase in Zn concentration in the diets.

While assessing the effect of diets in conjunction with period it was found that there was significant increase in per cent motility of the sperms with increasing period from initial 59.02% to 69.61% in II sperm cycle and 68.11 in III sperm cycle in good bulls. The PTM (%) significantly increased from 47.71 initial to 49.83% in I sperm cycle in good bulls and afterword the PTM per cent did not increase. The poor bulls also responded to increased concentration of Zn in diet with increased feeding period for increase in per cent sperm motility from 20.90 at the start of the experiment to 31.15 by the end of III sperm cycle. The PTM (%) also increased from 28.33 at the start of the experiment to 50.00 and 40.00 by the end of II and III sperm cycle, respectively.

(III) EXTERNALLY FUNDED PROJECTS

Molecular Characterization and Analysis of genetic polymorphism in Integrin alpha beta 6 receptor gene associated with Foot-and-Mouth Disease Virus (FMDV) cell tropism in cattle (DST)

Integrin beta 6 (ITGB6) is one of the important integrin family proteins, required for viral entry in their respective host. The constitutive expression of ITGB6 has been reported in cattle and sheep.The constitutive expression pattern of ITGB6 in the air pathways (tongue, trachea, bronchi and lung) of buffalo (*Bubalus bubalis*) was characterized. Results revealed that mRNA transcript and concentration of ITGB6 are significantly higher in tongue tissues compared to trachea, bronchi and lung in buffaloes. cDNA concentration was determined by adding SYBER GREEN DYE I in the amplified product of buffalo ITGB6 gene from different tissue samples. Results demonstrated that, the color intensity was comparatively higher in buffalo tongue tissue than the trachea, bronchi and Lung. Spectrophometer reading of the amplified products showed a higher concentration of cDNA copy number in tongue tissue followed by trachea, bronchi and lung (Fig-18).Real Time PCR based quantification of ITGB6 from different tissues showed that, mRNA transcripts were significantly ($P<0.05$) higher in tongue tissue (4.5±0.06) compared to trachea (3.2±0.04), bronchi (2.8±0.05) (Fig.-19) and lung (2.3±0.05).To identify the concentration of ITGB6 gene in different tissues of buffalo, the antigen-antibody interaction with mouse specific ITGB6 monoclonal antibodies was done by means of immune dot blot and the result revealed that the agglutination was higher in tongue tissue compared to trachea, bronchi and lung (Fig.-20). Concentration of ITGB6 was detected by Indirect ELISA, which revealed that, tongue (0.26±0.03) having significantly ($P<0.05$) higher concentration than trachea (0.19±0.01), bronchi (0.18±0.01) (Fig.-21) and lung (0.18±0.03). These studies indicated that integrin 36 expression was similarly distributed as described in transcript level.Further, immune localization of ITGB6 gene in different tissue samples were performed by Immune fluroscent assay (Fig.-22). The study revealed that, number of cells

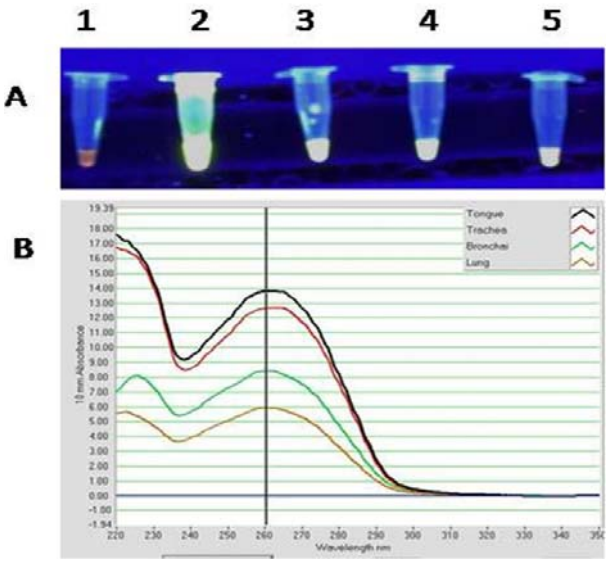


Fig. 18. Determination of cDNA concentration of ITGB6 gene in different tissue samples. A: SYBER Green I dye based visible detection of cDNA amplified product of ITGB6 gene in different tissue samples, 1: NTC (No template control), 2: Tongue, 3:Trachea, 4:Bronchi, 5:Lung. B: Specrto photometer reading of amplified product of ITGB6 with different concentration

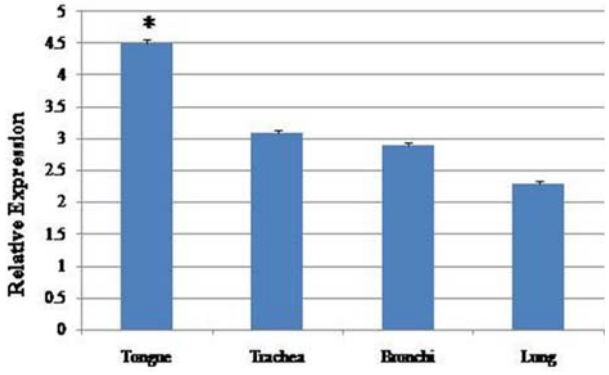


Fig. 19. Relative mRNA expression of ITGB6 in different tissues. (*) indicate significant difference at P<0.05

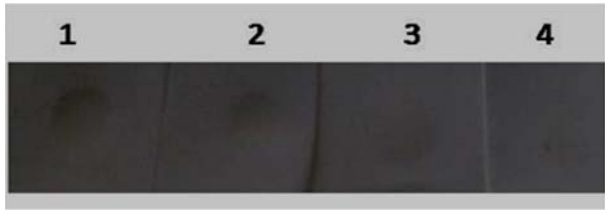


Fig. 20. Immunedot blot assay for detecting ITGB6 concentration among Tongue (1), Trachea (2), Bronchi (3) and Lung (4) tissue of buffalo

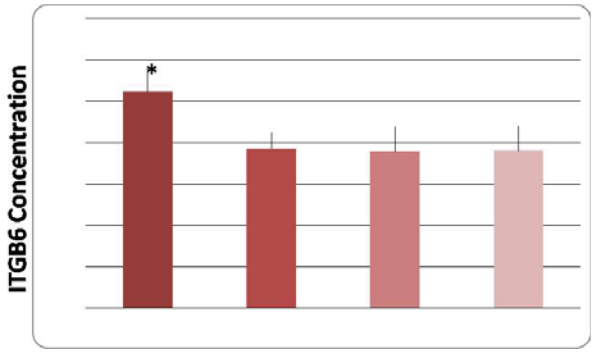


Fig. 21. Indirect ELISA based detection of ITGB6 protein concentration among different tissue samples. (*) indicate significant difference at P<0.01

reacted with FITC conjugated secondary antibody was comparatively superior in tongue tissue than trachea, bronchi and lung.The preliminary results indicated that ITGB6 expression may be comparatively higher in the tongue tissue compared to trachea, bronchi and lung. This indicated that, oral mucosa may be one of the important portal entry sites of the virus in buffalo.

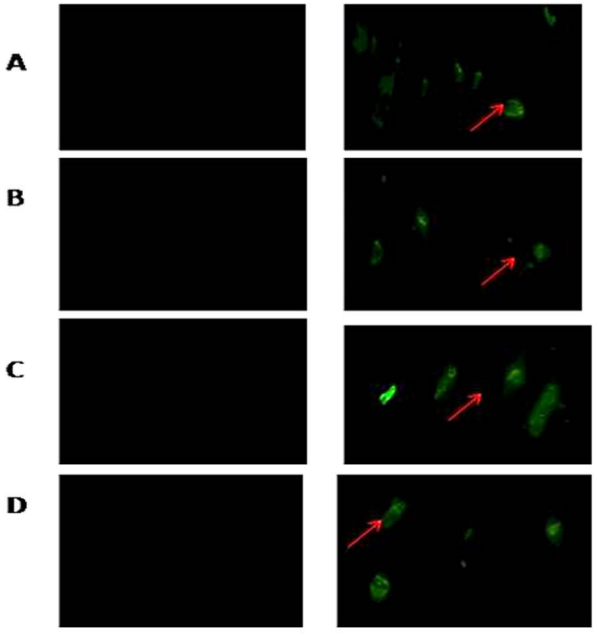


Fig. 22. Representative fluorescent micrographs of cells showing expression of ITGB6 gene in different tissue samples. A. Tongue; B. Trachea, C.Bronchi and D. Lung. Left panels are control

Inter-institutional research project

Status of micro elements in animal feeds from the areas under rice-wheat cropping system

Under the IIFSR-CIRC collaborative research project "On farm crop response to plant nutrients in rice-wheat cropping system and their impact on crop-livestock-human chain". Field/household visits were made in the districts of Amritsar (Punjab) and Samba (J&K) during May, 2015. From Amritsar 24 samples of feed/fodder (wheat straw-7, berseem-7, paddy straw-3, and concentrate-7), 3 samples of soil and 29 cattle/buffalo blood samples were collected, while from Samba 24 samples of feed/fodder (wheat straw-7, berseem-2 and concentrate-8), 6 samples of soil and 21 cattle/buffalo blood samples were collected. All the feed, soil and blood samples were processed for the determination of micronutrients. The proximate composition of feeds/fodder samples is given in the table 33.

Feed sample testing facility for Military Farms

Animal Nutrition Laboratory has provided feed sample testing facility to various Military dairy farms (24). During the period a total of 1065 feed samples were analyzed for proximate composition. Overall 24 Military Farms have availed this facility. Highest quantity of samples belonged to Military farms located at Meerut & Ambala followed by Secunderabad, Jalandhar and Pathankot. Ten major beneficiary Military farms have been illustrated in the Fig. 23.

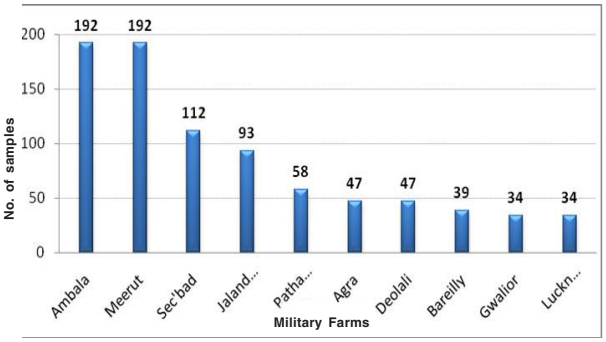


Fig. 23. Top ten beneficiary military farms who availed feed testing facility at our institute (figures shown indicate the number of feed samples analyzed for respective farm)

In terms of nature of various feed samples, highest number belonged to wheat bran, followed by maize whole, MO cake, CS cake, soya DOC, guar meal, GN cake, barley whole, rice polish, and bypass fat & bypass protein (Fig. 24).

Table 33. Average (%) nutrient composition of feeds/fodder samples collected from the IIFSR project area

Project area	Name of feed	CP	EE	CF	Ash	AIA	NFE
Amritsar	Wheat Straw (n=7)	4.41	1.16	39.20	9.79	4.69	45.44
	Paddy Straw (n=3)	5.47	1.22	37.51	14.48	8.21	41.32
	Berseem (n=7)	19.42	2.49	25.70	12.68	2.37	39.72
	Concentrate (n=7)	15.17	3.11	12.27	7.66	2.02	61.79
Samba	Wheat Straw (n=7)	3.87	1.43	38.85	7.34	5.36	48.52
	Berseem (n=2)	19.24	3.21	23.64	9.51	2.06	44.41
	Concentrate (n=7)	15.71	3.11	12.27	7.66	2.02	61.79
	Mustard Oil Cake (n=1)	37.82	6.78	12.43	5.80	1.04	37.17

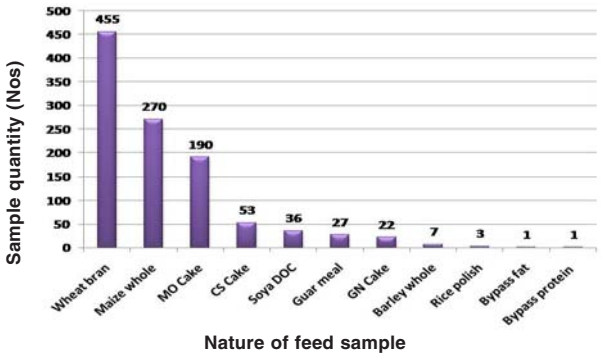


Fig. 24. Depiction of nature and extent of samples received from various military farms for proximate analysis

Efficient ground water management

A pilot research project entitled" Efficient ground water management for enhancing adaptive capacity to climate change in sugarcane farming system under Climate Change and Sustainable Agriculture: Monitoring, Modelling and Networking (CCSAMMN) component of National Mission of Sustainable Agriculture (NMSA) in collaboration with IIWM, Bhubaneswar has been started in Muzaffarnagar district.

Two training program were organised for farmers of Rasulpur village. The farmers were educated about various aspects of commercial dairying like high yielding breeds of cattle their nutritional, reproductive and health management and also management of water and waste in a commercial dairy. The farmers were also sensitized for use of vermicompost.

(IV) EXTENSION ACTIVITIES

1. Visit of Scientific team

A team of expert scientists visited Panchayati Gaushala Hapur on 25th April 2015. A case of uterine prolapse was attended and the mass protruding outside was reposed successfully and different tips were given to the management team of Gaushala to ensure balanced nutrition to different categories of livestock and to keep the livestock in perfect reproductive health.The Director along with a team of scientists visited dairy farm of a progressive farmer Sh. Manoj Kumar at Saket (Meerut) on 15th June 2015. His herd mainly comprised of Buffaloes and few crossbred cows. He is offering only dry fodder and concentrate and adequate quantity of good quality mineral mixture with vitamins to his animals. Due to which his animals were in perfect reproductive health despite of not being provided with green fodder. Dr. Rajendra Prasad, Principal Scientist and team gave necessary suggestions to him to reduce the cost of milk production for profitable dairy farming.

Visit of the Director and Scientific team

2. Infertility Camp organized

In order to solve various problems of infertility in farmers' herd, Institute organized one day camp at village Pooth Khas, on 8th May 2015. The total of 55 animals examined and among them 35% were anestrus, 7% repeat breeders and remaining suffered from other health related problems. All the animals were treated accordingly. Farmers of the village were also made aware of importance of mineral mixture along with the other nutrients for the optimum production and reproduction. Another Infertility Camp was organized in Village Tikri (Baghpat) in order to solve various problems of infertility in farmers' herd on 5th Nov 2015. The animals examined were 45 and found affected with anestrus, repeat breeding and other health problems. Two cases of AI were also attended.

3. Progressive Farmers Meet Organized

The Institute organized a progressive farmers' meet on 25thJune 2015 to apprise farmers about the latest trends in cattle rearing and take feedback from the progressive dairy owners and cattle farmers in order to encourage dairy farming in the area. The meeting was attended by about 40 progressive farmers from the nearby villages and sponsored by Intas Pharmaceuticals Ltd. (Bovicura Division). In the meeting Dr. Birham Prakash, Director CIRC expressed the need to take up cattle farming on scientific lines and assured the farmers to provide all possible logistic and technical support in this direction. During the meeting scientists of the Institute provided the brief of the various aspects of cattle, feeding, breeding and reproduction. They also explained the importance of regular balanced feeding management including energy and mineral nutrition which is of utmost importance in field condition.

4. Institute Participated

KHARIF KISAN SAMMELAN – 2015: The institute participated in Kharif Kisan Sammelan – 2015 organized by National Horticulture Board at SVPUAT, KVK, Baghra (Muzaffarnagar) on 27th June 2015. In the event,institute put up stall and scientists participated in technical session organized on this occasion and delivered a lecture on scientific feeding of livestock. Queries of farmers were addressed by the team of scientists participated in this event. Farmers visiting the Institute stall were given extension booklet published by the Institute free of cost.

FARMER TRAINING: Institute participated in a farmer training programme organized by State Animal Husbandry Department and Bovicura Division of Intas Pharmaceuticals Limited at Bulandshahar on 22nd Aug 2015 and delivered scientific input regarding management of dairy farm to 60 progressive

farmers and beneficiary of Kamdhenu Dairy Scheme of State Government. Printed literature on scientific livestock production was also distributed to the farmers.

KISAN MELA: The institute participated in Virat Kisan Mela Avm Krishi Pradarshani-2016 organized by Agriculture Department of Govt. of U.P held at Krishi Prasar Bhavan Complex, Delhi Road, Meerut. on February 25-27, 2016. In the event scientist team members put up stall of the Institute and participated in technical session organized on this occasion. Queries of farmers were addressed by the team of scientists. Farmers visiting the Institute stall were given extension booklet published by the Institute free of cost. The institute stall was judged as the best and awarded.

KRISHI UNNATI MELA, New Delhi: The Krishi Unnati Mela 2016 was organized at Pusa New Delhi during March 19-21, 2016 for promoting use of science for the welfare of farmers. ICAR- Central Institute for Research on Cattle, participated in the Mela and displayed its scientific activities of direct relevance to farmers and availability of quality frozen semen of Sahiwal, Gir, Kankrej, Tharparkar and Frieswal cattle for use to farmers and other stakeholders, preparation of balanced feed ration for various categories of cattle using local feed ingredients, mineral mixtureand also distributed published literature for profitable cattle keeping. The activities of the Institute were also displayed via modern scientific movies and different scientific posters on indigenous cattle breeds, animal breeding, feeding and nutrition, management and healthcare. Preparing vermi-compost manure for organic farming was in great demand by farmers. We also demonstrated through posters the activities related to villages adopted under prestigious scheme of GOI "MERA GAON MERA GAURAV" for farmer awareness aiming enhancing productivity and profitability of dairy animals. An expert team of scientists Dr. Birham Prakash (Director), Dr. Suresh Kumar D.S. (Animal Reproduction), Dr. Ravinder Kumar (Animal Breeding), and Shri. C.P. Singh (CTO) participated and given the valuable information on animal breeding, feeding, management, health care and marketing tools to the farmers and satisfied various queries raised by the visiting farmers. In this event, morethan 2000 farmers visited our stall. Addresses of keen farmers were recorded for future correspondences. We provided all relevant scientific literature free of cost to the farmers.

HELLO KISAN programme at Doordarshan: Dr. Ravinder Kumar, Senior Scientist participated as Animal Husbandry expert in Hello Kisan programme telecasted on DD Kisan Channel on July 02, 2015 and adviced farmers on scientific breeding management and future scope of dairy sector.

5- ,d fnolh; O;olkf;d Mjh if'k{k.k dk;Øe dk vk;kstu

दिनांक 02.09.2015 को संस्थान में कृषि एवं सहकारिता विभाग, कृषि एवं किसान कल्याण मंत्रालय के सहयोग से एक प्रशिक्षण कायक्रम का आयोजन किया गया। जिसमें व्यवसायिक

डेरी आरम्भ करने हेतु प्रशिक्षण दिया गया। इस कार्यक्रम में डॉ. संजीव बालियान, माननीय कृषि राज्य मंत्री द्वारा चयनित आदर्श ग्राम रसूलपुर जाटान, (जिला मुजफ्फरनगर) से आये 40 किसानों ने प्रशिक्षण प्राप्त किया। इसके अतिरिक्त जिला मेरठ के भी पांच प्रगतिशील पशुपालक इस कार्यक्रम में उपस्थित थे। कार्यक्रम का उद्घाटन करते हुए संस्थान के निदेशक, डॉ. बी. प्रकाश ने सभी किसानों का स्वागत करते हुए इस प्रशिक्षण कार्यक्रम की महत्ता पर प्रकाश डाला। कार्यक्रम में डॉ. सुशील कुमार, प्रधान वैज्ञानिक ने डेरी पशुओं की प्रमुख नस्लों के बारे में बताया। डॉ. राजेन्द्र प्रसाद, प्रधान वैज्ञानिक ने डेरी पशुओं के उचित भरण पोषण पर प्रकाश डाला। इस प्रशिक्षण कार्यक्रम में डॉ. अनिल कुमार माथुर, प्रधान वैज्ञानिक ने पशुओं में मदहीनता व प्रजनन सम्बन्धी समस्याओं के बारे में किसानों से वार्तालाप की व उनकी समस्याओं का समाधान किया। डॉ. नेमी चंद, वरिष्ठ वैज्ञानिक ने पशुओं की प्रमुख बीमारियों के बारे में बताया तथा किसानों से आग्रह किया कि प्रत्येक पशु का प्रतिवर्ष टीकाकरण अवश्य कराये ताकि पशुओं को खुरपका, मुंहपका व गलघोटु नामक बीमारियों से बचाया जा सके। प्रशिक्षण कार्यक्रम में डॉ. महेश कुमार, प्रधान वैज्ञानिक ने व्यवसायिक डेरी करते समय जल प्रबन्धन व गोबर निस्तारण के विषय में किसानों

को जागरूक किया। कार्यक्रम के अन्त में किसानों को वर्मी–कम्पोस्ट बनाने के बारे में भी बताया गया ताकि डेरी में उपलब्ध गोबर का सदुपयोग किया जा सके। किसानों द्वारा बडी संख्या में पशुओं से सम्बन्धित प्रश्न पूछे गए। जिनका संस्थान के वैज्ञानिकों ने संतोष जनक जवाब दिया व समाधान के तरीके बताए।

6- dke/ku Mjh ;kstuk dh ykHkkfFkZ;ksa gsrq if'k{k.k f'kfoj dk vk;kstu

संस्थान में दिनांक 24.09.2015 को कामधेनु डेरी योजना के लाभार्थियों के लिए एक विशिष्ट प्रशिक्षण कार्यक्रम का आयोजन किया गया जिसमें जनपद मेरठ, बुलंदशहर, हापुड़ व बागपत के लगभग 80 लाभार्थियों ने भाग लिया। कार्यक्रम संयोजक ने बताया कि कामधेनु योजना की सफलता तभी संभव है जब इस के लाभार्थी को तकनीकी की रुप से सक्षम हो। इसी को ध्यान में रखते हुए फार्मविक कम्पनी, जयपुर से आए हुए पशुपोषण विशेषज्ञ डॉ. राकेश रायकवाड़ ने इस बात पर जोर दिया कि जब तक डेरी पशुओं का पोषण सुनिश्चित नहीं किया जाएगा तब तक उन से अधिकतम उत्पादन लेना संभव नहीं हो सकेगा। पी.एच.डी. चेंबर ऑफ़ कामर्स के डॉ. दुर्गेश चन्द्र शर्मा ने प्रशिक्षनार्थियों को दूध विपणन के बारे में बताया। डॉ. ए.के. माथुर ने कहा कि

डेरी पशुओं से हर साल बच्चा लेना परमावश्यक है। गोवंशी पशुओं में बाँझपन निवारण हेतु एक व्याख्यान भी दिया। संस्थान के निदेशक डॉ. बी. प्रकाश ने संस्थान द्वारा उपलब्ध कराई जा रही सुविधाओं के बारे में लाभार्थियों का अवगत कराया। कार्यक्रम के दौरान मुख्य पशु चिकित्सा अधिकारी, मेरठ, डॉ. हरपाल सिंह ने किसानों को कामधेनु डेरी योजना के उद्श्यों के बारे में विस्तार से बताया। यह कार्यक्रम कारगिल इंडिया प्राइवेट लिमिटेड के सोजन्य से आयोजित किया गया। कारगिल इंडिया से आए हुए डॉ. प्रशांत शर्मा ने कारगिल इंडिया के पोषण उत्पादों के बारे में पशुपालकों को अवगत कराया। कार्यक्रम में भारती स्पलैश के प्रगतिशील किसान मनीष भारती जी ने किसानों को अपने अनुभवों के बारे में बताया तथा किसानों को अपने पशु उत्पादों के मान में वृद्धि कर के अच्छे दामों पर बेचने की नीति से अवगत कराया।

7- ,d fnolh; tkx#drk o if'k{k.k dk;Øe dk vk;kstu

संस्थान के सभागार में कृषि व सहकारिता विभाग, कृषि एवं किसान कल्याण मंत्रालय, भारत सरकार के सहयोग से ''उत्तम गुणवत्ता के कच्चे दूध का विपणन व कुछ पारंपरिक भारतीय दुग्ध उत्पादों को बनाकर दुध का मुल्य संवर्धन'' विषय पर एक जागरुकता व प्रशिक्षण कार्यक्रम दिनांक 24.11.2015 को आयोजित किया गया। यह कार्यक्रम रसूलपूर जाटान (जिला मुजफ्फरनगर) के किसानों के लिए विशेष रुप से आयोजित किया गया था। इस कार्यक्रम में किसानों को पशुओं के संतुलित खानपान, उचित प्रजनन, प्रबंधन व पशुओं की विभिन्न बीमारियों के बारे में अवगत कराया गया। संस्थान के निदेशक डॉ. ब्रहम प्रकाश ने इस बात पर जोर दिया कि गर्भाधान हेतु उच्च कोटि का वीर्य ही प्रयोग किया जाए। संतुलित पोषण के महत्व को बताते हुए डॉ. प्रमोद सिंह, प्रधान वैज्ञानिक ने किसानों से आग्रह किया कि नवजात बछड़े बछियों का पोषण सुनिश्चित करके ही पशुपालन को

लाभदायक स्तर तक पहुँचाया जा सकता है। कार्यक्रम में राष्ट्रीय डेरी अनुसंधान संस्थान, करनाल से आए मुख्य अतिथि डॉ. सत्य प्रकाश अग्रवाल, पूर्व प्रधान वैज्ञानिक ने अपने संबोधन में कहा कि दूध के मान म्रें वृद्धि करके ही किसान दूध का सही दाम प्राप्त कर सकता है। अगर कच्चे दूध की गुणवत्ता उत्तम होगी तो किसान को उसके मनचाहे दाम प्राप्त हो सकेगें। इस प्रशिक्षण कार्यक्रम में आए हुए किसानों को निकटवर्ती ग्राम अरनावली में एक प्रगतिशील पशुपालक द्वारा चलाए जा रहे आधुनिक डेरी फार्म का भी भ्रमण कराया गया जिसमें किसानों ने दूध निकालने की मशीन के बारे में जानकारी

प्राप्त की व दूध की स्वचालित पैकिंग मशीन को भी देखा। इस कार्यक्रम में गाँवों रसूलपुर से आए लगभग चालीस किसानों व मेरठ जनपद के विभिन्न पंद्रह गाँवों से आए लगभग तीस किसानों ने भाग लिया।

8- fdlku lEeku fnol ij fdlku lxk"Bh dk vk;kstu

इस संस्थान द्वारा कलंजरी गाँव को ''मेरा गाँव मेरा गौरव'' के अंतर्गत चयनित किया गया। इसी गाँव में दिनांक 23.12.2015 को किसान सम्मान दिवस हर्षोल्लास से मनाया गया तथा साथ ही एक किसान संगोष्ठी का आयोजन सफलतापूर्वक किया गया।

9. 'JAI KISAN JAI VIGYAN' WEEK

ICAR- Central institute for Research on Cattle celebrated 'Jai Kisan Jai Vigyan' Week from 23 December to 29 December 2015 on the birth anniversary of former Prime Ministers Late Shri Chaudhary Charan Singh and Shri Atal Bihari Vajpayee. The celebration was being organized keeping in view their immense contribution for promoting use of science for the welfare of farmers. Director, headed over the programme.

10. Institute Won First Prize

The institute participated in Virat Kisan Mela Evam Krishi Pradarshani-2016 organized by Agriculture Department of Govt. of U.P held at Krishi Prasar Bhavan Complex, Delhi Road, Meerut. on February 25-27, 2016 and won the first prize for demonstration of scientific technologies at stall in Central Govt. category.


एग्रोक्लाइमेटिक जोन-1 के अन्तर्गत मेरठ एवं सहारनपुर मण्डल के संयुक्त तत्वाधान में

विराट किसान मेला एवं कृषि प्रदर्शनी-2016

कृषि विभाग

प्रमाण-पत्र

कृषि सूचना तंत्र के सुदृढीकरण एवं कृषक जागरूकता कार्यक्रम योजनान्तर्गत दिनांक 25 से 27 फरवरी 2016 तक तीन दिवसीय विराट किसान मेला कृषि प्रसार भवन परिसर, दिल्ली रोड मेरठ, पर आयोजित कृषि प्रदर्शनी में I.C.A.R C.C.R.I. MEERUT CANTT. ने विशेष रूचि के साथ स्टॉल लगाया। इन्हें 'सरकारी/निजी' स्टॉल के उत्कृष्ट प्रदर्शन के आधार पर FIRST स्थान दिया जाता है।

(डा0 रामवीर कटारा)
उप कृषि निदेशक
मेरठ

(रामचन्द्र सिंह)
संयुक्त कृषि निदेशक
मेरठ मण्डल, मेरठ

11. Success stories

i. Scientific Cattle Rearing: A Success Story of a Dairy Farmer of Village-Arnawali, Meerut

Mr. Manish Bharti, resident of village-Arnawali Meerut district of Uttar Pradesh was a traditional dairy farmer. He possesses about 25 acre of land including his house and

Machine milking parlour at farmer door

cattle shed. After completion of his MBA, he was struggling to become a successful entrepreneur in dairy sector. He approached ICAR- Central Institute for Research on Cattle, Meerut Cantt. The institute advised him to attend a program on scientific dairy farming focused on breeding and feeding improvement of cattle. After attending the training he started dairy business in 2012 with 4 cows with average production of 35 litres of milk per day on trail basis. ICAR-Central Institute for Research on Cattle, Meerut provided the necessary technical inputs and good quality semen and knowhow of organized dairy.

Currently he owns about 30 cows producing on an average of 300 litre milk per day and is able to sell entire production under his own brand.He is now selling milk at the rate of 50/ per litre from retail counter and @ Rs.54/ to home delivery customers whereas other farmers are getting only Rs. 30/- per litre by selling to various agencies. He also offers farm fresh cow milk shake with different flavours at his retail outlet. He has special insulated boxes and a delivery van for home delivery of milk. His total farm operations are managed through 15 KVA Biogas Generator set and the entire cow dung is used in his own farm for routine organic agriculture replacing the chemicals fertilizers completely.

With the help of 30 cows today he has yearly turnover of Rs. 55/-lakhs. Today Mr. Manish Bharti has proved his strength as a farmer by adopting scientific dairying and is happy to share his knowledge and experiences with other farmers. Because he believes that power of producer, when matched with scientific farming and marketing skills, is the only way out for better rural development in this country.

ii. Successful indigenous cattle farming story of a dairy farmer of Village-Kakepur, Meerut

Livestock is an important asset for the farmers and critical in supporting their

livelihoods. Cow keeping can be an economical and sustainable profession as demonstrated by Mr. Shobit Kumar Tyagi of Kakepur village of Meerut district of Uttar Pradesh. He was a small and traditional dairy farmer. He possesses about 9 acre of land which includes his house and cattle shed. He was struggling to become a dairy entrepreneur. One day, he came in contact with the scientists of ICAR Central Institute for Research on Cattle, Meerut Cantt. Meerut and subsequently was advised to gain knowledge on scientific dairy farming focused on breed improvement of cattle. He started his journey in 2010 with three cows along with his ancestral farming. Presently he has more than 210 Indigenous (Sahiwal, Rathi, Gir, Hariana breeds) and 66high yielding crossbred cows (ranging between 15-20 kg milk per days). In the span of last five years, he has achieved several milestones, which include supplying of various dairy products. He mainly prepares ghee using cream separation which is sold at Rs. 550 per Kg. and also by the traditional churning method which is sold @ Rs. 1000/- per Kg., Additionally, butter milk is sold at Rs. 20-25/kg. He also started making compost manure from cow dung for his own farming and production of bio-gas using cow dung at a small scale. He is not applying chemical fertilizers in his fields. Before coming into contact of this institute, he was not aware of scientific rearing of his cattle, the production of his cows was very low and his expenditure was more on animal health. He is now getting about 600 kg of milk per day and earning about Rs.50,000 to 100000 per month. Besides increased milk yield, he is also benefitted by the institute in getting scientific guidance on feeding and management of cows, receipt of good quality semen, preventive health care, first aid for his animals and feed supplements. He is using homemade concentrate for balancing the diet of cow herd and animals are so healthy that they rarely fall ill. Mostly feed and fodder are self-cultivated but occasionally purchasing from other farmers.

Additional income has helped him to convert a temporary shed into permanent self-constructed tinned roof well aerated and comfortable shed with 10,000 sq. feet covered area for animals. His family is also enjoying a good socio-economic status in the village and they are all leading a comfortable life. In future, he plans to increase the production of bio-gas and promote the self treatment by Gaupanch i.e. Gaumutra, Gauarka from cow dung, cow milk, cow butter milk and cow ghee. His whole family feels indebted to ICAR-CIRC, Meerut for bringing happiness and change in their life. Mr Shobit Kumar Tyagi has become a live example and role model for a number of unemployed youths of this area.

11. 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, knowledge and advisories on regular basis. For reaching the farmers all the scientists have been involved by making four core groups of 5-6 scientists each involving multi disciplinary and subject matter specialists. Each team is led by a senior member with one member secretary to regulary interact with the farmers and make them aware with newer innovative

Glimpses of scientist-farmers interaction on clean milk production

agricultural and allied technologies, farm practices, 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 germ-plasm 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 are also focussed during the interactions.

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, nutrition, health and hygiene, importance of superior germ plasm for genetic improvement, artificial insemination, quality of semen and reproduction management including timely insemination, estrus detection, source of semen and precautions during artificial insemination were also discussed at length at times and were also demonstrated.

The collaborative progammes with state government,IIFSR and public entrprisers were also organised for clean milk production and dugdh utpadak gosthies were organised with Quality India limited 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 and Virat Kisan Sammelan organised by UP State Govt. During the last six months we reached to more than one thousand farmers through direct interface, distributed the farmer friendly technical information through pamphlets,literature etc.

(V) TECHNOLOGY/CONCEPT

Patents Filed:

1. **DEVELOPMENT OF A RAPID USER FRIENDLY SINGLE TUBE PCR BASED TOOL FOR DETECTION OF BOVINE LEUKOCYTE ADHESION DEFICIENCY (BLAD) CARRIER IN CATTLE:** A single tube tetra ARMS PCR based diagnostic strategy developed for

detection of BLAD carrier in cattle. The test is rapid, economical and user friendly. The test has been utilized to screen Frieswal bulls for identifying BLAD carrier before semen collection. A Patent has been filed with application number **1073/DEL/2015**.

Inventors:R.R.Alyethodi, Umesh Singh, Sushil Kumar, Rajib Deb, Rani Alex, Sheetal Sharma, B.Prakash.

2. **A COLOR BASED ASSAY FOR DIFFERENTIATING COW Vs GOAT MILK/MEAT:** A post PCR color based differentiation of cow Vs goat milk and meat samples has been developed. The test does not require downstream PCR processing and handling of carcinogenic dyes. Moreover, it is rapid and can be completed within 2-3 hour including genomic extraction from milk/meat samples. The test can detect 2% adulterated milk or 1 mg meat from either cow or goat sources. A Patent has been filed with application number **1901/DEL/2015**.

   Inventors: Rajib Deb, Rani Alex, Sushil Kumar, Umesh Singh, T.V.Raja, R.R.Alyethodi, Gyanendra Sengar, B.Prakash.

3. **PROMISING CONCEPT ON "ARTIFICIAL NEURAL NETWORK MODEL FOR EARLY PREDICTION OF POST THAW MOTILITY IN BULL SEMEN** was developed by Rajib Deb, Raja T V, Umesh Singh, Sushil Kumar, Shrikant Tyagi, Rani Alex and B. Prakash. Published in ICAR Newsletter (April-June 2015, Vol 21, N0.2)

4. **DEVELOPMENT OF AN IN-HOUSE BUILT LAMP ASSAY FOR RAPID DETECTION OF COW COMPONENTS ADULTERATED IN BUFFALO MILK/MEAT**. An in-house built rapid, economical and user-friendly LAMP assay protocol to identify the buffalo milk/meat samples adulterated with cow milk/meat was developed. This test can be completed with in 1 hour 45 minutes and can detect upto 5% adultrated cow DNA in buffalo counter parts. A Patent has been filed with application number **3870/DEL/2015**.

   Inventors: Rajib Deb, Umesh Singh, Sushil Kumar, A. K. Das, T. V.Raja, R.R.Alyethodi, Rani Alex, Gyanendra Sengar, B.Prakash.

Technologies ready for commercialization

1. R.R.Alyethodi, Umesh Singh, Sushil Kumar, Rajib Deb, Rani Alex, Sheetal Sharma, B.Prakash. Development of a rapid user friendly single tube PCR based tool for detection of Bovine Leukocyte Adhesion Deficiency (BLAD) carrier in Cattle. Zonal agro-technology Management center, ICAR-National Dairy Research Institute,Karnal-132001, Haryana: Page no:62-63)

2. Rajib Deb, Rani Alex, Sushil Kumar, Umesh Singh, T.V.Raja, R.R.Alyethodi, Gyanendra Sengar, B.Prakash. A visible test for differentiating cow and goat milk/meat. Zonal agro-technology Management center, ICAR-National Dairy Research Institute, Karnal-132001, Haryana: Page no:63-65).

RESEARCH PROJECTS

The followings research projects were in operation during the year 2015-16

AICRP PROJECTS

Sl.No.	Project Title	Research Workers
1.	Studies on genetic aspects of Holstein-Sahiwal crossbreds - **"Frieswal Project"**	Dr. Sushil Kumar (PI) Dr. S Tyagi Dr. Ajaveer Singh Sirohi Dr. Rani Alex Dr. Rajib Deb Dr. N Chand Dr. R Prasad Director, Frieswal
2.	Genetic studies on performance of important indigenous breeds of cattle and their improvement through selection – **"Indigenous Breeds Project"**	Dr. Umesh Singh (PI) Dr. Raja TV Dr. Rafeeque R Alyethodi **In-charge Associated units:** **Sahiwal** : Dr. AK Gupta **Gir** : Dr. PU Gajbhiye **Kankrej** : Dr. JB Patel
3.	Field recording of performance data for undertaking large scale progeny testing – **"Field Progeny Testing of Frieswal Bulls"**	Dr. AK Das (PI) Dr. Ravinder Kumar Dr. SK Rathee **In-charge associated units:** **GADVASU** : Dr. PP Dubey **KAU** : Dr. K Anil Kumar **BAIF** : Dr. SB Gokhale **GBPUA&T** : Dr. CB Singh

INSTITUTIONAL PROJECTS

Sl.No.	Project Title	Research Workers
1.	Differential expression and SNP identification of genes related to establishment of pregnancy in Frieswal and Sahiwal cattle	Dr. Rani Alex Dr. Umesh Singh Dr. Sushil Kumar
2.	Early selection of Frieswal sires using test day records	Dr. T.V. Raja Dr. R. Kumar Dr. S.K. Rathee
3.	Expression of fertility associated genes in sperm transcriptome of different breeds of cattle –A comparative approach	Dr. R. Alyethodi Dr. S. Tyagi Dr. A.K. Das Dr. Rani Alex

Sl.No.	Project Title	Research Workers
4.	Genetic studies on performance and disposal pattern in Frieswal cattle	Dr. S.K. Rathee Dr. A.K. Das Dr. T.V. Raja
5.	Baseline survey on Cattle to multiply superior Germplasm in field conditions for enhanced milk production	Dr. R. Kumar Dr. Anil Kumar (IIFSR, Meerut)
6.	Prognostic value of semen quality parameters as a 'basic comprehensive indicator' to grade fertility of frozen thawed semen of cross bred bulls	Dr. N. Srivastava Dr. Megha Pande
7.	Functional analysis of sperm morphometric subpopulations in Frieswal bulls	Dr. Mahesh Kumar Dr. S. Saha
8.	Effect of different housing systems on physiological, behavioural and semen production performance of Frieswal bulls	Dr. A.S. Sirohi Dr. N. Chand
9.	Improvement of reproductive efficiency of cattle through different physiological and reproductive techniques	Dr. S. Saha Dr. A.K. Mathur Dr. Y.K. Soni
10.	Augmenting the reproductive efficiency of cattle in organized farms and rural areas around Meerut through various reproductive and nutritional interventions	Dr. Y.K. Soni Dr. A.K. Mathur Dr. S. Saha Dr. Megha Pande
11.	Investigation on Fertility-Associated Antigen in sperm membranes and seminal plasma vis-à-vis semen quality parametres and freezability of Frieswal bulls	Dr. Megha Pande Dr. N. Srivastava Dr. M. Kumar Dr. Y.K. Soni
12.	Optimization of dietary energy in periparturient Frieswal cows	Dr. Rajendra Prasad Dr. S. K. Verma Dr. Pramod Singh
13.	Micronutrient status in the feeds and effect of dietary supplementation on growth and semen quality of Frieswal bull calves	Dr. Pramod Singh Dr. R. Prasad Dr. S. K. Verma
14.	Functional analysis of IRES elements at bovine heat shock protein genes: an approach to modulate thermo regulatory response in cattle	Dr. Rajib Deb Dr. Umesh Singh Dr. B. Sajjanar
15.	Studies on heavy metal status, their effects on biochemical profile and semen quality in bovines	Dr. Naimi Chand Dr. S. Tyagi
16.	Effect of different levels of micro-minerals on qualitative and quantitative attributes of semen in Frieswal bulls	Dr. Pramod Singh Dr. Rajendra Prasad
17.	Molecular characterization of autosomal and Y specific microsatellite markers related to milk production traits and fertility status of Frieswal cattle	Dr. Rajib Deb Dr. Umesh Singh Dr. Sushil Kumar Dr. Rafeeque R Alyethodi
18.	Quality assessment on Frieswal bull semen	Dr. Suresh Kumar D.S. Dr. N. Srivastava Dr. M. Kumar

Sl.No.	Project Title	Research Workers
19.	Studies on cryodamages of bull spermatozoa and its mitigation using different additives	Dr. Suresh Kumar D.S. Dr. A.S. Sirohi
20.	**SERVICE PROJECT** Screening for genetic diseases in Frieswal and Indigenous bulls	Dr. R.R. Alyethodi Dr. Umesh Singh Dr. Sushil Kumar Dr. R. Alex
21.	Value addition in dung waste through vermiculture	Dr. Mahesh Kumar Sh. Rajiv Verma
22.	**PILOT PROJECT** Isolation, in vitro culture and characterization of different types of cells in cattle	Dr. S. Saha Dr. A.K. Mathur Dr. Suresh Kumar D.S.
23.	Use of assisted reproductive technologies for genetic improvement & propagation of elite cattle	Dr. Suresh Kumar D.S.
24.	**INTER-INSTITUTIONAL PROJECT** Study of genetic Polymorphism of heat shock protein genes among indigenous and crossbred cattle	Dr. Basavraj Sajjanar Dr. Rajib Deb

EXTERNALLY FUNDED PROJECT

Sl.No.	Project Title	Research Workers
25.	Molecular Characterization and Analysis of genetic polymorphism in Integrin alpha beta 6 receptor gene associated with Foot-and-mouth disease virus (FMDV) cell tropism in cattle (DST)	Dr. Rani Singh Dr. Rajib Deb Dr. Umesh Singh
26.	Cataloguing of miRNA transcripts during thermal stress and their crosstalk with heatshock protein 70mRNA in Cattle" Project Code YSS/2014/000279 DST-SERB2015-2016	Dr. Rajib Deb
27.	Water budgeting and enhancing water productivity in livestock based farming system	Dr. Mahesh Kumar Dr. A.S. Sirohi Dr. S. Saha Dr. R. Prasad

PUBLICATIONS

RESEARCH PAPERS

1. Bhanuprakash V, Singh Umesh, Sengar G, Sajjanar B, Bhusan B, Raja TV, Alex R, Kumar S, Singh R, Ashish, Alyethodi RR, Kumar S and Deb R. 2016. Differential effect of thermal stress on HSP70 expression, nitric oxide production and cell proliferation among native and crossbred dairy cattle. *Journal of Thermal Biology* http://dx.doi.org/10.1016/j.jtherbio.2016.04.012 .

2. Deb R, Sajjanar B, Singh Umesh, Alex R, Raja TV, Alyethodi, RR, Kumar S, Sengar G, Sharma S, Singh R and Prakash B. 2015. Understanding the mechanisms of ATPase beta family genes for cellular thermo tolerance in crossbred bulls. *International Journal of Biometeorology,* **59:**1783-1789.

3. Kumar S, Ganguly I, Deb R, Singh Umesh, Mandal DK, Mann S, Singh R, Kumar M and Sharma A. 2015. Elucidation on the effect of bovine GnRHR on semen quality traits among crossbred bull. *Indian Journal of Animal Sciences.* **85(12):** 31–34.

4. Kumar J, Singh YP, Kumar S, Singh R, Kumar R, Kumar P. 2015. Genetic analysis of reproductive performance of Frieswal cattle at Military Farm, Ambala. *Veterinary World* ***8*****(9)**: 1032-1037.

5. Kumar S, Deb R, Singh Umesh, Ganguly I, Mandal DK, Tyagi S, Kumar M, Sengar G, Sharma S, Singh R and Singh R. 2015. Bovine Circadian Locomotor Output Cycles Kaput (CLOCK) and Clusterin (CLU) mRNA quantitation in ejaculated crossbred bull spermatozoa. *Reproduction in Domestic Animals* **50(3):**505-509.

6. Kumar S, Ganguly I, Deb R, Singh Umesh, Mandal DK, Mann S, Singh R, Kumar M and Sharma A. 2015. Elucidating the role of bovine GnRHR on semen quality traits among crossbred bull. *Indian Journal of Animal Sciences,* **85(12):**1314-1317.

7. Kumar S, Singh Umesh, Deb R, Tyagi S, Mandal DK, Kumar M, Sengar G, Sharma S, Singh R and Singh R. 2015. A SNP (g.358A>T) at intronic region of CD9 molecule of crossbred bulls may associate with spermatozoal motility, *Meta Gene,* doi.org/10.1016/j.mgene.2015.07.004.

8. Kumar S, Singh Umesh, Deb R, Tyagi S, Mandal DK, Kumar M, Sengar G, Sharma S, Singh R and Singh R. 2015. A SNP (g.358>T) at intronic region of CD9 molecule of crossbred bulls may associate with spermatozoa motility. *Meta Gene* **5**:140-143.

9. Mathur AK,Kumar S, Prabhakar JH, Mandal DK, Ingale HR and Jose James. 2015. Motility of frozen thawed semen after thermal resistance test. *Indian Journal of Animal Reproduction.* **35(1)***:* 18-20.

10. Mondal K, Chakravarti S, Ghosh AK, Kumar S, Nayak B, Nandi S, Sarkar U, Deb R, De A and Biswas J. 2016. Identification of Factor XI deficiency in Indian Sahiwal (*Bos indicus*) cattle. *Molecular Biology Reports* doi.10.1007/s11033-016-3955-5.

11. Singh R, Deb R, Singh Umesh, Raja TV, Alex R, Kumar S, Chakraborti S, Alyethodi RR, Sharma Sand Sengar G. 2015 Heterozygosity at the SNP (rs136500299) of ITGB6 receptor gene possibly influences the susceptibility among crossbred bull to foot and mouth disease infection. *Indian Journal of Virology*, **26(1-2):**48-54.

12. Singh Umesh, Kumar A, Alex R and Vinoo R. 2016. Genetic evaluation of Ongole bulls in organized herds in India. *Indian Journal of Animal Sciences,* **86(1):** 89-90.

13. Srivastava N, Srivastava SK, Ghosh SK, Kumar A, Jerome A, Singh M, kumar A and Ramteke SS. 2015. Cryoinjury in relation to cholesterol content of bull spermatozoa.*Indian Journal of Animal Research* **49(3):** 308-312.

14. Srivastava N, Srivastava SK, Ghosh SK, Kumar A, Pande M, Perumal P and Soni YK. 2015. Cholesterol content of bull spermatozoa alters survival at ultra-low temperatures. *International Journal of Veterinary Science Research* **1(3):** 63-69.

REVIEW ARTICLE

1. Deb R, Chakraborti S, Sengar G and Bhanuprakash V. 2016. Pros and cons of recombinant DNA technology in animal disease diagnosis, prevention and control. *Journal of Pure and Applied Microbiology*,**10(1)**: 451-462.

BOOKS/BOOK CHAPTER

1. Rajib D, Raja TV, Chakraborty S, Gupta SK and Singh U**.** 2015. Role of GMC (Genetically Modified Crops) in Increasing the Food Supply in the Developing and Developed Countries 25. Genetically Modified Crops: An Alternative Source of Livestock Feeding - Genetically Modified Organisms in Food Production, Safety, Regulation and Public Health – **ELSEVIER- ISBN: 978-0-12-802259-7 page 291-302.**

ACCESSION NUMBERS

1. KM272399 Deb R., Sajjanar B,Singh U, Raja TV, SaxenaVK, Sengar G., Sharma S. Bos indicus x Bos taurus 3' UTR region of HSP90AA1

2. KM27400 Deb R., Sajjanar B,Singh U, Raja TV, Saxena VK, Sengar G., Sharma S. Bos indicus (Sahiwal) 3' UTR region of HSP90AA1

3. KM27401 Deb R, Sajjanar B, Singh U, Raja TV, SaxenaVK, Sengar G, Sharma S. Bos indicus (Sahiwal) 3' UTR region of HSP90AA1

4. KM27402 Deb R, Sajjanar B,Singh U, Raja TV, SaxenaVK, Sengar, G., Sharma, S. Bos indicus (Ongole) 3' UTR region of HSP90AA1

5. KM27403 Deb R, Sajjanar B,Singh U, Raja TV, SaxenaVK, Sengar G, Sharma S Bos indicus (Gir) 3' UTR region of HSP90AA1

6. KM27404 Deb R, Sajjanar B,Singh U., Raja, TV, SaxenaVK, Sengar G, Sharma S. Bos indicus (Kankrej) 3' UTR region of HSP90AA1

7. KP768402 Deb R, Kumar S, Singh U, Alytheodi RR, Alex R, Sengar G, Sharma S, Singh R, Kumar R., Prakash B. *Bos indicus* Mitochondrion D-loop sequence, partial

8. KP768403 DebR, Kumar S,Singh U,AlytheodiRR, Alex R,Sengar G,Sharma S, Singh R,Kumar R., Prakash B. *Capra hircus* Mitochondrion D-loop sequence, partial

9. KP776744 Deb R, Kumar S, SinghU,AlytheodiRR,Alex R,Sengar G,SharmaS,SinghR, Prakash, B. *Bos indicus X Bos taurus* Growth hormone receptor gene, partial Intron sequence

10. KR779877 Singh R, Deb R, Singh U, Kumar S, Koringa P, Sengar G, Sharma S. Full length CDS of ITGAV receptor gene in *Bos indicus*.

11. KU951575 Singh R, Sengar G, Kumar A, Bhanupraksh V, Singh U, Kumar S, Deb R. CC allele of Bos indicus ITGAV, 25th Exon

12. KU951576 Singh R, Sengar G, Kumar A, Bhanupraksh V, Singh U, Kumar S, Deb R. TT allele of Bos indicus ITGAV, 25th Exon

13. KU951577 Singh R, Sengar G, Kumar A, Bhanupraksh V, Singh U, Kumar S, Deb R. CT allele of Bos indicus ITGAV, 25th Exon

MONOGRAPHS/TRAINING MANUALS

1. Chand N, Kumar R, Sirohi AS, Tyagi S, Srivastava N, Kumar S. 2016. गोपशुओं गोवंशी में टीकाकरण एवं थनैला वं किलनियों से बचाव। Published by ICAR - Central Institute for Research on Cattle, Meerut Cantt.pp-1-4.

2. Kumar R, Sirohi AS, Chand N, Prasad R, Pande M, Srivastava N and Kumar S. 2016. लाभदायक गौवंश पालनः तकनीकी ज्ञान। Published by ICAR - Central Institute for Research on Cattle, Meerut Cantt. pp 1-4.

3. Srivastava N, Tyagi S, Sirohi AS, Pande M, Chand N, Kumar S, Kumar M, Kumar R, and Prakash B. 2015. Training Manual on Molecular approaches to augment reproductive efficiency in cattle. Published by ICAR - Central Institute for Research on Cattle, Meerut Cantt.

INVITED LECUTURES/LEAD PAPER

1. Prakash B, Raja TV, Alex R, Kumar S and Singh U. 2016. Enhancing cattle productivity using breeding and biotechnologies in India. National Symposium on Policy Planning for Livelihood Security through Domestic Animal Biodiversity & XIII Annual Convention of Society for Conservation of Domestic Animal Diversity Faculty of Veterinary Sciences & Animal Husbandry, SKUA&T, R S Pura, Jammu. 11-12 February 2016, pp 24-31.

2. Prasad R. 2016. Nutritional and Physiological Factors Determining Semen Quality and Fertlity of Breeding Bulls. XVI Biennial Animal Nutrition Conference on Innovative Approaches for Animal Feeding and Nutritional Research. NDRI, Karnal. 6-8 February 2016, pp159-171.

LECTURES DELIVERED IN TRAINING PROGRAMES

1. Alex R,Alyethodi RR and SengarG. 2015.Expression Analysis: RNA isolation to real time PCR.In Training Manual: *Molecular approaches for augmenting reproductive efficiency in cattle* held at ICAR-Central Institute for Research on Cattle, Meerut from 8-21, December, 2015.pp 209-217.

2. Alex R, Deb R and Sharma S. 2015. Methods of detection of genetic polymorphisms. In Training Manual: *Molecular approaches for augmenting reproductive efficiency in cattle* held at ICAR-Central Institute for Research on Cattle, Meerut from 8-21, December, 2015.pp168-179

3. Alyethodi RR and SengarG. 2015.Genomic DNA isolation, quality, quantity ans purity assessment from sperm cells. In Training Manual: *Molecular approaches for augmenting reproductive efficiency in cattle* held at ICAR-Central Institute for Research on Cattle, Meerut from 8-21, December, 2015. pp 180-185.

4. Alyethodi RR. 2015. Sperm transcriptomics: A new way to identify the fertile animal. In Training Manual: *Molecular approaches for augmenting reproductive efficiency in cattle* held at ICAR-Central Institute for Research on Cattle, Meerut from 8-21, December, 2015. pp 180-185.

5. Chand N, Sirohi AS, Srivastava N and Sharma A. 2015. Applications of biotechnology in vaccines and diagnostics of infectious reproductive diseases. In Training Manual: *Molecular approaches for augmenting reproductive efficiency in cattle* held at ICAR-Central Institute for Research on Cattle, Meerut from 8-21, December, 2015. pp. 218-225.

6. Deb R 2015. micro RNAs: Basics and implications in animal reproduction.In Training Manual: *Molecular approaches for augmenting reproductive efficiency in cattle* held at ICAR-Central Institute for Research on Cattle, Meerut from 8-21, December, 2015. pp 102-112.

7. Deb R, Bhanuprakash V, Sengar G 2015. Recombinant DNA technology: principle to practices. In Training Manual: *Molecular approaches for augmenting reproductive efficiency in cattle* held at ICAR-Central Institute for Research on Cattle, Meerut from 8-21, December, 2015. pp 134-138.

8. Deb R, Bhanuprakash V, Sengar G, Sharma S 2015. Westernblot based analysis of antigen antibody interaction. In Training Manual: *Molecular approaches for augmenting reproductive efficiency in cattle* held at ICAR-Central Institute for Research on Cattle, Meerut from 8-21, December, 2015. pp 149-150.

9. Deb R, Bhanuprakash V, Sengar G, Singh R 2015. Plasmid isolation and screening of recombinant clones. In Training Manual: *Molecular approaches for augmenting reproductive efficiency in cattle* held at ICAR-Central Institute for Research on Cattle, Meerut from 8-21, December, 2015. pp 139-140.

10. Deb R, Sengar G, Bhanuprakash V, Sharma S 2015. Enzyme linked immunosorbant assay. In Training Manual: *Molecular approaches for augmenting reproductive efficiency in cattle* held at ICAR-Central Institute for Research on Cattle, Meerut from 8-21, December, 2015. pp 149-150.

11. Kumar R, Raja TV and Alex R. 2015. Impact of Biotechnological Tools in Animal Productivity Enhancement. In Training Manual: *Molecular approaches for augmenting reproductive efficiency in cattle* held at ICAR-Central Institute for Research on Cattle, Meerut from 8-21, December, 2015. pp. 226.

12. Kumar S. 2015. Folliculogenesis and Follicular Dynamics in Bovines. In Training Manual: *Molecular approaches for augmenting reproductive efficiency in cattle* held at ICAR-Central Institute for Research on Cattle, Meerut from 8-21, December, 2015. pp.16-23.

13. Kumar S. 2015. Oocyte collection, culture and maturation in bovines (cattle and buffaloes). In Training Manual: *Molecular approaches for augmenting reproductive efficiency in cattle* held at ICAR-Central Institute for Research on Cattle, Meerut from 8-21, December, 2015. pp. 141-148.

14. Mathur AK and Soni YK. 2015. Current trends and future strategies of embryo transfer technology. In Training Manual: *Molecular approaches for augmenting reproductive efficiency in cattle* held at ICAR-Central Institute for Research on Cattle, Meerut from 8-21, December, 2015. pp. 63-73.

15. Pande M and Srivastava N. 2015.Principles and applications of 2D PAGE. In Training Manual: *Molecular approaches for augmenting reproductive efficiency in cattle* held at ICAR-Central Institute for Research on Cattle, Meerut from 8-21, December, 2015. pp. 204-208.

16. Pande M and Srivastava N. 2015. Seminal plasma proteins as biomarkers of bull fertility. In Training Manual: *Molecular approaches for augmenting reproductive efficiency in cattle* held at ICAR-Central Institute for Research on Cattle, Meerut from 8-21, December, 2015. pp. 247-257.

17. Pande M, Srivastava N, Mathur AK, Alyethodi RR, Sengar G, Sharma A and Arya S.2015. SDS PAGE and its application for analysis of seminal proteins. In Training Manual: *Molecular approaches for augmenting reproductive efficiency in cattle* held at ICAR-Central Institute for Research on Cattle, Meerut from 8-21, December, 2015. pp.196-203.

18. Prasad R, Singh P and Verma SK. 2015. Metabolomic biomarkers of male infertility In Training Manual: *Molecular Approaches for Augmenting Reproductive Efficiency in Cattle*, held at ICAR-Central Institute for Research on Cattle, Meerut from 8-21, December, 2015. pp 289-300.

19. RajaTV, Kumar R and Alex R. 2015. Concept and Application of Artificial Neural Network in Animal Production. In Training Manual: *Molecular approaches for augmenting reproductive efficiency in cattle* held at ICAR-Central Institute for Research on Cattle, Meerut from 8-21, December, 2015. pp. 258.

20. Saha S, Soni YK and Mathur AK. 2015. Demonstration of heat detection systems.In Training Manual: *Molecular approaches for augmenting reproductive efficiency in cattle* held at ICAR-Central Institute for Research on Cattle, Meerut from 8-21, December, 2015. pp. 83-87.

21. Singh P, Verma SK and Prasad R, 2015. Nutrogenomics and its role in livestock production. In Training Manual: *Molecular Approaches for Augmenting Reproductive Efficiency in Cattle*, held at ICAR-Central Institute for Research on Cattle, Meerut from 8-21, December, 2015. pp. 274-288.

22. Singh P. 2016. Common feeds and feeding practices of cattle.In Training Manual: *Advance Administrative Course*, held at Military Farm School, Meerut Cantt. 25, February, 2016.

23. Singh U and Rani A. 2015. Marker Based Selection in Relation to Animal Breeding.In Training Manual:*Molecular Approaches for Augmenting Reproductive Efficiency in Cattle* held at ICAR-Central Institute for Research on Cattle, Meerut from 8-21, December, 2015.pp. 186-195

24. Sirohi AS, Chand N, Srivastava N and Sharma A. 2015. Demonstration of mitigating strategies to relieve environmental stress on productive and reproductive performance of dairy cattle.In Training Manual: *Molecular approaches for augmenting reproductive efficiency in cattle* held at ICAR-Central Institute for Research on Cattle, Meerut from 8-21, December, 2015. pp.. 218-225.

25. Soni YK,Mathur AK, Saha S and Bhargava A. 2015.Identification and significance of ovarian structures using ultrasonography. In Training Manual: *Molecular approaches for augmenting reproductive efficiency in cattle* held at ICAR-Central Institute for Research on Cattle, Meerut from 8-21, December, 2015. pp.74-82.

26. Srivastava N, Pande M, Tyagi S, DS Suresh Kumar, Chand N, Kumar P, Sharma A, Arya S and Hemlata.2015. Acrosome integrity of sperm cell through FITC-PSA stain. In Training Manual: *Molecular approaches for augmenting reproductive efficiency in cattle* held at ICAR-Central Institute for Research on Cattle, Meerut from 8-21, December, 2015. pp.131-133.

27. Srivastava N, Pande M, Tyagi S, Sirohi AS, Chand N, DS Suresh Kumar, Kumar P, Sharma A and Hemlata.2015. Evaluation of sperm cell viability through triple stain fluorescent microscopy. In Training manual: *Molecular approaches for augmenting reproductive efficiency in cattle*, held at ICAR- Central Institute for Research on Cattle, Meerut from 8-21 December, 2015, pp. 125-127.

28. Srivastava N, Pande M, Tyagi S, Sirohi AS, Sharma A, Kumar P and Arya S. 2015. Distribution of capacitation status of spermatozoa as a marker to assess cryoinjury.In Training Manual: *Molecular approaches for augmenting reproductive efficiency in cattle* held at ICAR-Central Institute for Research on Cattle, Meerut from 8-21, December, 2015. pp.129-131.

29. Tyagi S and MisraAK. 2015. Sexing of mammalian spermatozoa. In Training Manual: *Molecular approaches for augmenting reproductive efficiency in cattle* held at ICAR-Central Institute for Research on Cattle, Meerut from 8-21, December, 2015. pp. 113-124.

30. Tyagi S. 2015. Endocrinology and manipulative techniques to augment fertility in males. In Training Manual: *Molecular approaches for augmenting reproductive efficiency in cattle* held at ICAR-Central Institute for Research on Cattle, Meerut from 8-21, December, 2015. pp. 1-10.

31. Tyagi S. 2015. Endocrinology of female reproduction in cattle. In Training Manual: *Molecular approaches for augmenting*

reproductive efficiency in cattle held at ICAR-Central Institute for Research on Cattle, Meerut from 8-21, December, 2015. pp. 11-15.

TECHNICAL/ POPULAR ARTICLES

1. Chand N, Sirohi AS, Tyagi S, Srivastava N and Kumar S. 2015. परसते थनैला पर काबू पायें। Ayurvet Pashu Swasthya Sansar Patrika, *Ayurvet*. July(7): 1 - 4.

2. माथुर अनिल कुमार एवं प्रसाद राजेन्द्र 2015. फ्रीजवाल बछड़ियों में अलग–अलग खानपान देने का उनकी जनन क्षमता पर प्रभाव। *भारतीय कृषि अनुसंधान पत्रिका,* 30(1): 44-45-

3. Sandeep M, Rajib D, Sushil K and Umesh S. 2015. Role of Biotechnology in livestock empowerment. Indian Farming, **65(6):** 36-38.

4. Rajib Deb, Umesh Singh, Rani Alex, Sushil Kumar, Gyanendra Sengar and Birham Prakash. 2015. Role of ATPase Beta family genes on cellular thermo tolerance in cattle. ICAR Newsletter (July-Sep,2015)

5. Mathur A K, Prasad R, Pande Megha and Bansal V K. 2016. Improved post-partum productive performance in Frieswal cows by practicing individual feeding. *The Blue Cross Book*. **33**: 67-70.

PAPERS PRESENTED IN CONFERENCES/SYMPOSIA/ WORKSHOP

1. Alex R, Singh U, Ramesha KP, Kumar S, Alyethodi RR, Rajib D, Sengar G and Prakash B. 2016. Differential expression of Interferon stimulated genes in blood leukocytes: an alternative diagnostic approach for early pregnancy detection in dairy cattle**.** National Symposium on *"Policy Planning for Livelihood Security through Domestic Animal Biodiversity & XIII Annual Convention of Society for Conservation of Domestic Animal Diversity"* held at Faculty of Veterinary Sciences & Animal Husbandry, SKUA&T, R S Pura, Jammu from February 11-12, p 237.

2. Bhanuprakash, Deb R, Singh U, Alex R, Sengar G, Raja TV, Alyethodi RR, Kumar S and Singh R. 2016. Crosstalk between the NOD like receptors and heat shock proteins in in-vitro cell culture model during thermal stress in cattle**.** National Symposium on *"Policy Planning for Livelihood Security through Domestic Animal Biodiversity & XIII Annual Convention of Society for Conservation of Domestic Animal Diversity"* held at Faculty of Veterinary Sciences & Animal Husbandry, SKUA&T, R S Pura, Jammu from February 11-12, p 217.

3. Chand N, Sirohi AS, Tyagi S, Hemlata, Sharma A and Srivastava N. 2015. Assessment of microbial load in frozen semen in Frieswal bulls. National conference of SVAHE on *"Push to the livestock farming through knowledge empowerment of the farmers"* held at GADVASU, Ludhiana. November, 18-20. 2015. pp 249.

4. Chand N, Sirohi AS, Tyagi S, Sharma A. and Hemlata. 2016. Retrospective study of clinical disorders in crossbred breeding bulls at an organized bull rearing unit. National Symposium on *"New Approaches in Diagnosis and Management of Animal Diseases for*

Sustainable Health and Production cum Workshop on Advance Clinical Procedures in Veterinary Practice" held at GADVASU, Ludhiana. February, 17-19. 2016. pp 70.

5. Das AK, Alex R, Kumar R**,** and Prakash B. 2016. Evaluation of Frieswal bulls under field progeny testing. National Symposium on *"Policy Planning for Livelihood Security through Domestic Animal Biodiversity"* held at Faculty of Veterinary Sciences and Animal Husbandry (SKUAST-J), R.S. Pura, Jammu (J&K), India, during February 11-12, 2016. pp 175.

6. Deb R, Raja TV, Singh U and Sengar G. 2015. Diagnostic strategy for detecting IBR infection in Bull Semen. Scientific Seminar on *"Sexually Transmitted Diseases in Bovines with special reference to infectious Bovine Rhinotracheitis – its diagnosis and control". The Indian Society for study of Animal Reproduction*, West Bengal Veterinary Council Belgachia, Kolkata, July 31st. pp 22-26.

7. Deb R, Singh U, Kumar S, Das AK, Tyagi S, Raja TV, Alex R, Alyethodi RR and Sengar G. 2016. Genetic discrepancy at AP2 box region of HSP70 and its influence on semen quality traits among crossbred cattle**.** National Symposium on *"Policy Planning for Livelihood Security through Domestic Animal Biodiversity & XIII Annual Convention of Society for Conservation of Domestic Animal Diversity"* held at Faculty of Veterinary Sciences & Animal Husbandry, SKUA&T, R S Pura, Jammu from February 11-12, pp 222.

8. Kumar R,Das AK, Rathee SK, Singh U, Raja TV, Kumar S, Alex R, Deb R, Kumar AK, Singh CB, Dubey PP and Gokhale SB. 2016. Genetic Improvement Of Crossbred Cattle Under Field Conditions. National Symposium on *"Policy Planning for Livelihood Security through Domestic Animal Biodiversity"* held at Faculty of Veterinary Sciences and Animal Husbandry (SKUAST-J), R.S. Pura, Jammu (J&K), India, during February 11-12, 2016. pp 187-188.

9. Kumar S, Alex R, Singh U, Deb R, Alyethodi RR, Prakash B and Singh G. 2016.Altered sex ratio in Frieswal Cattle and its causes.National Symposium on *"Policy Planning for Livelihood Security through Domestic Animal Biodiversity & XIII Annual Convention of Society for Conservation of Domestic Animal Diversity"* held at Faculty of Veterinary Sciences & Animal Husbandry, SKUA&T, R S Pura, Jammu from February 11-12, pp 297.

10. Kumar S, Tyagi S, Kumar M, Srivastava N, Sirohi AS, Chand N, Arya S and Prakash B. 2015. XXXI Annual Convention of the Indian Society for Study of Animal Reproduction (ISSAR) & National Symposium on *"Current Challenges and Opportunities in Animal Reproduction"* held at Veterinary College, Benguluru. December 3-5. 2015.

11. Mathur AK, Soni YK, Pande M, Saha S, Chand N and Prasad R. 2016. Studies on anestrus and other reproductive problems in bovines under field conditions. 103rd Indian Science Congress held at University of Mysore, Mysuru. January, 3-7, 2016. pp. 53.

12. Singh U, Raja TV, Alyethodi RR, Gajbhiye PU and Prakash B. 2016 Genetic improvement of Gir cattle through progeny testing in its breeding tract. National Symposium on *"Policy Planning for Livelihood Security through Domestic Animal Biodiversity & XIII Annual Convention of Society for Conservation of Domestic Animal Diversity"* held at Faculty of Veterinary Sciences & Animal Husbandry, SKUA&T, R S Pura, Jammu from February 11-12, pp 191.

13. Sirohi AS, Mathur BK, Mathur AC, and Yadav ND. 2015. A study on drinking water requirement of indigenous cattle in western Rajasthan. National Symposium on *"Sustaining Agricultural Productivity in Arid Ecosysytem: Challenges and Opportunities"* held at ICAR-CAZRI, RRS, Leh. August, 19-22. 2016. pp 263.

14. Sirohi AS, Mathur BK, Mathur AC, Misra AK and Bohra RC. 2015. The Tharparkar cow: White gold of the Thar desert needs an attention. National Symposium on *"Sustaining Agricultural Productivity in Arid Ecosysytem: Challenges and Opportunities"* held at ICAR-CAZRI, RRS, Leh. August, 19-22. 2015. pp 260.

15. Sirohi AS, Tyagi S, Chand N, Srivastava N, Sharma A and Hemlata. 2016. Assessment of semen quality parameters after FMD vaccination in Frieswal crossbred bulls. International *Livestock conference "INDIGENOUS" & Expo,* 23rd Annual Convention-ISAPM-2016, held at Hyderabad. January, 28-31. 2016. pp 246-247.

16. Soni YK**,** Mathur AK, Pande M, Saha S and Verma SK. 2016. Estrus synchronization in cross-bred heifers maintained at gaushala under group feeding and management practices. 103rd Indian Science Congress held at University of Mysore, Mysuru. January, 3-7, 2016. pp. 56.

17. Srivastava N, Srivastava SK, Ghosh SK, Pande M, Perumal P. Antibodies mediated sequestration of seminal protein BSP-A1/-A2 significantly improves cryoprotection to bull spermatozoa. International Conference on *"Low Temperature Science and Biotechnological Advances"* held at NASC Complex, Pusa Campus, New Delhi, April 27-30.

TRAINING/CONFERENCE/SEMINAR/WORKSHOP ATTENDED

Scientific staff

S. No.	Name of the training/conference/seminar/ workshop	Venue/Period	Name of the Scientist
1	Priority Setting, Monitoring and Evaluation (PME) of Agricultural Research Projects.	ICAR-NAARM, Hyderabad, June 02-06, 2015.	Dr S Tyagi Dr. S.K. Verma
2	Refresher course on agricultural Research Management	ICAR-NAARM, Hyderabad, July 13-25, 2015	Dr N Chand
3	3rd Technical Seminar on Development in Bovine Reproduction Biotechnologies.	IMV Technologies Raddison Blue hotel, New Delhi. July 14, 2015.	Dr S Tyagi Dr Suresh Kumar DS Dr AS Sirohi
4	स्वदेशी गोवंश पर आधारित स्वास्थ्य एवं स्वावलम्बन राष्ट्रीय संगोष्ठी	विज्ञान भवन, नई दिल्ली–110001, 8 अगस्त 2015	Dr. B Prakash Dr AK Mathur Dr S Tyagi Dr. Umesh Singh Dr. Sushil Kumar
5	National symposium on sustaining agricultural productivity in arid ecosystem: challenges and opportunities (SAPECO-2015)	Regional Research Station, CAZRI, Leh, August 19-22, 2015	Dr AS Sirohi
6	XIV Annual Review Meet of AICRP on Cattle	NASC Complex, New Delhi on 28-29 October, 2015	Dr. B Prakash Dr. Umesh Singh Dr. S Tyagi Dr. Sushil Kumar Dr. AK Das
7	1st SVAHE Annual Convention & National Symposium	Guru Angad Dev Veterinary and Animal Sciences University, November 18-20, 2015	Dr N Chand
8	31st Annual Convention of The Indian Society for Study of Animal Reproduction (ISSAR) & National Symposium on"Current Challenges and Opportunities In Animal Reproduction"	Department of Veterinary Gynaecology and Obstetrics, Veterinary College, Bengaluru, December 3-5, 2015	Dr Suresh Kumar D.S.
9	103rd Indian Science Congress; Science & Technology for Indigenous Development in India	University of Mysore, Mysuru 3-7, January 2016	Dr AK Mathur Dr. S Saha Dr. Y.K Soni

S. No.	Name of the training/conference/seminar/ workshop	Venue/Period	Name of the Scientist
10	International Livestock conference "INDIGENOUS" & Expo, 23rd Annual Convention-ISAPM-2016	P.V.N.R. Telangana State University for Veterinary, Animal & Fisheries Sciences, Hyderabad,January 28-31, 2016	Dr AS Sirohi
11	XVI Biennial Animal Nutrition Conference on Innovative Approaches for Animal Feeding and Nutritional Research	NDRI, Karnal, Feb 6-8, 2016	Dr. Rajendra Prasad
12	Competency Development for HRD Nodal Officers of ICAR	NAARM Hyderabad Feb 10-12, 2016	Dr Pramod Singh
13	National Symposium on Policy Planning for Livelihood Security through Domestic Animal Biodiversity & XIII Annual Convention of Society for Conservation of Domestic Animal Diversity	Faculty of Veterinary Sciences & Animal Husbandry, SKUA&T, R S Pura Jammu from February 11-12, 2016.	Dr. Umesh Singh Dr. Sushil Kumar Dr. SK Rathee Dr. Rani Alex
14	34th ISVM Annual Convention & National Symposium	Guru Angad Dev Veterinary and Animal Sciences University, Feb 17-19, 2016	Dr N Chand
15	Programme on Advanced Techno Management for Scientists (DST sponsored)	Administrative Staff Collage of India, Bella Vista: Hyderabad January 18 – February 19, 2016	Dr. Ravinder Kumar
16	Refresher Course on Agricultural Research Management	ICAR-National Academy of Agricultural Research Management, Rajendra Nagar, Hyderabad (TL) February 23 to March 05, 2016	Dr. Ravinder Kumar Dr N Srivastava

Administrative Staff

S. No.	Name of the training/workshop	Venue/Period	Name of the Officer/official
1	Workshop on pay roll	IASRI, New Delhi May 28-30, 2015	Shri N.S. Saini Shri O.P. Aggarwal Shri Vikas Kumar
2	Pay roll	IASRI, New Delhi June 22-24, 2015	Shri S.L. Gautam Shri Sankar Kasyap
3	Accrual accounting in Govt./Autonomany	NIFM, Faidabad September 7 – 12, 2015	Shri A.K. Sharma
4	Management development programme	NIFM, Faidabad October 7 – 9, 2015	Shri Rishi Ram
5	Accrual accounting in Govt./Autonomany	NIFM, Faidabad Janurary 4 – 9, 2016	Shri Rajnesh

TRAININGS ORGANIZED

S. No.	Name of the training/seminar	Venue and date	Course Director/ Organizing Secretary
1	Molecular approaches to augment reproductive efficiency in cattle (DBT Sponsored)	S F Lab, CIRC, Meerut December 8-21, 2015	N Srivastava
2	Standard operating procedures for bovine semen preservation (For Semen Station Staff)	S F Lab, CIRC, Meerut February 22-28, 2016	N. Chand A. S. Sirohi

PROFESSIONAL RECOGNITIONS

- Dr N. Chand acted as Co- chairman and conducted scientific session “Farm Animal infectious diseases" in National Symposium of ISVM held at COVS, GADVASU, Ludhiana during 17-19 Feb 2016.
- Dr A. S. Sirohi was elected as Member, Central Executive Committee of the Indian Society of Animal Production and Management.

Dr N. Srivastava

- Acted as Editor/Co-editor for Animal Science Reviews and International Journal of Veterinary Science Research
- Reviewer for Animal Reproduction Science (Elsevier), Theriogenology (Elsevier), Reproductive Biology (Elsevier), Asian-Australian Journal of Animal Science (CSIRO group), Journal of Applied Animal Research, Agricultural Reviews (ARCC), Indian Journal of Animal Research, International Journal of Veterinary Science Research, Indian Journal of Animal Science (ICAR).

Dr. Umesh Singh

- Expert in judging cattle and buffaloes in Dairy Mela and Cattle show held at Hisar 13th March, 2016.

- Rapporteur for evaluation of best poster presentation in National Symposium on "Policy Planning for Livelihood Security through Domestic Animal Biodiversity & XIII Annual Convention of Society for Conservation of Domestic Animal Diversity" held at Faculty of Veterinary Sciences & Animal Husbandry, SKUA&T, R S Pura, Jammu from February 11-12, 2016.
- Reviewer for Indian Journal of Animal Research, Journal of Hill Agriculture (JHA), African Journal of Biochemistry Research and Advances in Animal and Veterinary Sciences.

Dr. Rajib Deb

- Selected as executive member of Indian Society of Veterinary Immunology and Biotechnology (Regd. Society No.409/ 1990, Chennai Central, Tamilnadu, India) for the year 2015-16.

AWARDS

Dr Suresh Kumar DS

- **Fakhruddin Ali Ahmed Award 2014** for Outstanding Research in Tribal Farming System by ICAR during ICAR foundation Award ceremony held at Patna on 25.07.2015.

Dr N Srivastava

- Dr GB Singh Memorial award by Indian Society for Study of Animal Reproduction at Bengaluru December 3-5, 2015.

Dr. Rajib Deb

- Received Start up Young Scientist Research Grant Award (2015) from Department of Science and Technology, New Delhi, India.

Dr. Anil Kumar Mathur

- डॉ. अनिल कुमार माथुर को हिन्दी में प्रकाशित शोधपत्रों के आधार पर ^^jk"VªHkk"kk ds Lor=rk lsukuh** सम्मान, भारतीय भाषा प्रतिष्ठापन राष्ट्रीय परिषद्, मुंबई द्वारा वर्ष 2015 में दिया गया।
- Cross Mark Award for

    1. Rajoriya JS, Prasad JK, Ramteke SS, Perumal P, Ghosh SK, Singh M, Pande M and Srivastava N. 2015.

Enriching membrane cholesterol improves stability and cryosurvival of buffalo spermatozoa. *Animal Reproduction Science* **164:** 72–81.

2. Kumar, A, Mehrotra S, Singh G, Mourya S, Soni YK, Singh M and Srivastava N. 2015. Sustained delivery of exogenous melatonin influences biomarkers of oxidative stress and total antioxidant capacity in summer stressed anoestrous water buffalo (*Bubalus bubalis*). *Theriogenology* **83:** 1402-1407.
3. Ponraj P, Baruah KK, Khate K, Srivastava N, Rajoriya JS and Chang S. (2016). CASA parameters of mithun semen treated with melatonin. *Advances in Animal & Veterinary Sciences* **4(2):** 5-12.

Award for Poster presentation

- Third best poster presentation award for Sirohi AS, Mathur BK, Mathur AC, Misra AK and Bohra RC. The Tharparkar cow: White gold of the Thar desert needs an attention in National Symposium on Sustaining Agricultural Productivity in Arid Ecosysytem: Challenges and Opportunities held at ICAR-CAZRI, RRS, Leh. August, 19-22, 2015.pp-260.
- Second Best Poster Awardaward to Ahmad A, Prasad S, Kamboj M L, Mohanty T K, Bhakat M, Sirohi A S, Malhotra R, Tomar S K, Singh A, Kumar R,Raja T V,Gupta R and Kumar P. 2016. in the category of Animal production & health for the poster entitled "Evaluation of Milking performance of crossbred dairy cows in automated herringbone milking parlours organized on the occasion of 44th Dairy Industry Conference at ICAR-National Dairy Research Institute, Karnal, during 18-20 February, 2016.

INSTITUTE TECHNOLOGY MANAGEMENT UNIT (ITMU)

During the year 2015-16, Institute Technology Management Unit (ITMU) arranged Institute Technology Management Committee Meetings to discuss the issues related with filing of patents and other routine work under the chairmanship of Dr. Birham Prakash, Director, CIRC, Meerut. Lectures were also delivered in DBT sponsored training program on Intellectual Property Rights (IPRs) and biosafety guidelines.

Students, farmers and other para-vet visiting the institute were given latest technology information developed by the institute and other ICAR institutes for livestock. ITMU facilitated the scientists in prior art search and patent registration and filing at patent office. During the year, three methodology/process patents were filed. ITMU also assisted in event management i.e. collecting information and photographs of different events organized at the institute and also provided photographs for institute website.

ITMU also provided assistance in compilation of Annual reports, Website updating and technical help for online tender uploading. cases related to service function such as Memorandum of Understanding with other agencies and customized trainings to stakeholders were also dealt in consultation with PME section.

RIGHT TO INFORMATION ACT 2005

A total of 21 applications including 13 applications forwarded from ICAR headquarter were received for providing the information. The desired information was provided to all information seekers within stipulated time. Rs. 110/- (hundred ten only) was received as application fee and other charges.

IMPORTANT COMMITTEES

RESEARCH ADVISORY COMMITTEE (RAC)

1.	Dr S.N. Maurya, Ex-Vice Chancellor, Vety. University, Mathura 15A, Foot Hill Colony Behind Gurukul Intl. School, Kamaluaganja Haldwani – 263139 (UK)	Chairman
2.	Dr K.T. Sampath, Ex- Director, NIANP FF2-Passion Paradise, Ist Main Ist Block, Thyagraj Nagar Bangalore – 560028	Member
3.	Dr S.N.S. Parmar I/c Vice Chancellor and Dean Faculty Nanaji Deshmukh Veterinary Science University, Civil Line, Jabalpur – 482001	Member
4.	Dr. S.K. Srivastava, Ex – PS (Microbiology) IVRI, Izatnagar, 95, Mandal Vihar, Opposite IVRI Gate No. 1, Bareilly, Izatnagar - 243122	Member
5	Dr K.P. Aggarwal, Ex-National Coordinator, NAIP G-29, Brahma Apartments, Sector-7, Plot No. 7, Dwarka, New Delhi	Member

6	Shri Vinod Bharti, Village Arnawali, Block Rohta, Meerut (U.P.)	Member
7	ADG (AP&B), Indian Council of Agricultural Research Krishi Bhawan, New Delhi	Member
8	Dr. Vijay Kumar Pandit, Green Care Society, 57, Vikas Enclave, Rohta Road, Meerut (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 (w.e.f. 7.8.2013)

1.	Director Central Institute for Research on Cattle, Meerut (UP)	Chairman
2.	The Asstt. Director General (AP&B), ICAR, K.B., New Delhi	Member
3.	The Chief Executive Officer UP Livestock Development Board Directorate of Animal Husbandry Campus Gorakhnath Road, Badshah Bagh, Lucknow-226007 (UP)	Member
4.	Dr. R.S. Patel Managing Director, Amroli Distt. Milk Cooperation Ltd., Amroli (Gujarat)	Member
5.	Dr. Rajvir Singh Dean, COVAS, SVBPUAT, Meerut (UP)	Member

6.	Dr. A.K. Pandey Principal Scientist (AG&B), Central Institute for Research on Buffaloes, Hisar (Haryana)	Member
7.	Dr. Avtar Singh Principal Scientist (AG&B), National Dairy Research Institute, Karnal (Haryana)	Member
8.	Dr. R.K. Pundir Principal Scientist (AG&B), National Bureau of Animal Genetics Research, Karnal (Haryana)	Member
9.	Dr. Umesh Singh Principal Scientist (AG&B), Central Institute for Research on Cattle, Meerut (UP)	Member
10.	Shri B.K. Bisht Sr. Finance & Accounts Officer, NBPGR, New Delhi	Member
11.	Dr. Vijay Kumar Pandit Chief Functionary, Green Care Society, 57, Vikas Enclave, Rohta Road, Meerut (U.P.)	Member
12.	Shri Vinod Bharti Village Arnawali, Block Rohta, Meerut (U.P.)	Member
13.	Shri Rishi Ram Administrative Officer Central Institute for Research on Cattle, Meerut (UP)	Member Secretary

INSTITUTE JOINT STAFF COUNCIL (IJSC)

Office side

1.	Dr. Birham Prakash, Director	:	Chairman
2.	Dr. Shrikant Tyagi, Principal Scientist	:	Member
3.	Dr. Megha Pandey, Scientist	:	Member

4.	Shri Rishi Ram, AO & H.O.	:	Member
5.	Shri D. S. Verma, AF&AO	:	Member
6.	Sh. A.K.Sharma, Asst. Admn. Officer	:	Member Secretary

Staff side

1.	Shri O. P. Agarwal, Assistant	:	Member
2.	Shri Vikas Kumar, LDC	:	Member Secretary (Staff)
3.	Shri S. K. Sharma, Technical Assistant	:	Member
4.	Shri Omkar Singh, Technical Assistant	:	Member
5.	Shri Veer Mahender, Skilled Supporting Staff	:	Member
6.	Shri Mohan Chandra, Skilled Supporting Staff	:	Member

IMPORTANT MEETINGS

XV Research Advisory Committee (RAC)

The XV Research Advisory Committee meeting of the Institute was conducted on 22nd May, 2015. The meeting was chaired by Dr. S.N. Maurya, Ex Vice Chancellor, Veterinary University, Mathura. The other members of the committee were Dr. K.T. Sampath, Ex-Director NIANP, Bangalore, Dr. S.N.S. Parmar, I/c Vice Chancellor and Dean faculty, Nanaji Deshmukh Veterinary University, Jabalpur, Dr. S.K. Srivastava, Ex-PS (Microbiology), IVRI, Bareilly, Dr. K.P. Agarwal, Ex-National Coordinator NAIP, Dr. Birham Prakash, Director, CIRC, Meerut, Sh. Vinod Bharti, Farmer representative and Dr. Rajendra Prasad (Member Secretary). After giving a brief background of CIRC, the Director presented an account of current research ativities being undertaken by CIRC and the progress made in various projects during last year. Chaiman, Dr. S.N. Maurya emphasized the need of undertaking work on various aspects of indigenous cattle. Dr. B. Prakash, in his welcome address suggested 15-20% culling of the low producing animals in the Frieswal herd to make the selection programme effective. In the meeting various AICRP and Institutional projects were discussed.

Institute Research Council (IRC)

The mid term Institute Research Committee (IRC) meeting was held on 08.07.2015 to dicuss the new proposals along with projects completed in 2015-16 under the chairmanship of Dr. B. Prakash, Director,

CIRC. All the Scientists of the Institute attended the same. At the onset, the chairman, IRC reiterated the house to strictly follow the guidelines of ICAR about the involvement of scientists as PI and Co-PI in different projects. A total of 7 institutional projects (5 RPF I and 2 RPF III), 1 service project and 2 externally funded projects were presented for discussion of IRC. While concluding, the chairman stressed the importance of externally funded projects for institution building. Finally, he appreciated all scientists for their research efforts.

XIV Annual Review Meeting of AICRP

The XIV Annual review meet of AICRP on Cattle was held on 28th and 29th October, 2015 at NASC complex, New Delhi under the Chairmanship of DDG (AS). Dr. Birham Prakash, Director, CIRC, Meerut welcomed the dignitaries of ICAR and Ministry of Defence and the PI and Co-PIs from different units of AICRP on cattle. Honorable Dr. S. Ayyappan, DG ICAR attended the meet for a short period and stressed the importance of prestigious indigenous cattle and also requested the PIs of different units to put whole hearted efforts to achieve the goals of this vital programme of great national significance. Dr. R.S. Gandhi, ADG (AP&B), ICAR in his opening remarks stressed the importance of cattle production in India and the role of AICRP projects on genetic improvement of indigenous and crossbred cattle. Brig. P. Bali, DDG (MFs) briefed the role of Military farms in the AICRP on Frieswal cattle. Dr. K.M.L. Pathak, DDG (AS), ICAR in his inaugural remarks expressed his concern on the performance of various units of AICRP on cattle and instructed the PIs and Co-PIs of all the units to devote their full time for proper implementation of the technical programme He also emphasized close monitoring of the progress of the projects and instructed all units to submit the raw data to CIRC regularly in the prescribed format. He also desired that the number of animals registered under the project by various units must be achieved in terms of breedable females, male calves etc. as outlined in the technical programme either by purchase or by expanding the coverage area. Later, Dr. Birham Prakash, Director, CIRC presented the action taken report (ATR) on the recommendations of the XIII Annual Review Meeting of AICRP on cattle held at GBPUA&T, Pantnagar followed by a detailed discussion on each item. Dr. Umesh Singh, Dr. Sushil Kumar and Dr. A.K. Das presented the co-ordinator reports of Indigenous breeds project, Frieswal project and Field progeny testing project, respectively.

Institute Animal Ethics Committee

Two meetings of CPCSEA were conducted during the year and all the new projects submitted by the scientists were screened and approved by CPCSEA as per the norms.

MONTHLY SEMINAR

Sl. No.	Title	Date	Name of the Speaker
1.	High Altitude Physiology & Adaptation	29-04-2015	Dr. S. Saha, Senior Scientist
2.	Reproductive Ultrasonography in Bovines	26-05-2015	Dr. Y. K. Soni, Scientist
3.	Seminal Plasma Proteins: An Overview	24-06-2015	Dr Megha Pandey, Scientist
4.	Sustainable Production in Farm Animals Through Reproductive Interventions	30-07-2015	Dr. S K Dabbas, Principal Scientist
5.	Diagnostic Importance of Hemato-Biochemistry & Urinanalysis in Health & Disease	26-08-2015	Dr. Naimi Chand, Senior Scientist
6.	KRISHI: ICAR Research Data Reporting for Knowledge Management	26-09-2015	Dr. Sushil Kumar, Principal Scientist
7.	Genetic Evaluation of Frieswal Cattle for Lifetime Traits	31-10-2015	Dr. Satish Kumar Rathi, Scientist
8.	DNA in daily life. All that you need to know	28-11-2015	Dr. S. K. Verma, Principal Scientist, CCMB, Hyderabad
9.	DNA Biotechnologies: The other side of the coin	31-12-2015	Dr. B. Prakash, Director, CIRC
10	Physiology and Management of Hypertension	01-02-2016	Dr. S. Tyagi, Principal Scientist
11.	Vigilance – A tool of management	29-02-2016	Dr. A. K. Mathur, Principal Scientist

INSTITUTE ACTIVITIES

Celebrations in the Institute

Sports Activity

The sports contingent of the Institute comprising of 31 contingents including one Chief-de-Mission and one Manager participated in ICAR Inter-Institutional Staff Sports Meet (North Zone) held at IISWC, Dehradun from 18-21 April, 2015.

Independence Day Celebration

15th August, 2015 was celebrated as the 69th Independence Day of the country. On this occasion, Dr. Birham Prakash, Director, CIRC, Meerut hoisted the National Flag, remembered all those who sacrificed their lives for this dream come true and paid tribute

to them. He wished the staff and their families for a brighter future.

Republic Day Celebration

The Institute celebrated 67th Republic Day on 26th January, 2016. At this occasion Dr. Birham Prakash, Director, CIRC, Meerut hoisted the National Flag and highlighted the progress made by the Institute during preceding years. He appreciated the efforts made by the staff in bringing the Institute to the present position. He asked the Institute's staff to work hard for achieving the objectives set forth by the Institute during XII Five year Plan.

LoPN Hkkjr vfHk;ku

स्वच्छ भारत अभियान के अंतर्गत सभी के योगदान एवं स्वच्छता के प्रति जागरूकता तथा सजगता लाने हेतु नोडल अधिकारी द्वारा दिनॉक 01.10.2015 को कार्यालय के सभी चतुर्थ श्रेणी कर्मचारियों एवं संविदा कर्मचारियों (कुशल एवं अकुशल) को संबोधित किया गया तथा कार्यालय परिसर के उद्यानों की खरपतवार निकालने के लिए कार्यालय के सभी अधिकारियों एवं कर्मचारियों के ने मुख्य द्वार की उत्तर दिशा के उद्यान में दिनॉक 09.10.2015 को अपरान्ह् 03:30 बजे श्रमदान किया।

fgUnh lIrkg 2015

संस्थान में राजभाषा प्रकोष्ठ द्वारा दिनॉक 14.09.2015 से 19.09.2015 की अवधि के दौरान हिन्दी सप्ताह का आयोजन किया गया। इसके अन्तर्गत विभिन्न प्रतियोगिताओं की श्रेणी में कम्प्यूटर पर हिन्दी टंकण प्रतियोगिता (सभी वर्ग), हिन्दी पत्रलेखन प्रतियोगिता (सभी वर्ग), हिन्दी श्रुतलेखन प्रतियोगिता (सभी वर्ग), हिन्दी सुलेख प्रतियोगिता (अहिन्दी भाषी वर्ग), हिन्दी निबंध लेखन प्रतियोगिता (प्रशासनिक एवं कुशल सहायक कर्मचारी वर्ग), हिन्दी तकनीकी लेख प्रस्तुतिकरण प्रतियोगिता (वैज्ञानिक एवं तकनीकी वर्ग) एवं हिन्दी शब्दावली प्रतियोगिता (हिन्दी एवं अहिन्दी भाषी वर्ग) का आयोजन किया गया। दिनॉक 19.09.2015 को आयोजित समापन समारोह में बाल काव्य पाठ का भी आयोजन किया गया जिसमें सभी प्रतियोगिताओं के विजेता

अधिकारियों/कर्मचारियों एवं बाल काव्य पाठ करने वाले बच्चों को भी पुरस्कृत किया गया। इस दौरान दिनॉक 15.09.2015 को हिन्दी कार्यशाला का भी आयोजन कराया गया। कार्यक्रम में हिन्दी सप्ताह के दौरान एवं पूरे वर्ष हिन्दी कार्य में अधिकाधिक सहयोग करने वाले कर्मचारी को विशेष प्रोत्साहन पुरस्कार, हिन्दी में आज का शब्द लिखने वाले कर्मचारी को विशेष प्रोत्साहन पुरस्कार तथा सरकारी कामकाज मूल रूप से हिन्दी में करने के लिए लागू प्रोत्साहन योजना वर्ष 2014–15 के विजेता 03 प्रतिभागियों को भी नकद पुरस्कार से सम्मानित किया गया।

fgUnh lIrkg 2015 & fgUnh ifr;kfxrkvk d uxn ijLdkj dh lph ,o ifj.kke

	fgUnh 'kCnkoyh ifr;kfxrk	
1.	डॉ. प्रमोद सिंह	प्रथम
2.	डॉ. महेश कुमार	प्रथम
3.	डॉ. ए. के. दास	प्रथम
4.	डॉ. योगेश कुमार सोनी	द्वितीय
5.	डॉ. नेमी चंद	द्वितीय
6.	डॉ. श्रीकान्त त्यागी	द्वितीय
7.	डॉ. राजेंद्र प्रसाद	द्वितीय
8.	डॉ. ए. के. माथुर	द्वितीय
9.	डॉ. एस. साहा	द्वितीय
10.	श्री पंकज गौतम	तृतीय
11.	डॉ. नीरज श्रीवास्तव	तृतीय
12.	डॉ. रानी एलेक्स	तृतीय
	fgUnh dEI;wVj Vkd.k ifr;kfxrk	
1.	श्री शंकर कश्यप	प्रथम
	fgUnh fuca/k y[ku ifr;kfxrk	
1.	श्रीमति अनीता जैन	प्रथम
2.	श्री पंकज गौतम	द्वितीय
	fgUnh i= y[ku ifr;kfxrk	
1.	डॉ. ए. के. माथुर	प्रथम
	fgUnh lyy[k ifr;kfxrk	
1.	डॉ. योगेश कुमार सोनी	प्रथम

2.	डॉ. मेघा पाण्डे	द्वितीय
3.	डॉ. ए. के. माथुर	तृतीय

fgUnh Jry[ku ifr;kfxrk

1.	श्री पंकज गौतम	प्रथम
2.	डॉ. योगेश कुमार सोनी	द्वितीय
3.	डॉ. नेमी चंद	तृतीय

fgUnh rduhdh y[k ifr;kfxrk

1.	श्री एस. के. राठी	प्रथम

vkt dk 'kCn

1.	श्री वीर पाल सिंह	विशेष प्रोत्साहन

fgUnh ly

1.	श्री शंकर कश्यप	विशेष प्रोत्साहन

ljdkjh dkedkt eay:i l fgUnh e djus d fy, ikRlkgu ;kstuk 2014&15

1.	श्री मनोज नेहरा	प्रथम
2.	श्री एन. एस. सैनी	द्वितीय
3.	श्रीमति नीरजा जोशी	तृतीय

fgUnh lIrkg 2015 & ykxk fMtkbfuax ifr;kfxrk dk fooj.k] ifj.kke ,oa ijLdkj lph

Ø-l-	uke	d{kk	Ldy	ijLdkj
1.	आशुतोष यादव	11–ई	दिल्ली पब्लिक स्कूल	प्रथम
2.	मर्दव पंवार	12–ए	–तदैव–	तृतीय
3.	मैत्रेयी आनंद	12–ए	–तदैव–	सॉत्वना
4.	प्रियंवदा मिश्रा	12–ए	–तदैव–	–तदैव–
5.	आयुष चुटानी	9–ए	–तदैव–	–तदैव–
6.	मो. रिजवान	7–ए	जवाहर नवोदय विद्यालय	–तदैव–
7.	दीनु कुमार	8–बी	–तदैव–	–तदैव–
8.	किशोर राजेंद्र खंडेलवाल	9–ए	–तदैव–	–तदैव–
9.	आशीष वर्मा	9–बी	–तदैव–	–तदैव–
10.	दिवस भाटी	9–बी	–तदैव–	–तदैव–
11.	विक्रान्त	10–ए	–तदैव–	–तदैव–

Ø- l-	uke	d{kk	Ldy	ijLdkj
12.	विनायक गौतम	10–ए	–तदैव–	–तदैव–
13.	शशांक कुमार	8–सी	आई.आई.एम.टी. अकादमी	–तदैव–
14.	शालू चौहान	11–बी	–तदैव–	–तदैव–
15.	निखिल मलिक	10–डी	–तदैव–	–तदैव–
16.	उत्तरा राणा	9–बी	–तदैव–	–तदैव–
17.	आयुषी सिंघल	9–बी	–तदैव–	–तदैव–
18.	सोनु साकिब	9	–तदैव–	–तदैव–
19.	कोमल मित्तल	8	–तदैव–	–तदैव–
20.	मानसी ठाकुर	9–एफ	आर्मी पब्लिक स्कूल	–तदैव–
21.	विश्वजीत तवेनी	9–जी	–तदैव–	द्वितीय
22.	वासु सैनी	8–सी	–तदैव–	सॉत्वना

fgUnh lIrkg 2015 & Nk;kfp= ifr;kfxrk dk fooj.k] ifj.kke ,oa ijLdkj lph

Ø- l-	uke	d{kk	Ldy	ijLdkj
1.	आदेश चौधरी	6–बी	पुलिस मॉडर्न स्कूल	सॉत्वना
2.	गुंजन	7–ए	–तदैव–	–तदैव–
3.	समृद्धि	7–ए	–तदैव–	–तदैव–
4.	स्नेहा	7–ए	–तदैव–	–तदैव–
5.	सिमरन सिंह	7–ए	–तदैव–	–तदैव–
6.	ऋतिक पंवार	8	–तदैव–	–तदैव–
7.	आयुष कुमार	8	–तदैव–	–तदैव–
8.	सृष्टि गुप्ता	8	–तदैव–	–तदैव–
9.	अनुभव	8–डी	आर्मी पब्लिक स्कूल	–तदैव–
10.	दीपांजली राणा	9–ई	–तदैव–	–तदैव–
11.	गौरव सिंह मेहरा	7–सी	–तदैव–	–तदैव–
12.	सुरभी गुसाई	9–एफ	–तदैव–	–तदैव–
13.	प्रिया तोमर	9–जी	–तदैव–	–तदैव–
14.	अभिषेक बोरा	9–एच	–तदैव–	–तदैव–
15.	विवेक राणा	9–एच	–तदैव–	–तदैव–
16.	पायल पटनायक	9–एच	–तदैव–	–तदैव–
17.	स्नेहाशीष	8–सी	–तदैव–	–तदैव–
18.	अंकिता कुंवर	9–एच	–तदैव–	–तदैव–

fgUnh dk;Z'kkyk,a

संस्थान में राजभाषा हिन्दी के उचित प्रयोग, प्रचार–प्रसार तथा हिन्दी में अधिक व आसानी से कार्य करने एवं बोलने की झिझक को दूर करके बढ़ावा देने हेतु दिनॉक 06.05.2015, 15.09.2015 एवं 21.03.2016 को हिन्दी कार्यशालाओं आयोजन किया गया। उक्त कार्यशालाओं में केंद्र सरकार एवं राज्य सरकार के स्थानीय कार्यालयों के राजभाषा अनुभाग के कर्मचारियों सहित अधिकारियों एवं कर्मचारियों एवं सभी स्टॉफ अधिकारियों/कर्मचारियों ने भाग लिया।

o"kZ 2015&16 esa lLFkku dh jkt Hkk"kk dk;kZUo;u lfefr dh vk;kftr cBdsa

1. दिनॉक 24.04.15 को 54 वीं तिमाही बैठक
2. दिनॉक 10.07.15 को 55 वीं तिमाही बैठक
3. दिनॉक 14.10.15 को 56 वीं तिमाही बैठक
4. दिनॉक 12.01.16 को 57 वीं तिमाही बैठक

uxj jkt Hkk"kk dk;kZUo;u lfefr] esjB dh lehf{kk cBdksa dk vk;kstu

- नगर राजभाषा कार्यान्वयन समिति, मेरठ की छमाही समीक्षा बैठक में समीक्षा हेतु दिनॉक 01.04.15 से 30.09.15 तक समाप्त छमाही की हिन्दी के प्रगामी प्रयोग/कार्यान्वयन संबंधी समेकित छमाही प्रगति रिपोर्ट दिनॉक 19.10.15 को अध्यक्ष, नगर राजभाषा कार्यान्वयन समिति, मेरठ के स्थानीय कार्यालय को भेजी गई तथा दिनॉक 28.10.15 को आयोजित बैठक में कार्यालय की ओर से श्री शंकर कश्यप, आशुलिपिक ने भाग लिया।
- नगर राजभाषा कार्यान्वयन समिति, मेरठ की छमाही समीक्षा बैठक में समीक्षा हेतु दिनॉक 01.10.15 से 31.03.16 तक समाप्त छमाही की हिन्दी के प्रगामी प्रयोग/कार्यान्वयन संबंधी समेकित छमाही प्रगति रिपोर्ट दिनॉक 08.04.16 को अध्यक्ष, नगर राजभाषा कार्यान्वयन समिति, मेरठ के स्थानीय कार्यालय को भेजी गई तथा दिनॉक 13.05.16 एवं 20.05.16 को आयोजित बैठक में कार्यालय की ओर से श्री शंकर कश्यप, आशुलिपिक एवं श्री ऋषि राम, प्रशासनिक अधिकारी ने भाग लिया।

"सरकारी कामकाज मूल रूप से हिन्दी में करने के लिये प्रोत्साहन योजना **o"kZ 2014&2015 ¼vof/k ekg vi;y] 2014 l ekg ekp] 2015 rd½**" के अन्तर्गत निम्नलिखित विवरणानुसार कर्मचारियों को पुरस्कृत किया गया:–

1. श्री मनोज नेहरा, वरि. लिपिक
   प्रथम पुरस्कार
   रूप्ये 1600.00 मात्र नकद
2. श्री एन. एस. सैनी, सहायक
   द्वितीय पुरस्कार
   रूप्ये 800.00 मात्र नकद
3. श्रीमति नीरजा जोशी, कु0सहा0 कर्मचारी
   तृतीय पुरस्कार
   रूप्ये 600.00 मात्र नकद

LFkkiuk&fnol

संस्थान का 29 वॉ "स्थापना–दिवस" समारोह दिनॉक 03.11.2015 को धूमधाम एवं हर्षोल्लास के साथ मनाया गया तथा विभिन्न खेलकूद प्रतियोगिताओं एवं सॉस्कृतिक कायक्रमों के साथ ही एक गोष्ठी का भी आयोजन किया। स्थापना दिवस समारोह में मुख्य अतिथि एवं वक्ता के रूप में श्री हरीश चंद्र जोशी, भूतपूर्व निदेशक (राजभाषा), भा.कृ.अनु.परिषद, दिल्ली को आमंत्रित किया गया। अतिथि वक्ता को प्रतीक चिन्ह एवं मानदेय दिया गया तथा कार्यक्रम के बाद सभी के लिए सूक्ष्म जलपान का आयोजन भी किया गया।

[kydn ifr;kfxrk ifj.kke ,oa ijLdkj forj.k

xkyk Qqd ifr;kfxrk ¼iq:"k oxZ½

Ø-l-	vf/kdkjh@deZpkjh dk uke	ijLdkj
1.	डॉ. पुनीत कुमार	प्रथम
2.	श्री ज्ञानेंद्र सिंह सेंगर	द्वितीय

xkyk Qqd ifr;kfxrk ¼efgyk oxZ½

Ø-l-	vf/kdkjh@deZpkjh dk uke	ijLdkj
1.	डॉ. रानी एलेक्स	प्रथम
2.	श्रीमति पुष्पा	द्वितीय

pDdk Qqd ifr;kfxrk ¼iq:"k oxZ½

Ø-l-	vf/kdkjh@deZpkjh dk uke	ijLdkj
1.	श्री विकास कुमार	प्रथम
2.	श्री ज्ञानेंद्र सिंह सेंगर	द्वितीय

xkyk Qqd ifr;kfxrk ¼ofj"B ukxfjd½

Ø-l-	vf/kdkjh@deZpkjh dk uke	ijLdkj
1.	डॉ. ब्रहम प्रकाश	प्रथम
2.	डॉ. अनिल कुमार माथुर	द्वितीय

Hkkyk Qqd ifr;kfxrk ¼iq:"k oxZ½

Ø-l-	vf/kdkjh@deZpkjh dk uke	ijLdkj
1.	डॉ. रफीक रहमान अल्यतोडी	प्रथम
2.	डॉ. पुनीत कुमार	द्वितीय

E;fdy p;j ifr;kfxrk ¼efgyk ox½

Ø-l-	vf/kdkjh@deZpkjh dk uke	ifjLdkj
1.	श्रीमति अनीता जैन	प्रथम
2.	श्रीमति पुष्पा	द्वितीय

fu'kkuckth ifr;kfxrk ¼efgyk ox½

Ø-l-	vf/kdkjh@deZpkjh dk uke	ifjLdkj
1	डॉ. रानी एलेक्स	प्रथम

jLlkdlh ifr;kfxrk

Ø-l-	vf/kdkjh@deZpkjh dk uke	vf/kdkjh@deZpkjh dk uke
	(टीम–अ) – प्रथम	(टीम–ब) – द्वितीय
1	डॉ. ब्रहम प्रकाश	डॉ. अनिल कुमार माथुर
2	डॉ. योगेश कुमार सोनी	डॉ. एस.के.वर्मा
3	डॉ. अजयवीर सिंह सिरोही	डॉ. सुशील कुमार
4	श्री मनोज नेहरा	डॉ. रविन्द्र कुमार
5	डॉ. महेश कुमार	डॉ. एस.के.राठी
6	श्री सुनील कुमार	श्री ऋषि राम
7	श्री वीरपाल सिंह	श्री राजीव वर्मा
8	श्री अशोक कुमार त्रिपाठी	श्री एस.के.शर्मा
9	श्री यशपाल मल्होत्रा	श्री जितेंद्र गिरि
10	श्री निरंजन सिंह सैनी	डॉ.एस.के.धूप सिंह
11	श्री सुरेश कुमार	श्री विकास कुमार
12	श्री मोहन चंद्र	श्री सी.पी.सिंह
13	श्री डूँगर सिंह	डॉ. नेमी चंद
14	श्री छोटे सिंह	डॉ. पुनीत कुमार
15	श्री एस.एल. गौतम	————————

vU; fnol@lIrkg@'kiFk&xg.k lekjkg vkfn dk;ldze] tk euk, x,] dk fooj.k

- संस्थान में दिनॉक 26.10.15 से 31.10.15 तक "सतर्कता जागरूकता सप्ताह" मनाया गया तथा निदेशक महोदय द्वारा समस्त अधिकारियों एवं कर्मचारियों को दिनॉक 26. 10.15 को सतर्कता जागरूकता की शपथ दिलाई गई।
- इसके अतिरिक्त ßlrdrk tkx:drk lIrkgÞ के दौरान दिनॉक 30.10.15 को संस्थान के सतर्कता अधिकारी डॉ. राजेंद्र प्रसाद, प्रधान वैज्ञानिक द्वारा सतर्कता जागरूकता पर एक भाषण दिया गया जिसमें सभी अधिकारियों/कर्मचारियों उपस्थित थे।
- संस्थान में सरदार वल्लभ भाई पटेल के जन्मदिवस के वार्षिकोत्सव पर उन्हें स्मरण करने हेतु दिनॉक 31.10.15 को ßराष्ट्रीय एकता दिवस के रूप में मनाया गया तथा समस्त अधिकारियों एवं कर्मचारियों को दिनॉक 31. 10.15 को निदेशक महोदय द्वारा ßराष्ट्रीय एकता दिवसÞ की शपथ दिलाई गई।
- संस्थान में डॉ. बी. आर. अम्बेडकर के 125 वें जन्मदिवस के वार्षिकोत्सव पर उन्हें स्मरण करने हेतु दिनॉक 26.11.15 को ßlfo/kku fnolÞ के रूप में मनाया गया तथा संविधान दिवस के उपलक्ष में दिनॉक 26.11.15 को निदेशक महोदय ने सभी अधिकारियों एवं कर्मचारियों की उपस्थिति में उन्हें स्मरण कराने हेतु भारतीय संविधान की प्रस्तावना को पढ़ा।

STAFF DETAILS

SCIENTIFIC

Sl. No.	Name of officer	Designation (Discipline)
1.	Dr. Birham Prakash	Director
2.	Dr. A.K. Mathur	Principal Scientist (Animal Physiology)
3.	Dr. Rajendra Prasad	Principal Scientist (Animal Nutrition)
4.	Dr. Shrikant Tyagi	Principal Scientist (Animal Physiology)
5.	Dr. Umesh Singh	Principal Scientist (Animal Genetics & Breeding)
6.	Dr. S. K. Dhoop Singh	Principal Scientist (Animal Reproduction)
7.	Dr. Sushil Kumar	Principal Scientist (Animal Genetics & Breeding)
8.	Dr. Mahesh Kumar	Principal Scientist (Animal Physiology)
9.	Dr. A.K. Das	Principal Scientist (Animal Genetics & Breeding)
10.	Dr. Pramod Singh	Principal Scientist (Animal Nutrition)
11.	Dr. S.K. Verma	Senior Scientist (Animal Nutrition)
12.	Dr. Ajayveer Singh Sirohi	Senior Scientist (Livestock Production Management)
13.	Dr. Ravinder Kumar	Senior Scientist (Animal Genetics & Breeding)
14.	Dr. T.V. Raja	Senior Scientist (Animal Genetics & Breeding)
15.	Dr. Neeraj Shrivastava	Senior Scientist (Animal Reproduction & Gynaecology)
16.	Dr. Siddhartha Saha	Senior Scientist (Animal Physiology)
17.	Dr. Naimi Chand	Senior Scientist (Veterinary Medicine)
18.	Dr. Jitender Kumar Singh	Senior Scientist (Animal Physiology)
19.	Shri S.K. Rathee	Scientist (Animal Genetics & Breeding)
20.	Dr.(Smt.) Saroj Rai	Scientist (Livestock Production & Management)
21.	Dr. Rajib Deb	Scientist (Animal Biotechnology)
22.	Dr. R.R. Alyethody	Scientist (Animal Genetics & Breeding)
23.	Dr. Rani Alex	Scientist (Animal Genetics & Breeding)
24.	Dr. (Mrs.) Megha Pande	Scientist (Animal Reproduction & Gynaecology)
25.	Dr. Yogesh Kumar Soni	Scientist (Animal Reproduction & Gynaecology)

TECHNICAL

1.	Shri C.P.Singh	Chief Technical Officer
2.	Shri Jitender Kumar	Senior Technical Officer (T-6)
3.	Shri Rajiv Verma	Sr. Technical Officer

4.	Shri Y.P. Malhotra	Technical Officer
5.	Shri S.K. Sharma	Technical Officer
6.	Shri Suresh Chand	Technical Officer
7.	Shri Omkar Singh	Sr. Technical Assistant
8.	Shri Chhote Singh	Sr. Technical Assistant

ADMINISTRATIVE

1.	Shri Rishi Ram	AO
2.	Shri D.S. Verma	AF&AO
3.	Shri Rajnish Kumar	Junior Accounts Officer
4.	Shri A.K. Sharma	AAO
5.	Smt. Anita Jain	Private Secretary
6.	Shri N.S. Saini	Assistant
7.	Shri S.L. Gautam	Assistant
8.	Shri O.P. Agarwal	Assistant
9.	Shri P.K. Gautam	Assistant
10.	Smt. Pushpa	Personal Assistant
11.	Shri Shanker Kashyap	Stenographer (Hindi)
12.	Shri Manoj Nehra	UDC
13.	Shri A.K. Tripathi	LDC
14.	Shri Vikas Kumar	LDC

SUPPORTING

1.	Shri Veer Mahendra	Skilled Supporting Staff
2.	Shri Kailash	Skilled Supporting Staff
3.	Shri Dungar Singh	Skilled Supporting Staff
4.	Shri Siyanand	Skilled Supporting Staff
5.	Shri Jitendra Giri	Skilled Supporting Staff
6..	Shri Mohan Chandra	Skilled Supporting Staff
7.	Shri Umesh Kaushik	Skilled Supporting Staff
8.	Shri Veer Pal Singh	Skilled Supporting Staff
9.	Shri Sunil Kumar	Skilled Supporting Staff
10.	Mrs. Neerja Joshi	Skilled Supporting Staff

PERSONNEL MILESTONES

PROMOTIONS

1. Shri Omkar Singh, Sr. Technical Assistant promoted to the post of Technical Officer w.e.f. 15-03-2015.

2. Shri Chhote Singh, Sr. Technical Assistant promoted to the post of Technical Officer w.e.f. 31-03-2015.

NEW JOINING

1. Dr. S. K. Dhoop Singh, Principal Scientist (Animal Reproduction), ICAR-Recearch Complex for NEH Region, Umiam joined the Institute on 06-04-2015 on same post.

2. Shri Rajnish Kumar, LDC, ICAR-NBAGR, Karnal joined the Institute on 19-06-2015 as Junior Accounts Officer.

3. Shri Jitender Kumar, Senior Technical Officer (T-6), ICAR-CIRB, Hisar joined the Institute on 02-11-2015 on same post.

4. Dr.Jitender Kumar Singh, Senior Scientist (Animal Physiology), ICAR-CIRB Sub-Campus, Nabha joined the Institute on 16-11-2015 on same post.

TRANSFER

1. Dr. (Smt.) Saroj Rai, Scientist (AN) relieved on 12-05-2015 (A/N) from ICAR-CIRC, Meerut to ICAR-NDRI Regional Station, Kalyani on inter institutional transfer on same post.

2. Shri Ashok Kumar Tripathi, LDC relieved on 30-11-2015 (A/N) from ICAR-CIRC, Meerut to ICAR-Directorate of Seed Research, Mau on inter institutional transfer on same post.

3. Dr. S. K. Verma, Senior Scientist (AN) relieved on 26-12-2015 (A/N) from ICAR-CIRC, Meerut to ICAR-Directorate of Poultry Research, Hyderabad on inter institutional transfer on same post.

STANDING INSTITUTIONAL COMMITTEES

Purchase Advisory Committee

1.	Dr. Rajendra Prasad, Principal Scientist	Chairman
2.	Dr. A.K. Das, Principal Scientist	Member
3.	Shri D.S. Verma, AF&AO	Member
4.	Shri Rishi Ram, AO	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.	Shri Rishi Ram, AO	Member Secretary

Works Committee

1.	Dr. Sushil Kumar, Principal Scientist	Chairman
2.	Dr. Mahesh Kumar, I/C Estate	Member
3.	Shri Rajiv Verma, S.T.O.	Member
4.	Shri C.P. Singh, CTO	Member
5.	Shri D.S. Verma, AF&AO	Member
6.	Shri A.K. Sharma, Asstt. Adm.Officer	Member Secretary

Tender Opening, Administrative and Financial Evaluation Committee

1.	Dr. Shrikant Tyagi, Principal Scientist	Chairman
2.	Shri Rishi Ram, AO	Member
3.	Shri D.S. Verma, AF&AO	Member
4.	Shri A.K. Sharma, AAO	Member Secretary

Technical Tender Evaluation Committee

1.	Dr. Umesh Singh, Principal Scientist	Chairman
2.	Dr. Pramod Singh, Principal Scientist	Member
3.	Dr. Naimi Chand, Sr.Scientist	Member

4.	Indenting Officer	Member
5.	Incharge Purchase	Member Secretary

Printing Publication Committee

1.	Dr. Shrikant Tyagi, Incharge, PME	Chairman
2.	Dr. A.K. Das, Principal Scientist	Member
3.	Dr. A.V.S. Sirohi, Sr. Scientist	Member
4.	Dr. S.K. Verma Sr. Scientist (upto 26.12.2015)	Member
5.	Dr. T.V. Raja, Sr. Scientist (wef 27.12.2015)	Member
5.	Dr. Y.K. Soni, Scientist	Member

Women Complaint Committee

1.	Dr. Rani Alex, Scientist	Chairman
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 Rishi Ram, Admn.Officer	Member Secretary

Library Advisory Committee

1.	Dr. B Prakash, Director	Chairman
2.	Dr. Rajender Prasad, PS	Member
3.	Dr. Shrikant Tyagi, PS	Member
4.	Dr. Dr. Suresh Kumar Dhoop Singh, PS	Member
5.	Dr. Sushil Kumar, PS	Member
6.	Dr. Naimi Chand, Sr. Scientist	Member
7.	Dr (Mrs.) Megha Pande, Scientist	Member
8.	Sh. Rishi Ram, AO	Member
9.	Sh. D.S. Verma, AF&AO	Member
10.	Dr. Siddhartha Saha, Sr. Scientist I/C. Lib.	Member Secretary

RFD Committee

1.	Director, CIRC	Chairman
2.	Dr. Rajendra Prasad, Principal Scientist	Member

3.	Dr. Umesh Singh, Principal Scientist	Member
4.	Shri Rishi Ram, Admn. Officer	Member Secretary

Repair, Maintenance & AMC Committee

1.	Dr. Pramod Singh, Principal Scientist	Chairman
2.	Shri D.S. Verma, AF&AO	Member
3.	Shri Rajiv Verma, STO (for other jobs)	Member
4.	Shri Y.P. Malhotra, TO (for IT related jobs)	Member
5.	Indenting Officer	Member
6.	Shri A.K. Sharma, AAO/IC.Store	Member Secretary

Rajyabhasha Committee

1.	Director, CIRC	Chairman
2.	Dr. Naimi Chand, Sr. Scientist	Member
3.	Dr. Rajib Deb, Scientist	Member
4.	Dr. (Mrs.) Megha Pande	Member
5.	Shri Rishi Ram, AO	Rajbhasha Adhikari/ Member Secretary

Bio-Safety Committee

1.	Dr. A.K.Mathur, Principal Scientist	Chairman
2.	Dr. Pramod Singh, Principal Scientist	Member
3.	Dr. (Ms.) Rani Alex, Scientist	Member
4.	Dr. Mahesh Kumar, Principal Scientist	Member Secretary

Institute Animal Ethics Committee

1.	Dr. A. K. Mathur, Principal Scientist	Chairman
2.	Dr. Sushil Kumar, Principal Scientist	Member
3.	Dr. Naimi Chand, Sr. Scientist	Member
4.	Dr. Megha Paney, Scientist	Member
5.	Dr. A.K. Sharma, CPCSEA	Member
6.	Dr. Manish Saini,CPCSEA	Member
7.	Mrs. Mamta Goel, CPCSEA	Member
8.	Dr. Mahesh Kumar, Principal Scientist	Member Secretary

Staff Welfare Committee

1.	Director, CIRC	Chairman
2.	Dr. Pramod Singh, Principal Scientist	Member
3.	Shri Rishi Ram, AO	Member
4.	Secretary (Staff Side), IJSC	Member
5.	Smt. Pushpa, Personal Assistant	Member
5.	Shri A.K. Sharma, AAO	Member Secretary

Institute Deputation Committee

1.	Director, CIRC	Chairman
2.	Dr. A.K.Mathur, Principal Scientist	Member
3.	Dr. Umesh Singh, Principal Scientist	Member
4.	Dr. Pramod Singh, Principal Scientist	Member

Institute Technology Management Committee

1.	Director, CIRC	Chairman
2.	Dr. Shrikat Tyagi, Incharge, PME Cell	Member
3.	Dr. Pramod Singh, Principal Scientist	Member
4.	Dr. Puneet Kumar,PS ,IVRI, Bareilly	Member
5.	Dr. Sushil Kumar, Principal Scientist	Member Secretary

Institute Technology Management Unit

1.	Director, CIRC	Chairman
2.	Dr. Rajendra Prasad, Principal Scientist	Member
3.	Dr. Shrikat Tyagi, Principal Scientist	Member
5.	Dr. Sushil Kumar, Principal Scientist	Member Secy./ Nodal Officer

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

PME Cell

1.	Dr. Shrikant Tyagi, Principal Scientist	Officer Incharge
2.	Dr. Umesh Singh, Principal Scientist	Member
3.	Dr. T.V. Raja, Senior Scientist	Member
4.	Dr. Rani Alex, Scientist	Member
5.	Dr. Y.K. Soni, Scientist	Member
6.	Dr. S.K. Verma, Sr. Scientist (upto 26.12.2015)	Member

Institute Management Committee for ISO-9001 Implementation

1.	Dr. Rajendra Prasad, Principal Scientist	Chairman
2.	Dr. Shrikant Tyagi, Incharge, PME	Member
3.	Dr. Umesh Singh, Principal Scientist	Member
4.	Shri Rishi Ram, Administrative Officer	Member

Institute Committee for Extension work

1.	Dr. Ravinder Kumar, Sr. Scientist	Chairman
2.	Dr. R.R. Alyethodi, Scientist	Member
3.	Dr. Y.K. Soni, Scientist	Member

NODAL OFFICERS

1. Dr. Rajendra Prasad, Principal Scientist as Nodal Officer, RFD
2. Dr. Shrikant Tyagi, Principal Scientist as Nodal Officer of Tribal Sub-Plan (TSP)
3. Dr. Umesh Singh, Principal Scientist as Nodal Officer for implementation of e-publishing of tender details on the Central Public Procurement Portal
4. Dr. Sushil Kumar, Principal Scientist as Nodal Officer, KRISHI
5. Dr. Mahesh Kumar, Principal Scientist as Nodal Officer, Aadhar Based Biometric System.
6. Dr. Siddhartha Saha, Sr. Scientist, Nodal Officer, IMS/FMS, INFLIBNET and CeRA
7. Shri Rajiv Verma, STO, as Labour Officer, CIRC,Meerut
8. Dr. Ravinder Kumar, Sr. Scientist as Nodal Officer for sending advisory to the farmers.

NOTES