2009 - 10

वार्षिक प्रतिवेदन
ANNUAL REPORT

केन्द्रीय भैंस अनुसंधान संस्थान
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Central Institute for Research on Buffaloes
Sirsa Road, Hisar - 125 001 (Haryana) India

CREDITS

Published by
Dr RK Sethi
Director
CIRB

Compilation and Editing
Dr SP Yadav
Dr SK Phulia
Dr VB Dixit
Dr SK Sarkar
Dr Ghansham Singh

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Mk v'ouh dekj ik.M;

Printed by :
Dorex Offset Printers, Hisar
Ph. : 230117, 231117
e-mail : dorex1987@gmail.com

भाकृअनुप
ICAR

Central Institute for Research on Buffaloes
Sirsa Road, Hisar - 125 001 (Haryana) India
Phone : 91-1662-276631, Fax : 91-1662-275004
Website : http://www.cirb.gov.in E-mail : cirb@asia.com

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India occupies the pride position of being the highest milk producing country in the world. This cannot entirely be ascribed to sheer numbers of livestock heads that we possess, but has to be credited to the gradual increase in productivity of our livestock. While cross-breeding of cattle has contributed a quantum increase to the milk pool, the major share is being contributed by buffaloes. Inspite of being almost half the population of cattle, high productivity of Indian buffaloes is evident by their contribution to milk pool, which is almost 10 percent more than the quantity of milk contributed by cattle.

With the spread of education and information dissemination system, the socio-economic status of people is improving. The increased production of food grain and livestock products has contributed to better health and longevity of people in the country, despite the burgeoning population. The population is becoming increasingly conscious of food items, particularly food from animal origin like milk, meat, fish and eggs. Despite these changes in consumption patterns the number of vegetarian is still very large. Milk and milk products are the major source of good quality proteins in their diets. Therefore, buffalo as a dairy animal has become of paramount importance in India.

In order to expedite the efforts for the development of buffalo production through optimum application of science and technology, the Indian Council of Agricultural Research (ICAR) established the Central Institute for Research on Buffaloes (CIRB) at Hisar in 1985 and a sub-campus at Nabha, Punjab in 1987 for the improvement of Murrah and Nili-Ravi buffaloes, respectively. Coordinating unit of All-India Network Project on Buffalo Improvement has been given the responsibility for improvement of various breeds of buffaloes in different regions of the country. It is being increasingly felt that the scientific community should develop a vision of action for further improvement in production of buffaloes in the country.

The entire team of scientific, technical, administrative, supporting and other staff is working towards growth and development of the Institute which has completed 25 years of its existence on February 1, 2010 and has brought number of achievements for buffalo improvement. I hope this report will serve as good reference text and will give a brief insight to the archives and achievements for the year 2009-2010. Guidance, help and support from the headquarters, especially from Dr S Ayyapan, Secretary, Department of Agricultural Research and Education and Director General, ICAR, Dr KML Pathak, Deputy Director General (Animal Sciences) and Dr CS Prasad, ADG (AN & P) is gratefully acknowledged.

(RK Sethi)
Director

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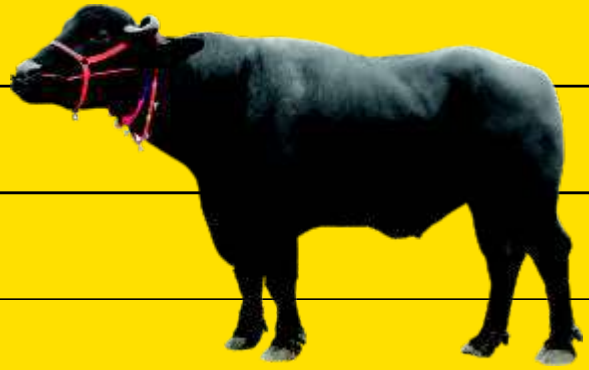

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केन्द्रीय भैंस अनुसंधान संस्थान, हिसार (हरियाणा) की स्थापना 1 फरवरी 1985 को हरियाणा सरकार के संतति परीक्षण सांड फार्म को अधिग्रहित करके हुई। दतुपरान्त पंजाब सरकार के नीली-रावी फार्म का 1 दिसम्बर 1987 को अधिग्रहण करके उप-परिसर की स्थापना नाभा (पटियाला) में की गयी। संस्थान का मुख्य ध्यान भैंस उत्पादन के सभी आयामों पर शोधकार्य करने व इसको बढ़ावा देने पर है। वर्ष 2009-10 के दौरान हुए मुख्य शोध कार्यों का कार्यकारी सारांश निम्न है -

- संस्थान ने अपना रजत जयंती वर्ष 2009-10 में मनाया।
- प्रायोगिक राशन शुरू करने के एक माह के बाद, उच्च ऊर्जा एवं उच्च प्रोटीन पर रखे गए जानवरों के भार में 680 ग्राम प्रतिदिन, व निम्न ऊर्जा निम्न प्रोटीन पर रखे गए जानवरों के भार में 330 ग्राम प्रतिदिन की बढौतरी पाई गई।
- कृत्रिम गर्भधारण के लिए 25 मिलियन व 15 मिलियन शुक्राणुओं से गर्भधारण दर लगभग समान (49.9 प्रतिशत व 53.8 प्रतिशत) पाई गई। अत: गर्भधारण दर से समझौता किए बिना ही प्रति वीर्य नलिका में शुक्राणुओं की संख्या को कम करके उच्च गुणवत्ता वाले झोटों से अधिक उत्पादन लिया जा सकता है। लेकिन 5 मिलियन शुक्राणु संख्या से 28.9 प्रतिशत गर्भधारण दर पाई गई जोकि आने वाली तकनीकों से बढ़ाई भी जा सकती है व उपयोग में लाई जा सकती है।
- प्रेरित दुग्ध उत्पादन के लिए उपचारित भैंसों में परिधिय रक्त प्लाज्मा और दूध के नमूने क्रमश: उपचार के 0 दिन से 63 दिन के बीच व दूध देना शुरू करने के 0 दिन व 70 दिन के बीच लिए गए। एस्ट्रोजन व प्रोजेस्ट्रोन का रक्त में आकलन एलिसा किट से किया गया। दूध में प्रोजेस्ट्रान मान समान चक्रीय व गर्भवती भैंस के दूध में पाए गए स्तर से भी बहुत कम था क्योंकि दूध का स्राव हारमोन देने के बहुत बाद शुरू हुआ।
- संतति परीक्षण के लिए अपनाए गए आठ गांवों में वर्ष 2009-10 के दौरान कुल 2674 भैंसों का कृत्रिम गर्भाधान किया गया। इसमें 1264 गर्भ सुनिश्चित किए गए। इस दौरान कुल 922 ब्यांत प्राप्त हुए जिसमें 461 कटड़े व 461 कटड़ियां थीं।
- संगणक आधारित शीर्ष वीर्य परीक्षण एवं प्रगतिशील शुक्राणु गतिविधि में सीधा सम्बन्ध पाया गया। अपनाए गए गांवों में झोटों से किए गए कृत्रिम गर्भाधान की दर 17.7 से 74.5 प्रतिशत पाई गई जो झोटों के वीर्य की गुणवत्ता एवं गर्भधारण करने की क्षमता को दर्शाता है।
- वीर्य संग्रह किसानों के घर जाकर किया गया। वहीं बने बनाए डायलूटर से पतला किया गया और हिमीकर में ठंडा करके आगे की प्रक्रिया और हिमिकृत करने के लिए प्रयोगशाला में पहुंचाया। इस वीर्य की पिघलाई उपरांत गतिशीलता, प्रयोगशाला में एकत्र व ठंडे किए गए शुक्राणुओं के बराबर हासिल की गई। प्रगतिशील किसानों के विजेता मुर्रा नस्ल के सात सांडों से लगभग 4500 वीर्य इकाईयां संरक्षित की गई हैं।
- मार्कर जीन के द्वारा एम्नियोन, एम्नियोटिक द्रव्य और भ्रूण गिरने के गुणदोष एवं उसके विभिन्न स्थापत्यों का भिन्न-भिन्न चरणों का अध्ययन किया गया। इन कोशिकाओं की विभिन्न रूपों में स्थापना बहुत से चरणों से गुजर कर होती है।
- 24 माह की उम्र के बछड़े एक दूसरे पर चढ़ने लगे लेकिन पहली बार वीर्य दान 32 महीने की उम्र में हुआ। वीर्य की गुणवत्ता जैसे रंग, मात्रा और शुक्राणु सांद्रता का विश्लेषण विभिन्न समूहों के सांडों के वीर्य गुणों की तुलना के लिए किया गया। वीर्य का रंग हल्का सफेद पीला था और मात्रा 1.97, 2.22 और 2.24 मिलीलीटर थी। शुक्राणु सांद्रता 641.30, 596.92 और 661.3 थी।

- फिल्टर प्रेस मड अपशिष्ट (Filter Press Mud Waste) खिलाने का पशुओं के स्वास्थ्य पर बुरा प्रभाव नहीं पड़ा लेकिन जिन समूह के पशुओं को फिल्टर प्रेस मड अपशिष्ट दाने की मात्रा का 40 प्रतिशत दिया गया उनमें शुष्क पदार्थ, CP, ईथर एक्सट्रैक्ट और CF की पचनीयता व DCP की ग्रहीता में कमी आ गई।

- मलजल द्वारा सिंचाई एवं नहर द्वारा सिंचाई से प्राप्त चारे का आसन विश्लेषण किया गया। चारे के नमूनों की भारी धातुओं की उपस्थिति के लिए भी विश्लेषण किया गया। दोनों समूहों में कई धातुओं के लिए महत्वपूर्ण अन्तर पाया गया। साख्यिकीय तरीके से दोनों समूहों का तुलनात्मक अध्ययन प्रगति पर है।

- यह देखा गया है कि क्षेत्र के अंतर्गत 75 प्रतिशत समस्याएं आवश्यक खनिजों की कमी के कारण होती हैं और जो क्षेत्र विशेष खनिज मिश्रण (ASMM) देकर दूर किया जा सकता है। जो जानवर ताव के लक्षण नहीं दिखाता / ताव में आता है, उसको सामान्य चक्र में लाने के लिए औसतन 30.5 दिन लगते हैं। 50 प्रतिशत जानवर क्षेत्र विशेष खनिज मिश्रण खिलाने के 21 दिन के बाद गर्भधारण कर लेते हैं और 75 प्रतिशत जानवर 42 दिन के बाद गर्भधारण कर लेते हैं। नियंत्रण समूह (4.5 कृत्रिम गर्भाधान) वाले जानवरों की तुलना में ईलाज समूह (2.7 कृत्रिम गर्भाधान) के जानवरों को गर्भधारण के लिए काफी कम कृत्रिम गर्भाधान की आवश्यकता पड़ी।

- अधिक उत्पादन देने वाली 20 मुर्रा भैंसों (दुग्ध उत्पादन > 8 किलो प्रतिदिन) को दो समूहों में विभाजित करके चार महीने प्रोटेक्टिड वसा संपूरक के रूप में खिलाई गई। प्रोटेक्टिड वसा संपूरक, दूध शुरू होने के 3-4 महीने के बाद शुरू किया गया, जिसके उत्साहवर्धक परिणाम प्राप्त हुए तथा यह पाया गया कि नियंत्रित समूह की तुलना में परीक्षण समूह के जानवरों में दूध उत्पादन में काफी वृद्धि हुई थी।

- भैंस प्रजनन, भोजन, जनन, स्वास्थ और रखरखाव पर ज्ञान को किसानों तक फैलाने के लिए वैज्ञानिक एवं तकनीकी कर्मचारी संस्थान द्वारा अपनाए गए आठ गांवों में नियमित दौरे करते हैं।

  इसके अलावा अन्य नियमित गतिविधिया जैसे पत्र एवं टेलीफोन के माध्यम से भैंस उत्पादन और स्वास्थ्य के विभिन्न पहलुओं पर किसानों के प्रश्नो के उत्तर दिए गए। इससे दिन प्रतिदिन के जीवन में भैंस पालन के बारे में किसानों की जागरूकता बढ़ाने में सहायता मिली है। इसके परिणाम स्वरूप, युवा, शिक्षित किसान न केवल भैंस पालन से लाभ प्राप्त कर रहा है बल्कि एक रोल मॉडल के रूप में साथी ग्रामीणों को भैंस पालन की बेहतर वैज्ञानिक पद्धति अपनाने के लिए प्रोत्साहित भी कर रहा है। यह कृत्रिम गर्भाधान बढ़ने व खनिज मिश्रण पूरक के रूप में पशु आहार में बढ़ने से स्पष्ट है। इस अवधि के दौरान आयोजित की गई विस्तार की मुख्य गतिविधियां नीचे सूचीबद्ध हैं :

- संस्थान द्वारा भैंस पालकों के लिए विभिन्न कटड़े/कटड़ियों की रैली, किसान मेला, भैंस मेला, किसान संगोष्ठी और अन्य विस्तार गतिविधियों का आयोजन किया।

- क्षेत्रीय संतति परिक्षण परियोजना के अन्तर्गत अपनाए गए गांवो में पैदा हुई कटड़ियों की रैली व बाँझपन/कृमि मारने के लिए कैंप का आयोजन किया गया। प्रत्येक गांव से तीन सर्वोत्तम कटड़ियों को दो श्रेणियों (1-2.5 साल व 2.5 साल से अधिक) में चयनित करके पुरस्कृत किया गया।

जेवरा	29 दिसम्बर, 2009
खेड़ी बर्की	4 जनवरी, 2010
किराड़ा	6 जनवरी, 2010
जुगलान	8 जनवरी, 2010

- संस्थान के परिसर में 4 जनवरी 2010 को भैंस मेला लगाया गया जिसमें अपनाए गए व आसपास के गांवों से 180 उत्तम मुर्रा नस्ल की भैंसों ने भाग लिया। पशुओं की प्रतियोगिता का आयोजन 6 श्रेणियों में किया गया और प्रत्येक श्रेणी में 3 पुरस्कार दिए गए - दूध देने वाली व शुष्क भैंस, कटड़ी 1 से 2½ वर्ष और 2½ वर्ष से अधिक, सांड 1 से 2½ वर्ष व 2½ वर्ष से अधिक। मेले का सर्वोत्तम पशु भी घोषित किया गया। 300 से भी अधिक किसानों ने मेले में हिस्सा लिया। दिल्ली में आयोजित अन्तर्राष्ट्रीय भैंस सम्मेलन में लगभग 400 विदेशी व भारतीय प्रतिनिधियों ने इस मेले में भाग लिया।

- बेहतर भैंस पालन पर चार प्रशिक्षण कायक्रमों का आयोजन किया गया। इस प्रशिक्षण कार्यक्रम में देश के विभिन्न भागों के प्रतिभागियों ने हिस्सा लिया और भैंस पालन प्रथाओं पर ज्ञान प्राप्त किया। संस्थान ने भैंस पालन व कृत्रिम गर्भाधान के लिए 11-20 जनवरी, 2010 तक प्रशिक्षण कार्यक्रम का आयोजन किया जिसमें 13 बेरोजगार युवकों ने हिस्सा लिया। उप परिसर नाभा में दो प्रशिक्षण कार्यक्रमों का आयोजन किया गया जिसमें किसानों को भैंस पालन प्रथाओं की नवीनतम प्रगति से अवगत कराया गया।

- राष्ट्रीय कृषि अनुसंधान एवं प्रबन्ध अकादमी, हैदराबाद द्वारा आयोजित कृषि वैज्ञानिक सेवा के 86वें बुनियादी पाठ्यक्रम के अन्तर्गत जून 26, 2009 से जुलाई 16, 2009 तक 6 नवोदित वैज्ञानिकों के लिए क्षेत्रीय अनुभव प्रशिक्षण कार्यक्रम का आयोजन किया गया।

Executive Summary

Central Institute for Research on Buffaloes, Hisar, Haryana was established on February 1, 1985 by acquiring the Progeny Testing Bull Farm of Haryana Government. Subsequently a sub-campus at Nabha (Patiala) was established on December 1, 1987 by acquiring Nili-Ravi Farm of the Punjab Government. The Institute celebrated its 'Silver Jubilee' during year 2009-2010. The Institute principally focuses on promoting and undertaking research on all aspects of buffalo production. The executive summary of the research highlights during the period 2009-10 is as under

- During the period under report 2674 artificial inseminations were performed in eight adopted villages and 1264 pregnancies were confirmed. A total of 922 calvings were recorded, out of which 461 were male and 461 were female calves.
- Direct correlation was elucidated between estimates of CASA based rapid or progressive sperm motility and field conception rate of bulls which varied from 17.7 to 74.5 percent, indicating relationship between fertility of bull and semen quality. Relationship between DNA polymorphism, seminal protein and sperm motility and bull conception rate has been established for efficient bull performance.
- During acclimatization period of an experiment on growth regulated gene expression, all animals were examined hematologically to evaluate clinical health status before initiation of experimental feeding. At the end of the first month of differential feeding, animals on high energy–high protein diet evidenced an average body weight gain of 680 g/day, while the other group on low energy–low protein exhibited an average body weight gain of 330 g/day.
- In acyclic heifers there is emergence of follicular wave at regular intervals with largest developing follicle (DF) reaching a diameter equivalent to ovulatory size but it undergoes atresia without ovulation. In cyclic lactating buffaloes, follicular growth during estrous cycle occurred in a wave pattern with a predominance of 2 waves (n=6) compared to 3 waves (n=1). Diameter of the ovulatory DF at estrus was 14.32±0.43 mm (n=14). The anovulatory DF attained maximum diameter of 13.46±0.58 mm on day 11.14±0.96 of the cycle. The average duration of the first and the ovulatory waves was 23.14±1.14 and 12.85±1.06 days, respectively. The first wave emerged on the day of estrus in majority of buffaloes (6/7) while the ovulatory wave emerged on day 9.71±1.02 of the estrous cycle.
- Following Ovsynch synchronized oestrus (n=9), a high degree of synchrony for oestrus and ovulation was observed but largest follicle did not necessarily ovulate. There is reduced diameter of ovulatory DF at induced oestrus (13.45±0.82 mm *vs* 15.08±0.64 mm). Large follicles responded to GnRH with ovulations but in 33 percent buffaloes developing CL failed to sustain its viability for full cycle length.
- Reduced diameter of ovulatory DF in short cycle buffaloes compared to normal cycle buffaloes indicated premature

ovulation and resulting CL failed to maintain its normal life span.

- AI with 25 and 15 million spermatozoa resulted comparable pregnancy rates (49.5 and 53.8 percent respectively) suggesting scaling down the sperm dose per straw for increased production without compromising conception rates. But, using 5 million sperm dose, a conception rate of 28.9 percent was significantly lower compared to 25 and 15 million doses.
- Peripheral blood plasma and milk samples were collected frequently between Days 0 to 63 of hormonal treatment for induction of lactation and Days 0 to 70 after start of milking, respectively. Estrogen and progesterone were estimated in blood plasma by using ELISA kits. Since milk secretion started much later after completion of hormonal administration, milk progesterone values were very low and less than the levels normally detected in milk of normal cyclic and pregnant buffaloes.
- Semen collection was performed at the farmer's door step, diluted with readymade diluter there itself, cooled in an icebox and then transported to laboratory for further processing and cryopreservation. Post-thaw sperm motility equal to that of semen collected and frozen in the laboratory was achieved. About 4500 semen doses have been conserved from seven true to the breed 'Prize Winner' Murrah buffalo bulls of progressive farmers in its breeding tract.
- Semen freezing lab of the institute is maintaining over >3 lacs doses of frozen semen under progeny testing programme out which 50,000 doses are of progeny tested bulls. ~14000 doses of frozen semen supplied for test mating to the project participating centers. For the improvement of buffaloes ~64000 doses of frozen semen sold to the inseminators for AI in farmers' buffaloes in the field during the last year.
- To take up the breed improvement further >8000 semen doses of 10 true to breed prize winner/superior Murrah buffalo bulls frozen and being maintained at the semen lab, and sold to the filed inseminators/farmers for AI in buffaloes.
- Characterization of cells from amnion, amniotic fluid and fetal explants established their pluripotency by the expression of marker genes at different passages. These cells differentiate after several passages and change their morphology.
- At the age of about 24 months the calves started mounting but the first semen was donated at the age of 32 months. The semen characteristics i.e. colour, volume and sperm concentration were analyzed to compare the semen quality of the bulls in different groups. The colour of the semen was creamy, lemon and the volume was 1.97, 2.22 and 2.24 ml and the values for sperm concentration were 641.30, 596.92 and 661.3 million.
- The dry matter intake in all the groups (2.81, 2.87, 2.74 kg per 100 kg body weight) remains same and the growth rate in all the groups also remains same and the values for three groups were 526, 558 and 562 g/h/day.
- There was no ill effect of feeding Filter Press Mud Waste (FPMW) on health of animals but there was significant depression on the digestibility of DM, CP, EE, CF and DCP intake in the animal fed with FPMW to the extent of 40 percent of concentrate mixture.
- Proximate analysis of fodder grown under sewage irrigation and canal irrigation was done. The fodder samples were analyzed for the presence of heavy metals also. Significant differences in the two groups were observed for many heavy metals.
- It was observed that about 75 percent of reproductive problems under field condition are due to deficiencies of essential minerals and can be overcome by supplementing area specific mineral mixture (ASMM). Average treatment time taken by animal showing no or silent heat to become normal cycler is 30.5 days. 50 percent of animals conceived after 21 days of feeding ASMM while 75 percent of animals conceive after 42 days of feeding. Number of AI per conception was reduced significantly in the treatment group (2.7 AIs) as compared to the control group (4.5 AIs).
- An experiment on twenty high yielding buffaloes (Milk Yield > 8 Kg/day) randomly divided in two groups was conducted for supplementation of protected fat under field conditions for about four months. The supplementation started from 3-4 months of lactation and milk fat increased considerably in the treatment group as compared to control group.

Extension Activities

In addition, addressing queries of the farmers on different aspects of buffalo production and health through post and telephonically, are other regular activities. This has helped in increasing awareness of farmers regarding buffalo husbandry in their day-to-day life. Young educated farmers, as a result, are not only managing buffalo dairying profitably but as role models they are also encouraging fellow villagers to adopt novel scientific husbandry practices. This is evident through increasing application of artificial insemination and mineral mixture supplementation of their animal feed. Institute is engaged in extension activities for propagation of knowledge on buffalo breeding, feeding, reproduction, health and management to the farmers through regular visits by the scientists / technical personnel to eight adopted villages. Institute has organized various calf rallies, Buffalo Mela, farmer interaction meets and other extension activities for the buffalo farmers. Apart from this animal health check-up camps were also organized every month in the Haryana state with the collaboration of PNB Farmers Training Center, Saccha Khera. The main extension activities organized are listed as under :

- Organized *Buffalo Mela at t*he Institute premises on January 4, 2010 in which 180 elite buffaloes from adopted and adjoining villages participated. Competition of animals was held under six categories and three prizes in each category *viz.* lactating and dry buffaloes; heifers 1-2½ years and >2½ years; buffalo bulls 1-2½ years and >2½ years were given. Best animal of the show was also declared. More than 300 farmers participated in the mela. Foreign and Indian delegates of International Buffalo Conference also visited the show.
- Calf rallies cum infertility/deworming camps were organized for daughters born of the FPT project in four adopted villages. Three best calves/heifers were selected in two categories (1-2½ years and >2½ years) from each village to give away the prizes.

Jewra	December 29, 2009
Kheri Barki	January 4, 2010
Kirada	January 6, 2010
Juglan	January 8, 2010

- Organized four training programs on improved buffalo husbandry programme. In these training programmes, participants gained knowledge about the buffalo husbandry practices. The Institute also organized training program for layman inseminators from January 11-20, 2010 in which 13 unemployed youth participated.
- At Sub campus Nabha two training programme were organized in which farmers were acquainted with the latest advancement in the buffalo husbandry rearing practices.
- Organized Field Experience Training (FET) for six scientist probationers of 86th FOCARS from NAARM, Hyderabad on June 26 to July 16, 2009.

Introduction

Being a multipurpose animal, buffaloes play important role in the rural economy through their contribution to milk, meat and drought, income and employment generation. The species has emerged as a source of highly nutritious food and power in the harsh agro-climatic conditions. India has world's best recognized milch breed-Murrah, under the umbrella of the rich diversity in buffalo germplasm. Milk constitutes major protein in the diet of Indian population since times immemorial because of its necessity for growth and maintenance of vital functions in humans. Indian buffaloes are great contributors of high quality milk. Though the rural masses understood the importance of welfare of elite buffaloes since long yet the need for appropriate research and development was felt much later..

INSTITUTE

The Central Institute of Research on Buffaloes was established at Hisar on February 1, 1985. A sub-campus was established at Nabha, Punjab to undertake research on different aspects of Nili-Ravi buffaloes. The Institute at Hisar has over 1000 acres of land of which about 300 acres is cultivable. The remaining land is saline and undulating. The production of fodder crops is at present dependent on canal irrigation. Efforts are being made for reclamation of saline land. Sub-campus of the Institute was established on 1st December, 1987 at Bir-Dosanjh, Nabha in Punjab by acquiring land and other facilities from the Government of Punjab for research on improvement of Nili-Ravi buffaloes. The Institute primarily focuses on to establish an elite herd of Murrah and Nili-Ravi buffaloes and also to undertake research on all aspects of production.

PAST ACHIEVEMENTS

- Institute has supplied over 432 Murrah bulls and 226 Nili-Ravi bulls of superior genetic merit to various developmental agencies and village Panchayats in the country.
- Breeding programs in Nili-Ravi, Surti, Jaffarabadi, Bhadawari, Toda, Pandharpuri and Swamp buffaloes are being undertaken at various centers of the Network Project on Buffalo Improvement.
- RAPD - PCR analysis of buffalo DNA, based on 20 primer sequences revealed that 11 to 35 percent polymorphism obtained in buffalo genome was able to segregate the high and low service period animals with 39 percent dissimilarity by cluster analysis, thereby segregating high and low reproduction performance in terms of SP. However, sub-groups of animals with more and less age at first calving could not be segregated by RAPD-PCR analysis. Some SSR sequences were able to show 44 percent dissimilarities in DNA band patterns of high and low producing buffaloes. High and low producing animals were differentiated by NTSYS-PC on RAPD fingerprint data.
- The Institute has over three lakh doses of frozen semen in its cryobank under progeny testing programme. Technology for ET was standardized and as a result calves were born through ETT at the Institute.
- Technology for cryo-preservation of buffalo oocytes and embryos was standardized. Achieved success in in-vitro

fertilization of buffalo oocytes. The technique of micromanipulation of embryos was also standardized in buffaloes.

- The sex of embryos produced through IVF has been successfully predetermined using PCR techniques. Early pregnancy diagnosis was made with sonographic technique. Positive pregnancy diagnosis with this technique was possible as early as day 25 post-insemination.
- The technique of ultrasonography was used for evaluating appropriate therapeutic intervention in anoestrus condition. The technique also allowed monitoring of ovarian response so that optimum time for fixed time insemination of treated buffaloes could be worked out precisely, resulting in good fertility. This also circumvents the need for estrus detection which is rather difficult in buffaloes.
- 'Ovsynch-Plus' protocol was developed for inducing oestrus in summer acyclic buffaloes. It was obseved that conception rates are higher when buffaloes develop corpus luteum following both the GnRH injections.
- Technology for improving the nutritive value of poor quality roughages was developed.
- Technology for hay and silage making was standardized and it was concluded that 1.20- 1.35 kg of legume hay can replace 1 kg concentrate mixture in ration of buffaloes.
- *Enterolobium timbova* leaves were successfully used for removal of protozoa from the rumen of buffaloes. It was established that defaunation is beneficial for growth under certain feeding conditions. Defaunation effects of certain agents in the decreasing order were: copper sulphate > sodium lauryl sulphate > Enterolobium leaves > Neem seed kernels.
- Studies have indicated that growing Nili-Ravi heifers require 103.3 - 129.5 K cal/Kg W0.75 ME for maintenance at various body weights. Maintenance requirements for CP were in the range of 6.49 - 9.49 g/Kg W0.75. The requirements of ME for each gram of gain in BW were in the range of 6.18 - 12.9 Kcal. The requirements of CP for each gram of gain in body weight were in the range of 0.24 - 0.42 g.
- Two grainless concentrate mixtures, isocaloric and isonitrogenous, were formulated in such a way that cereal maize grain portion was completely replaced with brans of wheat and rice. Results revealed a body weight gain of 500 g/day he cereal portion of conventional concentrate mixture can be replaced with rice/wheat bran without affecting their growth performance and nutrient utilization.
- Boron as an antidote helped in sub-clinical fluorosis in buffalo calves in terms of better retention of calcium and phosphorus and increased excretion of fluorine from the body.
- Biochemical profiles of various body fluids (blood, milk, colostrum and rumen liquor) have been characterized extensively in relation to buffalo productivity.
- Colostrum feeding during early post-natal life ensures better calf survivability due to absorption of more amounts of immunoglobulins present in the colostrum. The immunoglobulin level at 24 hour may predict the health status of calves. A critical level of these blood proteins has been assessed for the survivability of calves. Study also revealed the sex variation in absorption of immunoglobulins.
- Higher risk of disease occurrence in hypogammaglo-bulinaemic calves was associated with higher incidence of enteritis and pneumo-enteritis during first two weeks after birth.
- Under field progeny testing programme, since 1998 a total of 14190 artificial inseminations with frozen semen of tested bulls has been done with an overall conception rate of 48.96 percent.
- Post-digestion trial analyses in early postpartum Nili-Ravi buffaloes to study reproduction-nutrition interactions indicated that the absolute intake of dry matter was maximum in high energy group, followed by medium energy and lowest in the group offered low energy ration (respective values being 14.72, 13.06 and 11.46 Kg per day). A major proportion of this was contributed by the dry matter intake through fodder. The production performance (milk yield and milk fat per cent of the buffaloes under three different levels of energy intake also did not reflect significant differences during the first four months postpartum.
- Studies on artificial induction of lactation were undertaken in buffaloes. In successful cases (n=4), the peak milk yield ranged between 2.5 to 7.0 litres/day and was attained between 20th to 75th day after start of milking. In poor responders (n=2), however, peak milk production was restricted at 250 ml and 800 ml only and these buffaloes were dried off after 75 days. No significant differences were observed in the haematological parameters before and after treatment for induced lactation in buffaloes.

- 150 frozen semen samples from 17 breeding bulls were evaluated with CASA for sperm motion attributes. Results revealed that bulls with higher field conception rates, had higher values of sperm total motility, progressive motility, rapid motion and viability.
- To establish the basal values of various proteins and calcium, blood samples were collected from peri-pubertal non-pregnant heifers and non-pregnant problem heifers and analyzed for total protein, albumin, globulin and calcium. The proteins, including albumin and globulin, were slightly higher in normal peri-pubertal heifers but calcium was marginally lower as compared to problem heifers. The differences were statistically non-significant.
- Studies on the effect of feeding complete feed blocks on growth and production performance of buffaloes revealed that the average milk yield (kg/day), fat, SNF and TS percent did not differ ($P<0.05$) significantly among different groups. Milk yield was 5.27, 5.33 and 5.71 kg/day in control, Wheat straw complete feed blocks (WSCFB) and Bajra kadabhi complete feed blocks (BKCFB) groups, respectively. Similarly, average fat was 7.16, 7.31 and 7.12 percent in control, WSCFB and BKCFB groups, respectively. Respective SNF was 9.84, 9.55 and 9.95 percent in these groups and TS was 17, 16.92 and 17.07 percent in control, WSCFB and BKCFB groups, respectively.
- A multi-residue method for three neonicotinoid pesticides *viz.* imidacloprid, acetamiprid and thiacloprid was developed using HPLC. Percent recovery from 0.5 to 2.0 ppm concentration varied in the range of 81.17 percent to 95.6 percent for imidacloprid, 84.99 percent to 92.76 percent for acetamiprid, and 88.50 percent to 96.96 percent for thiocloprid. The detection limit depending upon the peak to noise ratio was observed to be 5 ppb, 10 ppb and 20 ppb, respectively for imidacloprid, acetamiprid and thiocloprid.
- Test mating from XI set of Murrah bulls was completed and test matings from 15 bulls of XII set was initiated since January, 2010.
- The Institute organized 16 trainings of 21 days each on Animal Production and Management under NARP Project in which 265 teachers/scientists from SAUs and ICAR Institutes participated.
- The Institute has also organized three summer schools of 21 days each on reproductive aspects of buffalo production. More than 50 scientists/ teachers from different ICAR Institutes and SAUs have participated in these trainings.
- Eleven trainings on 'Improved Package of Practices of Buffalo Husbandry' were also organized at the Institute. More than 230 farmers from Haryana and other states participated in these trainings.

ORGANIZATIONAL SET-UP

Director is the executive head of the Institute and is the Chairman of the Institute Management Committee (IMC) which is responsible for all policy and decision making regarding the functioning of Institute. Research Advisory Committee (RAC) reviews the research achievements of the Institute and its consistency in view of the mandate of the Institute and suggests research programmes based on national/global context of research in the thrust areas. Director is also Chairman of the Institute Research Council (IRC) that monitors the progress of research projects. The research and extension activities at the Institute are looked after by the respective Heads/In-charges of Divisions and by the Officer-in-charge at sub-campus, Nabha. The Institute Joint Welfare Staff Council (IJSC) looks after the grievances and welfare of staff members of the Institute. The Institute also has a women cell to address the grievances of the women employees. The organizational structure of the Institute during the period has been depicted in the adjoining illustration.

PRIORITIZATION MONITORING AND EVALUATION CELL

The PME Cell is responsible for prioritizing of the research programmes of the Institute. In addition to the report on major actionable points to be submitted to Cabinet Secretary, Govt. of India, it is also responsible for preparation/compilation of monthly, quarterly, six monthly progress reports and annual report etc. of the Institute. The cell is also assigned the duties of arranging IRC meetings of the Institute and maintenance of the Research Projects Files (RPFs) of the scientists.

FORAGE PRODUCTION AND CONSERVATION

The Institute is spread over an area of 1,057 acres out of which about 30 percent of the area is under fodder production. During the period, 37,741 qtls of green fodder was produced in Rabi

Fodder Production at CIRB Farm

and Kharif seasons and 1,674 qtls of green fodder was purchased, out of which 8,240 qtls of green fodder was used for silage production. At sub-campus Nabha, 33,205 qtls of green fodder was produced and 1,694.1 qtls of dry straw was produced. 3,800 qtls of green fodder was used for silage preparation.

SEMEN FREEZING LABORATORY

To fulfill the requirements of the Network Project on Buffalo Improvement and to meet the demand for supply of certified

Semen Freezing Laboratory

buffalo bull semen, a semen freezing laboratory has recently been established at the Institute having all the internationally acclaimed facilities for collection, processing, freezing and preservation of semen as per OIE guidelines

ARIS CELL

The AIRS cell maintains the website (http//www.cirb.gov.in) of the Institute and provides computing facilities to the scientific


ARIS CELL

and other staff of the Institute. Apart from this it maintains the E-mail and internet connectivity through LAN via VSAT with a 1.0 GB, 3.06 GHz Intel Pentium IV, Microsoft Windows 2003 NT server is available in the ARIS Cell. It also provides the other logistic support for the research work.

LIBRARY

The Institute has a well maintained library having subscription of 21 Indian and 6 foreign journals related to disciplines of


Library

buffalo production, reproduction and health. The Library also contain 906 books on different disciplines of animal sciences including buffalo production, biotechnology, physiology, nutrition, genetics, management, biochemistry, veterinary science and agriculture to meet the requirements of scientists.

WORKSHOP AND ESTATE SECTION

The workshop is primarily responsible for maintenance and repair of vehicles and farm implements while estate section looks after the repair and maintenance needs of the office building/animal farm and residential complex and is also responsible for supervising all construction works at the Institute.

ELECTRICAL UNIT

This unit is responsible for smooth supply of electricity and also for repair and maintenance of all the electrical/electronic items. It has 11 KV sub-station and a 110 KVA generator set that ensures continuous power to all the laboratories and offices.

GUEST HOUSE

The Institute has a Guest House with fourteen well furnished rooms that can accommodate 25 persons. It has a spacious reception with attached well furnished lounge and dinning hall to cater to requirements of visitors as well as get-togethers of Institute fraternity.


Guest House

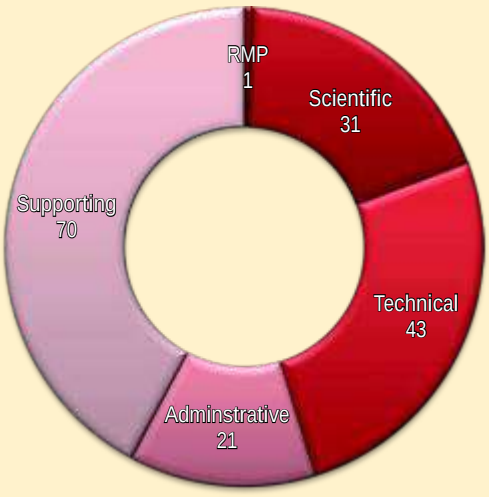
FEED UNIT

The Institute has facilities to formulate and produce concentrate feed for its livestock as per their specific needs. For this purpose, the unit has fully automatic feed grinder cum mixer unit with a capacity of preparing 10 quintals of concentrate mixture / hour. It also has a complete feed block making machine to make complete feed blocks.

Feed Processing Unit

STAFF POSITION

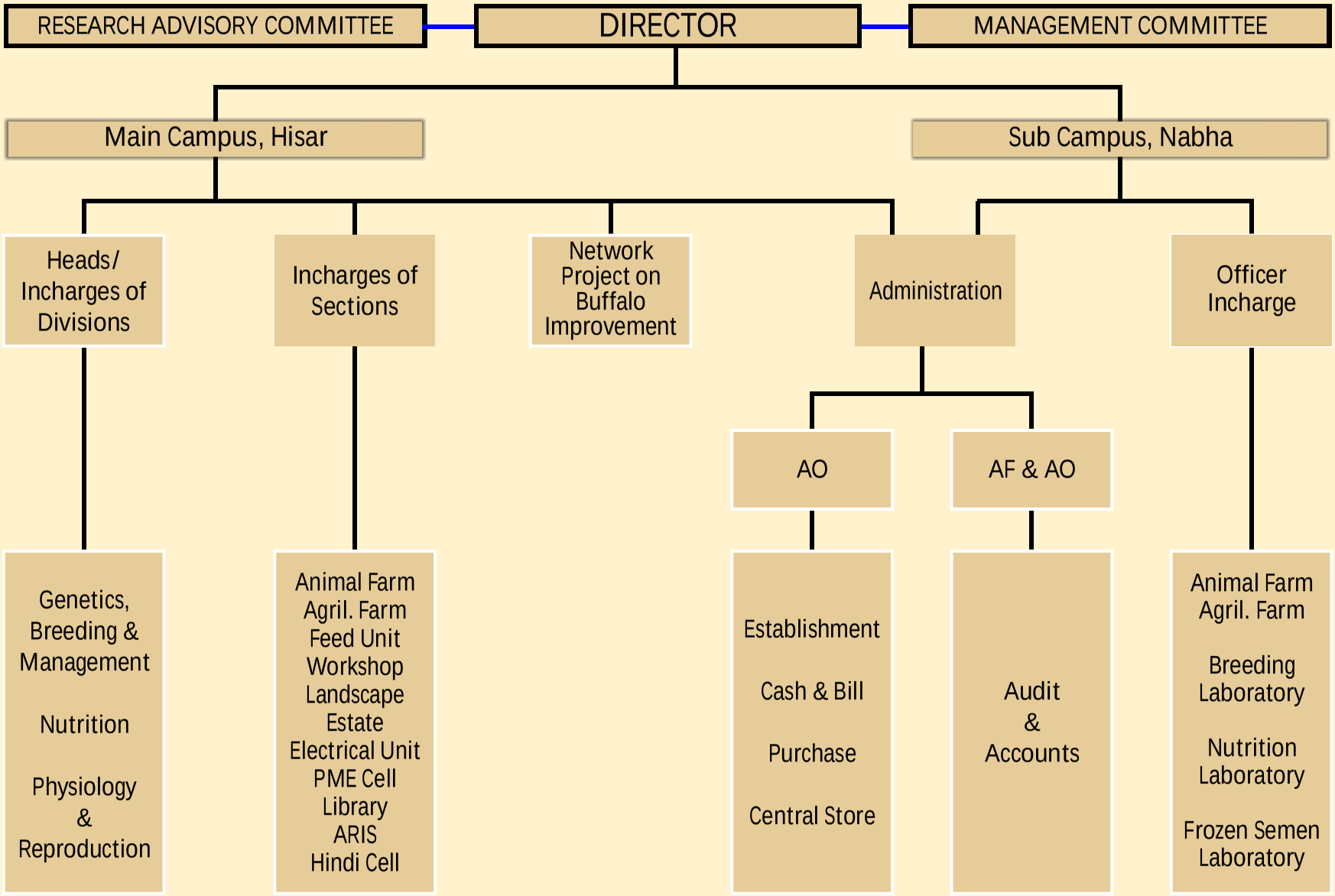
The staff position of Central Institute for Research on buffaloes (including sub-campus Nabha) as on March 31, 2010 is given in the figure



Staff Position of the Institute as on March 31, 2010

Head	Budget	2008-2009			2009-2010		
		Non-Plan	Plan	Total	Non-Plan	Plan	Total
Institute	Sanctioned	946.98	300.00	1246.98	1186.19	250.00	1436.19
	Expenditure	946.98	300.00	1246.98	1186.19	250.00	1436.19
Network Project (B)	Sanctioned		250.00	250.00		250.00	250.00
	Expenditure		249.79	249.79		249.98	249.98
DST	Sanctioned			5.20		-	-
	Expenditure			2.57		-	-
Buffalo Genomics	Sanctioned		13.30	13.30		17.81	17.81
	Expenditure		7.49	7.49		10.37	10.37
AICRP (Feed resources)	Sanctioned		7.50	7.50		7.48	7.48
	Expenditure		6.77	6.77		6.39	6.39
NAIP	Sanctioned		74.32	43.06		60.94	60.94
	Expenditure		46.89	30.71		52.94	52.94
DBT	Sanctioned			10.42			14.25
	Expenditure			53.82*			9.69
IPR Project	Sanctioned					5.63	5.63
	Expenditure					0.78	0.78
Receipt				135.28			162.65

Organogram


RESEARCH ADVISORY COMMITTEE
DIRECTOR
MANAGEMENT COMMITTEE
Main Campus, Hisar
Sub Campus, Nabha
Heads/ Incharges of Divisions
Incharges of Sections
Network Project on Buffalo Improvement
Administration
Officer Incharge
AO
AF & AO
Genetics, Breeding & Management
Nutrition
Physiology & Reproduction
Animal Farm
Agril. Farm
Feed Unit
Workshop
Landscape
Estate
Electrical Unit
PME Cell
Library
ARIS
Hindi Cell
Establishment
Cash & Bill
Purchase
Central Store
Audit & Accounts
Animal Farm
Agril. Farm
Breeding Laboratory
Nutrition Laboratory
Frozen Semen Laboratory

RESEARCH ACHIEVEMENTS

GENETIC RESOURCE IMPROVEMENT PROGRAMME

Inspite of India's position as highest producer of milk, productivity per animal is very low. The buffaloe, primarily a milch animal also provide meat as animal protein source and draft power for agricultural operations. The number of purebred animals of recognised breeds are expected to be about 25 to 30 percent of total buffalo population. Rest of the buffalo genetic resources in India belong to non-descript category and their productivity is also much lower than the well defined breeds of buffaloes. Through genetic improvement programme the non-descript population will immensely increase their productivity potential and contribute substantially in sustainable agriculture production system. The genetic resource improvement at the Institute is envisaged through selection, essentially by the use of superior germplasm. This aspect of breed improvement is addressed through different projects. Genetic improvement is targeted through associated progeny testing, performance recording and genetic analysis of data. It is the major programme undertake for studies on genetic improvement of Murrah breed at the main campus and Nili-Ravi breed at sub-campus.

GENETIC IMPROVEMENT OF MURRAH BUFFALO (NETWORK PROJECT)

The genetic improvement programme of the Murrah buffalo breed continues under the Network Project on Buffalo Improvement. During the period under report selection for 12th set of breeding bulls was completed. Brief summary of the duration, number of bulls, their location, dam no, sire no, dam's best lactation 305 day or less yield (kg), average lactation yield (kg), expected breeding value, semen doses and health status is shown below.

LIST OF BULLS SELECTED FOR XII SET OF NETWORK PROJECT ON BUFFALO IMPROVEMENT MURRAH BREED (JANUARY 2010 TO JUNE 2011)										
Sr No.	Bull No.	Location	Date of Birth	Dam No.	Sire No.	Dam's best lactation 305 day or less yield (kg)	Dam's 305 day or less average yield (kg)	Bull's expected BV	No. of Semen doses as on March 31, 2010	Health status TB/Tri/B/ IBR as in Dec. 2009
1.	3598	CIRB	25-07-06	587	1354	2655	2321/8	2148	1836	-Ve
2.	5797	NDRI	19-11-06	416	3930	3231	3046/2	2254	5592	-Ve
3.	5802	NDRI	20-12-06	4933	5197	3322	2809/4	2249		-Ve
4.	5720	NDRI	29-06-06	3543	3930	3011	2661/13	2248	385	-Ve
5.	5710	NDRI	23-05-06	5074	5054	2711	2598/3	2191	578	-Ve
6.	5604	NDRI	20-07-05	4020	3108	3222	2231/6	2122	200	-Ve
7.	2177	GADVASU	06-10-06	1884	1354	3024	2721/8	2253	3217	-Ve
8.	2176	GADVASU	02-10-06	2109	1354	2754	2463/5	2169	4257	-Ve
9.	2185	GADVASU	23-11-06	1898	1354	3423	2439/8	2172	2806	-Ve
10.	2216	GADVASU	26-10-07	2109	1506	2754	2463/5	2169	0	-Ve
11.	REDHU-10	REDHU FARM	15-11-07	042810	AI	5192		2385	100	-Ve
12.	REDHU-11	REDHU FARM	28-11-07	042832	AI	4000		2296	125	-Ve
13.	183	CCS HAU	03-06-07	1374	1354	2824	2257/5	2119	0	-Ve
14.	220	CCS HAU	20-09-07	1134	1153	2631	2296/7	2155	613	-Ve
15.		Khurana Rohtak							615	-Ve

PROGENY TEST EVALUATION OF BULLS

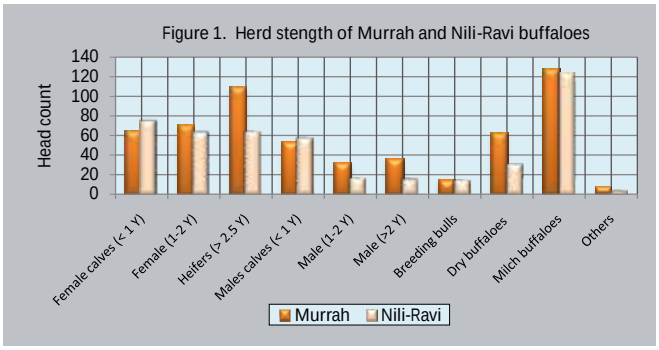
Data of daughters born from the VIIth set of bulls which completed Ist lactation was compiled and evaluated. Bull no. 4915 from NDRI, karnal top ranked with sire index 2116 followed by bull no 1796 from PAU Ludhiana having sire index 2092. The pedigree detail and sire index of the VIIth set are presented below.

SIRE INDEX OF VII SET BULL (JULY 2002 – DECEMBER 2003)											
Sr No.	Bull No.	Location	Date of Birth	Dam No.	Sire No.	Dam's best lactation 305 day or less yield (kg)	Daughter's 1st lactation 305 day or less average yield (kg/N)	Sire Index	Percent superiority over continue daughters	Rank	No. of Semen doses
1	2121	CIRB	27-09-98	982/3.7	1071	2518	1690/05	1736	- 4.04	VI	7002
2	2133	CIRB	08-10-98	381/3.5	1908	2537	1378/03	1633	- 9.68	XII	6293
3	2184	CIRB	06-01-99	1237	1363	2574	1756/19	1734	- 4.11	VII	4611
4	2331	CIRB	15-11-99	515/4.9	1446	2664	1904/09	1897	4.85	III	5568
5	2363	CIRB	27-12-99	917/4.0	2538	2654	1739/24	1697	- 6.18	X	3112
6	4807	NDRI	12-01-99	3655	2363	3544	1882/10	1881	3.98	IV	70
7	4915	NDRI	28-10-99	3521	2921	3437	2039/17	2116	17.26	I	3000
8	1419	HAU	24-01-00	782	4188	3042	1795/20	1790	- 1.08	V	3960
9	1749	PAU	19-02-99	1425	1354	3182	1702/08	1719	- 4.98	IX	6084
10	1727	PAU	31-10-98	1467	1084	3098	1697/07	1722	- 4.78	VIII	6582
11	1796	PAU	10-02-00	1386	1506	3170	2215/06	2092	15.81	II	5373
12	1746	PAU	21-09-99	1802	1153	2718	1696/13	1680	- 7.08	XI	6967

Note: 1. First lactation 305 day or less milk yield was1809 kg based on 141daughters (herd average).
2. Two top ranking bulls (4915 and 1796) have been selected for elite mating from October, 2009.

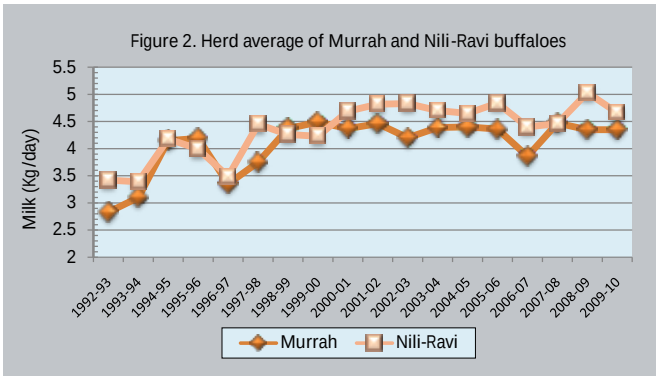
BUFFALO HERD PERFORMANCE AT CIRB

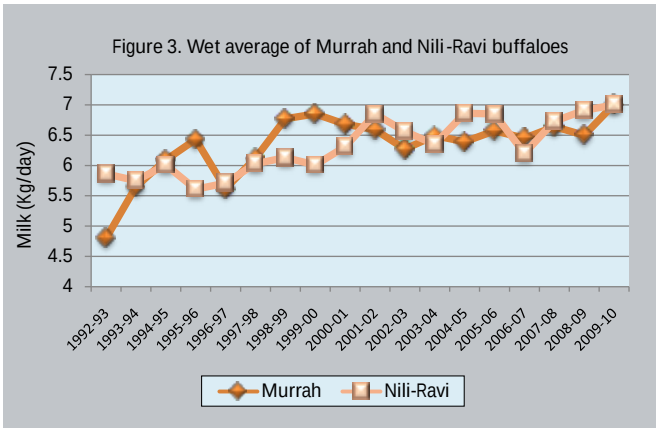
A total of 562 Murrah and 461 Nili-Ravi buffaloes of different categories were maintained at main campus, Hisar and sub-campus Nabha, respectively.

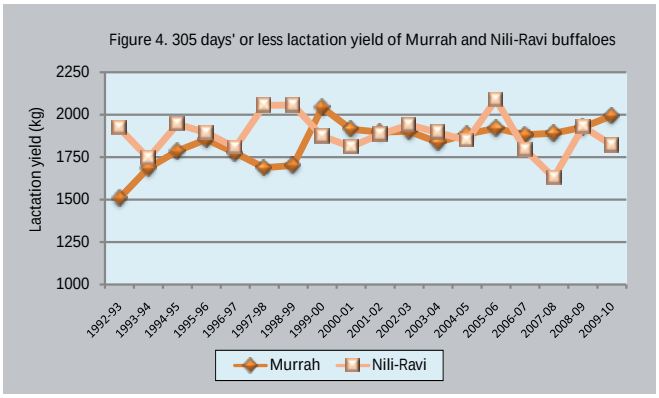


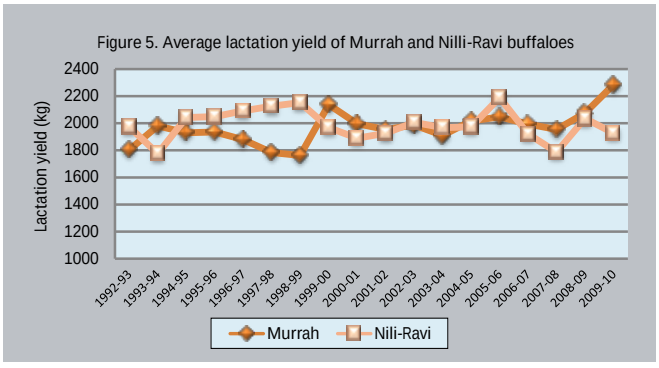
The data of the production and reproduction performance of both the breeds since 1992-93 is presented below

The herd and wet average (kg) for the year 2009-10 for Murrah and Nili-Ravi buffaloes were 4.35, 7.01 and 4.66, 7.0 respectively (Figure 2 and 3). The wet average for both the breeds is highest since the period 1992-93. The lactation yield of 305 days or less lactation yield and average lactation yield of Murrah and Nili-Ravi buffaloes since 1992-93 are illustrated in figures 4 and 5 respectively.









AVERAGE MILK CONSTITUENTS (PERCENT) IN MURRAH BUFFALOES DURING 2009-10

Month	n	Fat	SNF	Protein	Lactose
April 09	117	7.94	8.51	3.59	4.67
May 09	106	8.25	8.39	3.54	4.60
June 09	98	8.37	8.34	3.52	4.62
July 09	81	8.24	8.49	3.57	4.66
Aug 09	83	8.08	8.38	3.48	4.58
Sept 09	82	7.85	8.27	3.44	4.50
Oct 09	81	7.54	8.32	3.42	4.40
Nov 09	82	6.91	8.17	3.34	4.28
Dec 09	92	7.00	8.30	3.40	4.34
Jan 10	99	7.24	8.55	3.48	4.42
Feb 10	107	7.39	8.65	3.47	4.44
Mar 10	110	7.57	8.70	3.46	4.47
Overall	1138	7.70	8.44	3.48	4.50

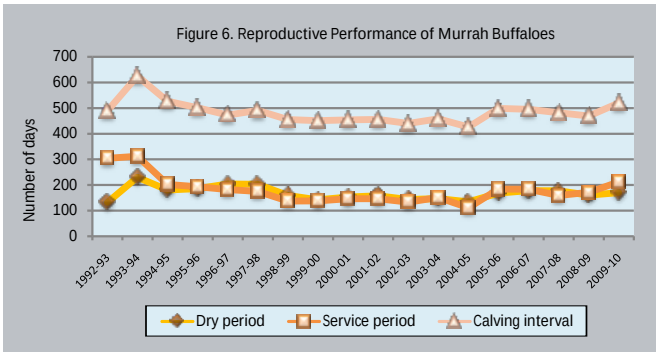
FAT PERCENTAGE

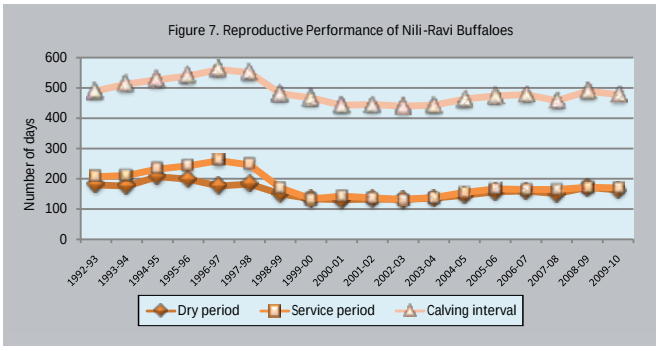
The overall fat percent in Murrah during the year 2008-09 increased from 7.58 (2007-08) to 7.88 percent. The fat percent among the breeds was highest in Jaffarabadi (8.61) and least in Nili-Ravi (6.9). The average fat percent (various centers of Network Project) trend within and across the breeds from 2006-07 to 2008-09 at various centres of Network project is depicted in the table.

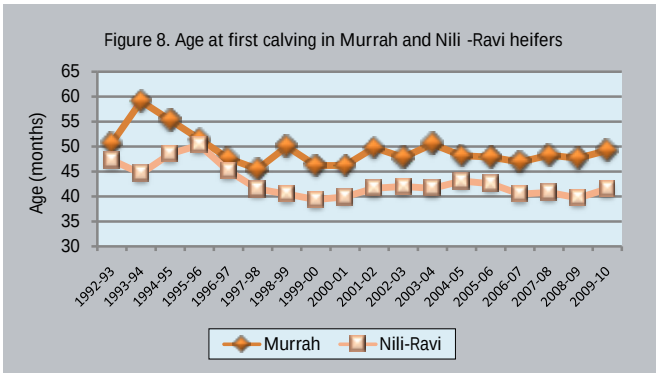
AVERAGE FAT PERCENT DURING THE YEAR								
MURRAH	GADVASU	CCSHAU	CIRB	NDRI	IVRI	NDUAT	OVERALL	
2006-07	7.57 (82)	7.6 (37)	7.01 (130)	8.07 (99)	7.55 (71)	8.17 (27)	7.55 (446)	
2007-08	7.31 (71)	7.70 (30)	7.03 (136)	7.92 (101)	7.99 (111)	8.02 (24)	7.58 (473)	
2008-09	7.80 (78)	7.3 (652)	7.82 (1436)	7.98 (787)	8.19 (1244)	7.96 (22)	7.88 (4197)	
2009-10	7.54 (79)	6.8 (780)	7.70 (1138)	8.11 (1083)	7.97 (1003)	7.92 (25)	7.71 (4113)	
Between Breeds	Murrah	Nili Ravi	Bhadawari	Jaffarabadi	Pandharpuri	Surti	Godawari	Swamp
2006-07	7.55 (446)	6.8 (118)	7.65 (34)	8.21 (34)	8.01 (25)	7.12 (34)	7.38 (47)	8.38 (12)
2007-08	7.58 (473)	6.70 (122)	8.09 (106)	8.25 (29)`	8.03 (15)	7.25 (34)	7.00 (47)	7.67 (21)
2008-09	7.88 (4197)	6.9 (108)	8.09 (604)	8.61 (260)	8.04 (180)	7.33 (446)	- -	8.52 (193)
2009-10	7.71 (4113)	6.9 (146)	8.02 (375)	-	8.04 (257)	7.50 (301)	-	8.52 (239)

REPRODUCTIVE PERFORMANCE

The values (days) for dry period, service period and calving interval for both the breeds are illustrated in figures 6 and 7, respectively. All the parameters were higher in the Murrah breed (170, 212 and 520) compared to Nili-Ravi (163,170 and 478). The average age at first calving (months) is significantly lower in Nili-Ravi (ranges between 39.38 to 50.30) breed than Murrah breed (45.50 to 59.10). Female conception rate during the period 2009-10 was 48.2 percent for Murrah and 46.7 percent for Nili-Ravi. Bull wise it ranged from 28.0 to 100 percent in Nili-Ravi.







FIELD PROGENY TESTING

In order to increase the number of inseminations under field progeny testing programme two more villages namely Sarsod and Bichpuri were adopted during the year. Activities in village Sarsod were initiated in July 2009 and in October, 2009 village Bichpuri was adopted. During the period under report 2803 artificial inseminations with the frozen semen of 14 test bulls each of X and XI set were performed in eight adopted villages. In all 1461 pregnancies were confirmed in the field during the year and 971 calving were recorded, out of which 490 were male and 481 were female calves. A total of 565 progenies of VII to XI set under different age groups was standing at various field unit centers. Data were also analysed for bullwise AI, conception and calving during the year identified. Twenty eight daughters were calved in the field during the year. Test day/ monthly milk recording of 56 daughters were done, out of which 28 daughters completed the lactation and recording of 26 daughters in progress. Two daughters were sold before the lactation completed.

GENETIC RESOURCE IMPROVEMENT OF NILI-RAVI

The Nili-Ravi is one of the important buffalo breed of India. Its home tract is in Gurdaspur, Amritsar and Ferozepur districts of Punjab i.e. along with the international border of Pakistan. Due to non-availability of pure and superior breeding bulls in the tract, the Nili-Ravi buffaloes are decreasing and considered as threatened breed by the Government. To preserve this important germplasm of buffalo in India, the sub-campus of this Institute has been established and identified as one of the centres for research work under the Network Programme on Buffaloes for Nili-Ravi breed. Presently, 461 lactating, bulls and growers animals are maintained at this campus.

The 3rd set of Nili-Ravi bulls is being used for breedable females at farm under network programme and performance of progenies is being recorded. Efforts were made to include Nili-Ravi germplasm available with farmers. Hence, semen is collected from the farmer's and processed after routine testing. Bulls of Nili-Ravi breed with good dam's yield are provided to the farmers as an integral part of this breed improvement programme. Survey conducted in the districts of Amritsar and Ferozepur indicated that the population of Nili-Ravi breed is very limited. Efforts are being made to identify the farmers in the breeding tract who are maintaining Nili-Ravi buffaloes.

The herd strength at the beginning for the year was 464 animals and at the end it was 461. The disposal of animals during year 2009-10 was through auction of 139 animals and sale of 14 surplus young males / bulls and death of 12 animals during the year. Overall, 6 young males and female calves died in the age group of birth to 12 months and 06 adult animals died due to several of reasons. The body weights at birth were 32.9 and 34.3 kg for female and male buffalo calves, respectively. The growth rate of male calves was higher than the female calves. Average total lactation yield during 2009-10 is 2036 kg. During the period of 2009-10, month wise milk production of buffaloes showed consistent performance, improvement of wet average was observed. Overall wet and herd average were 7.00 and 4.66 kg, respectively during 2009-10. Overall fertility was 46.7 percent in females and bull wise it ranged from 28 to 100 percent in Nili-Ravi buffaloes. The average age at first calving was 41 months, which is optimum. Overall service period and calving interval period was 172 and 489 days, respectively. Female conception rate during the period 2009-10 was 46.7 percent; the conception rate was higher during months of Dec.

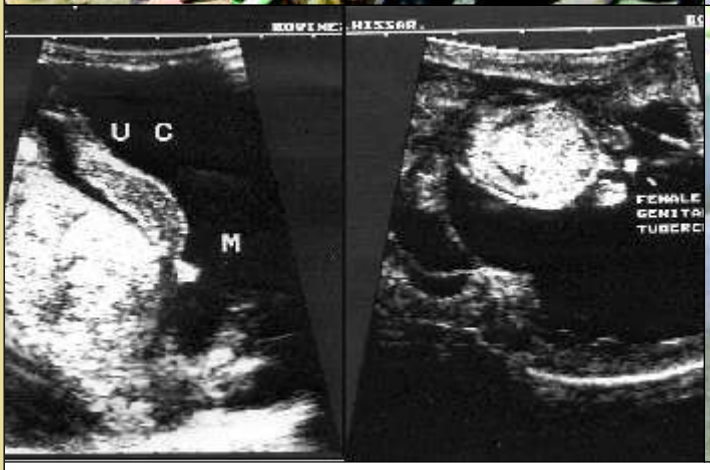
GENETIC TRENDS UNDER SELECTION PROGRAMME IN MURRAH AND NILI-RAVI HERDS

The pedigree recording has been completed for 10,504 calves bron from 1964-2009 at CIRB, Hisar. The Data on Animal numbers, date of birth, Dam No., Sire No, Disposal numbers and date of disposal has been entered in computer. A total number of 3297 dams produceed, 4346 males and 4403 females. A total number of 347 bulls were used to produce 8184 calves with average Number of daughters as 23 daughters per bull. There were 76 bulls used only once to produce single progeny. Out of 10504 calving recorded, 9676 birth occurred in in which 1532 records of bull no. were missing. A total of 347 bulls were recorded with a frequency of 1 to 237 services to produce 8144 calves. Milk yield performance of 3270 calving from 1177 dams has shown the calving interval ranged 566 days to 379 days during first to ninth lactation. Calving interval between 1st -2nd and 2nd - 3rd were higher as compared to later lactations. Higher lactation length was recorded with the dam calved in earlier lactations and it was lower in later lactations.

POLYMORPHIC MALE FERTILITY GENE IN RELATION TO SEMEN QUALITY AND CONCEPTION RATE (CR)

Murrah bulls categorized under sub-groups of high and low field conception rates recorded at farm, were genotyped for seminal plasma protein gene, using orthologous gene sequence based primers. This gene governs sperm membrane estability, acrosome integrity, sperm motility, capatitation ability and fertilization rate. Study reveals that said gene is polymorphic in Murrah bulls and indicates relations with semen quality attributes as sperm count motility, head size and viability which were estimated by computer assisted semen analyser (CASA) and field conception rates of bulls. Direct correlation was eluciated between rapid and progressive motivility of sperm (CASA estimates) and percent CR. Biochemical indices of sperm with respect to oxidative stress governing motility and other quality parameter is under study. Efforts to establish relationship among existance of polymorphic alleles of Seminal plasma protein gene, sperm rapid and progressive motility estimates and bull conception rate are under way.

Data collection on determination of sperm fertilization rate using technique of IVF (percent cleavage of fertilized oocytes) is in progress, to establish inter relation among semen quality parameters, sperm metabolic status, fertilization rate in association with the polymorphic gene patterns and bull conception rate obtained on Murrah bull population.



IMPROVEMENT OF REPRODUCTIVE EFFICIENCY PROGRAMME

Reproduction is an important consideration in the economics of livestock production as milk and calf, the two most desired products of dairy industry are obtained after successful reproduction. Reproductive efficiency of the buffalo requires investigations in male and female infertility, physiological profiles, semenology, AI, reproductive biotechnology as well as mammary gland development and other essential components. During the period under report following investigations are undertaken:

TRANSCRIPTIONAL ANALYSIS OF HSP70 AND GHR GENES DURING GROWTH

In view of changing climate and increasing global warming, concerns of animal welfare are gaining attention. With livestock husbandry becoming increasingly competitive with narrow profit margins, research has focused on improving the efficiency of animal production. Growth is the prerequisite to attainment of puberty as well as for better productivity including that of meat. Buffalo meat is an emerging food commodity in the world for which we need to achieve efficient growth for higher profitability. Therefore, emphasis on increasing understanding of physiological processes and molecular pathways associated with growth and development becomes crucial. The relationship of HSP70 transcripts expression with GHR, and feed conversion efficiency can immensely help in understanding the molecular physiology of growth in buffaloes. Hence a project is underway to identify these critical parameters in relation to growth in buffalo heifers.

During acclimatization period, all animals were examined hematologically to evaluate clinical health status before initiation of experimental feeding. At the end of the first month of differential feeding, animals on high energy – high protein diet evidenced an average body weght gain of 680 g/day, while the other group on low energy – low protein exhibited an average body weight gain of 330 g/day. A standard protocol for biopsy collection from the neck muscle (*Longismus dorsi*) of buffaloes,

Collection of muscle biopsy

procedure was standardized using an innovative technique. Muscle biopsies were collected under aseptic conditions by making a stab skin incision under local infiltration of anaesthetic agent (lignocaine HCl 2 percent), followed by insertion of endoscope biopsy needle into the muscle and biopsy was collected through external biopsy punch. No sutures were required and the wound healing took place within a week. First collection of biopsies has been completed and the sampled material has been stored for later use in analysis.

PHYSIOLOGICAL AND GENOMIC REGULATIONS OF FOLLICULAR DYNAMICS

Once puberty is achieved, regular ovarian cyclicity establishes i.e. the female ovulates fertilizable ovum at regular intervals. The knowledge about pattern of emergence, growth, selection and ovulation of such ovarian follicles in females is important for manipulating the cycles. Our study found that in acyclic heifers there is emergence of follicular wave at regular intervals with largest DF reaching a diameter equivalent to ovulatory size but it undergoes atresia without ovulation. In cyclic lactating buffaloes, follicular growth during estrous cycle occurred in a wave pattern with a predominance of 2 waves (n=6) compared to 3 waves (n=1). Diameter of the ovulatory DF at estrus was 14.32±0.43 mm (n=14). The anovulatory DF attained maximum diameter of 13.46±0.58 mm on day 11.14±0.96 of the cycle. The average duration of the first and the ovulatory waves was 23.14±1.14 and 12.85±1.06 days, respectively. The first wave emerged on the day of estrus in majority of buffaloes (6/7) while the ovulatory wave emerged on day 9.71±1.02 of the estrous cycle.

Using this insight into ovarian follicular dynamics, female were treated with appropriate hormonal regimen for induction of estrus. Following Ovsynch synchronized oestrus (n=9) a high degree of synchrony for oestrus and ovulation was observed but largest follicle did not necessarily ovulate. There is reduced diameter of ovulatory DF at induced oestrus (13.45±0.82 mm *vs* 15.08±0.64 mm). Large follicles responded to GnRH with ovulations but in 33 percent buffaloes developing CL failed to sustain its viability for full cycle length. Only one follicular ovulatory wave was observed during short oestrus cycle in contrast to two waves during normal length cycle. Reduced diameter of ovulatory DF in short cycle buffaloes compared to normal cycle buffaloes indicates premature ovulation and resulting CL fails to maintain its normal life span. Work on ultrasound guided ovum pickup has also been initiated and follicular cells and oocytes have been harvested.

OPTIMIZING SPERM DOSE

Cyclic females are to be inseminated at appropriate time during estrus period so as to achieve successful conception. Semen from high merit bulls is scarce and valuable. Hence, it must be used with utmost economy. With this objective, it is important that the optimum sperm dose is known in order to avoid overdose of sperms per AI and thus optimize frozen semen

BULL WISE AND DOSE WISE BUFFALO INSEMINATED AND PREGNANENT

Bull No.	Sperm dose (sperm per straw)							
	25 million		15 million		5 million		3 million	
	Pregnant	Total AI	Pregnant	Total AI	Pregnant	Total AI	Pregnant	Total AI
2990	16	30	37	60	6	12	-	-
3226	13	24	16	20	3	13	-	-
3267	12	25	11	25	-	-	-	-
12	-		5	13	2	11	6	11
3255	1	6	0	1	0	2	0	2
Total	42	85	64	119	11	38	6	13
Pregnancy Rate (percent)	49.5		53.8		28.9		46.2	

production. Therefore, in order to determine the optimum sperm dose for insemination in buffaloes, a total of 445 inseminations were made using sperm dosage of 25, 15, 5 and 3 million spermatozoa per straw. Out of total 445 inseminations pregnancy results are available for 255 AIs. The bull wise and dose wise pregnancy is given below. Pregnancy outcome for the remaining 190 inseminations is yet to be ascertained.

Comparable pregnancy rates with 25 and 15 million spermatozoa (49.5 percent *vs.* 53.8 percent, respectively) suggest scaling down the sperm dose per straw for increased production without compromising conception rates. Using 5 million sperm dose, an overall conception rate of 28.9 percent was significantly low compared to 25 and 15 M doses. Yet, this provides an indication that 5 million dose can also result in successful conception in buffalo. We further inseminated 13 heifers with 3 million sperm dose leading to 6 conceptions. Better conception rate at start of breeding season with 3 million sperm dose as compared to 5 million sperm dose AIs made at the end of breeding season may involve seasonal influences. The findings suggest that sperm dose can be reduced to 15 million without compromising conception rate. A dose of 5 million is probably low for routine AI in buffaloes under field conditions, though acceptable pregnancy rates can be achieved with 3 million sperm dose if semen is deposited in middle of uterine horn ipsilateral to the side of impending ovulation. This has strategic implications in application of sexed semen technology.

MAMMARY GLAND DEVELOPMENT AND MILK COMPOSITION FOLLOWING INDUCED LACTATION

Once the female initiates ovarian cyclicity, whether it is after attaining puberty or after the post-partum involution period, it must conceive to mating with a fertile bull or following insemination with appropriate semen dose at appropriate time. Yet, some females remain acyclic or don't settle after repeated inseminations and become repeat breeders. Such animals are a drain on scant resources of the farmers and highly uneconomical to maintain. Either these should be culled and used to other purposes like draft or meat, or there is an option to induce lactation in such infertile buffaloes to artificially induce a cycle of milk production. Artificial induction of lactation can bring infertile buffaloes to production. On this aspect, lactation was successfully induced in 4 of 6 acyclic and 2 of 6 cyclic non-pregnant multiparous Murrah buffaloes using Estradiol-17β and progesterone for 7 days, superimposed with inj. Largectil

MAMMARY GLAND DEVELOPMENT BEFORE AND AFTER HORMONAL TREATMENT FOR INDUCTION OF LACTATION

Parameters (mm)		N	Before treatment (Mean±SE)	N	After treatment (Mean±SE)
Teat Canal	Rear teat	24	8.31±0.58*	12	14.50±0.43**
	Fore teat	24	7.76±0.33*	12	11.62±0.58**
Teat Cistern	Rear teat	24	11.95±0.94*	12	16.52±2.75**
	Fore teat	24	8.07±1.06*	12	11.92±2.48**
Gland Cistern	Rear teat	24	25.28±2.22*	11	34.19±6.64*
	Fore teat	24	16.53±2.10*	12	24.41±3.16*
Teat End Width	Rear teat	24	16.89±0.67	12	18.32±0.73
	Fore teat	24	15.51±1.09	12	16.46±2.32
Annular Folds	Rear teat	20	08.50±0.64	10	09.43±0.92
	Fore teat	20	06.68±0.65	9	07.99±0.66
	Overall		07.58±0.51	19	08.80±0.52
Rear Teat Wall	Apex	22	08.30±0.51	11	08.27±0.75
	Middle	22	07.04±0.53	12	05.93±0.41
	Base	14	09.48±0.83	10	08.07±0.38
Fore Teat Wall	Apex	21	07.92±0.42	12	07.68±0.65
	Middle	19	07.23±0.54	10	06.66±0.88
	Base	16	08.36±0.55	8	07.50±0.43
Milk Vein		11	07.86±0.42	6	15.22±1.44**

Ultrasound Scan of Mammary Gland

Before Hormonal Treatment

After Hormonal Treatment

and Dexamethasone. After a lapse of seven days (8-15 days), udder massage was given daily to simulate milk let-down and this practice was followed till the udder was turgid with milk, followed by start of milking on day 21.

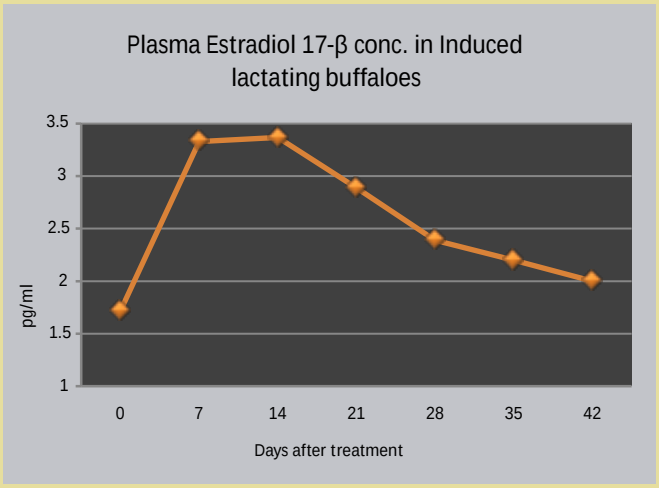
After induction of lactation, a few or small glandular parenchyma pre-treatment became mixed trabecular pattern of anechoic (black) areas compartmentalized by hyperechoic (white) partitions. The gland cisterns appeared as large anechoic areas. The biometrical observations pre-treatment and post-treatment are tabulated

Following let down of milk in induced lactation buffaloes, milk became normal in 7 to 15 days with respect to colour, curdling

Day	N	Fat (%)	Protein (%)	Lactose (%)	SNF (%)	Density
0	11	14.10±0.63	8.30±0.81	3.38±0.21	25.14±2.98	82.18±6.23
3	12	12.02±0.56	6.23±0.68	3.49±0.23	19.66±5.18	54.37±6.81
6	10	10.09±0.53	5.19±0.60	4.07±0.22	11.82±1.52	44.20±5.62
9	10	9.90±0.79	4.39±0.39	4.64±0.28	11.97±1.51	42.56±6.34
12	10	9.35±0.73	4.29±0.26	5.19±0.31	11.77±1.09	41.80±5.23
15	6	8.40±1.30	3.57±0.30	4.15±0.45	9.49±0.78	23.71±6.13
18	6	8.35±1.43	3.56±0.49	4.47±0.72	8.62±1.54	28.12±5.62
21	6	7.90±0.98	3.81±0.20	4.87±0.30	9.42±0.62	30.69±2.28
28	7	8.22±0.60	3.77±0.04	4.60±0.09	9.66±0.13	29.38±4.37
35	6	8.23±0.32	4.26±0.40	4.89±0.41	10.70±1.14	34.52±3.47
42	5	7.74±0.41	3.99±0.27	5.13±0.49	9.74±0.28	35.06±2.40
49	6	7.92±0.64	3.92±0.08	4.93±0.18	9.81±0.08	33.44±0.82
56	6	8.00±0.76	3.82±0.12	4.84±0.25	9.45±0.23	31.27±1.20
63	6	7.46±0.63	3.76±0.22	4.75±0.53	10.16±1.19	34.98±4.45

characteristics and density as well as composition *viz.* milk contents of fat, protein, lactose and SNF. Significantly (P<0.01) high initial fat, protein, SNF and density stabilized within two weeks. However, the lactose content was significantly (P<0.01) low and became normal on day 15. After 20 days, composition of milk in induced lactation buffaloes became similar to that of lactating buffaloes post calving.

Since induction of lactation involves exogenous administration of steroid hormones, it is important that their levels in peripheral circulation of the treated animals and their milk are monitored for evaluating its suitability for human consumption. Peripheral blood plasma and milk samples were collected frequently between Days 0 to 63 of treatment and Days 0 to 70 after start of milking, respectively. Estrogen and progesterone were estimated in blood plasma by using ELISA kits. Results are presented in line diagrams. Since milk secretion started much later after completion of hormonal administration, milk

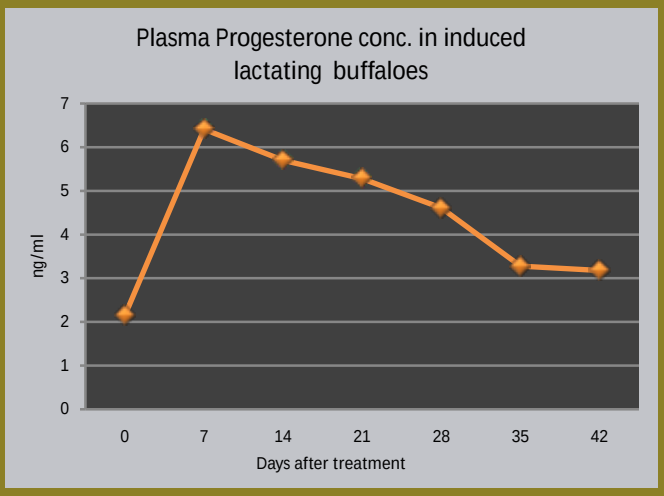


progesterone values were very low and less than the levels normally detected in milk of normal cyclic and pregnant buffaloes.

SEMEN EVALUATION

On the male aspects, frozen semen technology is an important tool in livestock improvement programme for accelerated propagation of superior male germplasm. Semen collection was performed at the farmers' door step, diluted with readymade diluter there itself, cooled in an icebox and then transported to laboratory for further processing and cryopreservation. We achieved post-thaw sperm motility equal to that of semen collected and frozen in the laboratory. In this way, 4500 semen doses have been conserved from seven true to breed prize winner Murrah buffalo bulls kept by the progressive farmers in the breeding tract of Murrah. Semen of these bulls is being used in network project for progeny testing programme and used by the farmers for breed improvement of their buffaloes.

For conservation of male germplasm i.e. semen, the sperm




Semen Processing

cells undergo stress and injury during the process of cryopreservation, which brings down the temperature to as low as -196^{o} C. Due to this injury during the processing, it is anticipated that the population of live and active spermatozoa decreases post-thawing of frozen semen. Sperm undergoes various changes during cryopreservation, also leading to the decreased fertility. Therefore, the primary goal of semen evaluation is to assess ejaculate quality – whether pre-freezing or post-thaw, but it also has the ultimate objective of checking the fertility potential of the sire. Laboratory-evaluated parameters of sperm quality include assessment of the integrity of various structures such as genomic DNA, acrosome, cell membrane and mitochondria. These are essential for cell survival, fertilizing ability, binding to zona pellucida and acrosome reaction apart from crucial importance of DNA integrity for further development of an embryo. Therefore, in order to assess these crucial parameters in response to cryopreservation protocol, a project has been initiated and the protocols are being standardized.

STEM CELL RESEARCH IN BUFFALO

The research work continued in the stem cell science and the cells obtained from amniotic membrane, amniotic fluid, umbilical cord matrix and fetal explant, could be maintained in culture for different intervals. Primary culture intiation time, first confluency, number of passages and total days in culture are presented. Apart from continuous culture, extra cells were frozen at intervals of five passages. Cells from all sources could maintain normal morphology for different but limited number of passages except cells from fetal explants which continue in continuous culture maintaining their morphology after 183 days / 45 passages. After a certain number of passages, the cell size increased and morphology also changed with decrease in cell

CELLS GROWN IN CULTURES FROM BUFFALO AMNIOTIC FLUID, AMNION, UMBILICAL CORD AND FETAL EXPLANT

Sr. No	Cell Source	Primary culture initiation time (Days)	First confluency (Days)	Passage numbers in culture	Days in culture (approx.)
1	Amnion	1	3	21	75
2	Amniotic fluid	2-3	7	22	100
3	Umbilical cord	5	8	27	108
4	Fetal explant	1	3	45	183

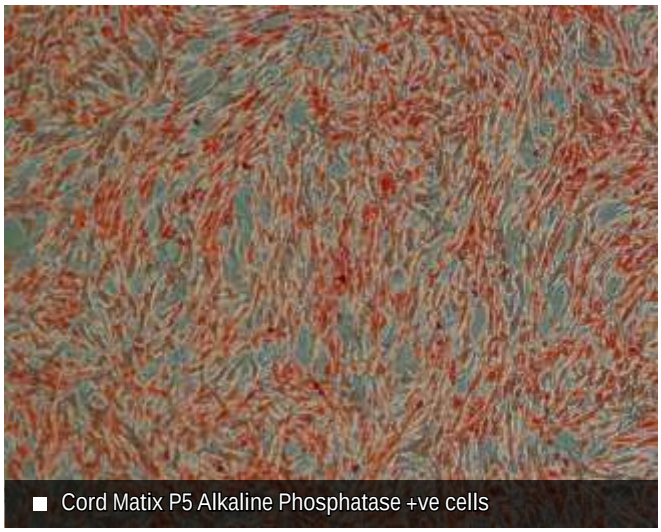
multiplication and increase in passage time, finally leading to cell mortality. Undirected differentiation started in cells from amniotic fluid, amnion and umbilical cord matrix. After differentiation, morphologically resembled neuron cells in some cultures.

CELL VIABILITY BEFORE AND AFTER FREEZING-THAWING IN 20 PERCENT SERUM + 10 PERCENT DMSO

Sr. No.	Source	Before Freezing (%)	Post Thaw (%)
1.	Amnion	96.6	79.4
2.	Amniotic Fluid	94.1	28.1
3.	Umbilical Cord Matrix	98.6	64.4
4.	Fetal Explant	98.9	83.8

The problems of slow growth and only partial adherence to flask were overcome by freezing in media containing increased concentrations of FBS i.e. 15, 20 or 25 percent. Post-thaw, cells were stained with trypan blue for viability test. Satisfactory results of post-thaw survival were obtained with 20 percent serum, except in amniotic fluid cells.

Cells from all sources were characterized as alkaline phosphatase positive. Amnion membrane tissue expressed transcription factors *Nanog* and *Sox-2* but not *Oct-4*. Amnion cells at P10 expressed *Nanog*, *Oct-4* and *Sox-2A* but not *Sox-2B*. In amniotic fluid cells, all four transcriptional factors *Nanog*, *Oct-4*, *Sox-2A* and *Sox-2B* were expressed in cells from P2 to P15. *Nanog* and *Sox-2A* genes have been expressed between P2 and P30 in fetal explants cells. The band intensity based expression level of *Sox-2B* was higher from P2 to P25 but low at P30. *Oct-4* was expressed at P5 to P15 but no expression was found at P20, P25 and P30. ß-actin and GAPDH were used as house keeping genes in all experiments as control. The expression of all these genes at later passages is in progress. Characterization of cells from amnion, amniotic fluid and fetal explants established their pluripotency by the expression of marker genes at different passages. These cells differentiate after several passages and change their morphology.



Cord Matix P5 Alkaline Phosphatase +ve cells



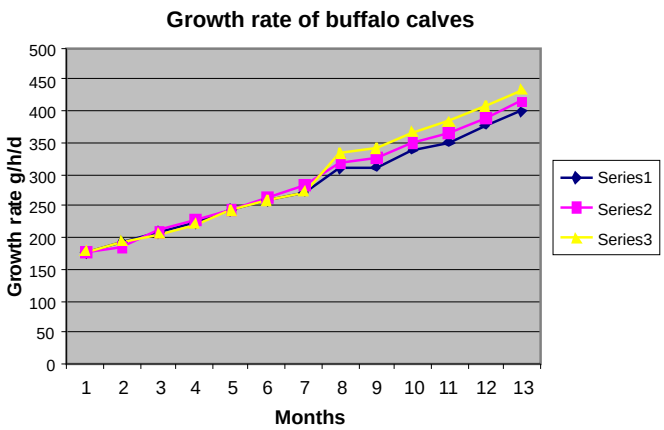

FEED RESOURCES UTILIZATION AND IMPROVEMENT

The balanced nutrition is an indispensable part of animal nutrition to improve productivity. The limited feed resources that too of lower quality available in our country are affecting the nutritional status of livestock. The growing feed shortage due to lack of well managed pastures, shrinkage of area under green fodder cultivation and diversion of grains for bio-fuel production pushing the feed cost higher and higher. Therefore, development of economic and balanced ration for different categories of buffaloes is important through: Strategic supplementation of bypass nutrients, evaluation of locally available feeds and agro-industrial byproducts and newer feed resources including the unconventional by-products.

LIMITING AMINO ACIDS SUPPLEMENTS: GROWTH OF MALE BUFFALO CALVES

The protein is usually deficient in lysine (on cereal based protein diets) and methionine (legume or animal-based proteins diets). An alternate strategy is to feed rumen undegradable protein sources with complementary amino acids, which may improve overall amino acids supply to the small intestine. The experiment was designed to study the "Effect of incorporation of limiting amino acids rich supplements on growth and maturity of male buffalo calves ". Eighteen buffalo calves of about one and a half year were divided into three groups of 5 each on the basis of their body weight and age. All the calves were given wheat straw + 10 kg green and concentrate mixture as per their requirement.

In group-II and III the protein source in the concentrate mixture were replaced by limiting amino acids rich sources i.e. sunflower cake and mixture of sunflower cake and cotton seed cake. The management conditions were same in all the groups. The experiment lasted for 14 months. The DM intake in all the



groups (2.81, 2.87, 2.74 kg per 100 kg body weight) remains same and the growth rate in all the groups also remains same and the values for three groups were 526, 558 and 562 g/h/day. Further analysis of growth data revealed that the growth rate was lowest during the third quarter i.e July to September of the year in all the groups. The digestibility of nutrients varied in a very narrow limit and the differences were non significant. The maturity age of the calves was judged by noticing the bulls' sexual behaviour i.e when they started mounting each other. At the age of about 24 months the calves started mounting others but the first semen was donated at the age of 32 months. The semen characteristics i.e. colour, volume and sperm concentration were analysed to compare the semen quality of the bulls in different groups. The colour of the semen was creamy, lemon and the volume (ml) was 1.97, 2.22 and 2.24 and the values for sperm concentration were (million/ml) 641.30, 596.92 and 661.3.

RAISING BUFFALO CALVES ECONOMICALLY FOR MEAT PRODUCTION

India has become the largest exporter of buffalo meat in the world market. But the main constraint to this industry is that raising buffalo calves is a costly affair. The main thrust is to reduce the cost of production by using unconventional and cheaper feed resources. The spent wash a waste of fermentation industry is available free of cost and can easily replace 50 percent of concentrate mixture in the ration of growing buffalo calves when fed in the form of Sanni with wheat straw without effecting nutrient utilization and meat quality of male buffalo calves slaughtered at beef age with no adverse effect on their health.

FILTER PRESS MUD WASTE

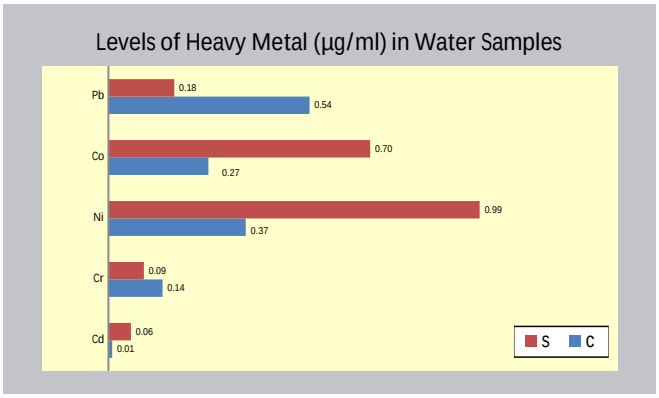
Filter press mud waste (FPMW), a byproduct of sugarcane industry, popularly known as 'Maili'.It was found to contain about 20 percent CP, 5-6 percent EE, 7-8 percent CF, 20 percent ash and 7-8 percent AIA content and rich in essential minerals, when analysed in laboratory. Its cost at the sugar mill is 15/- quintal + transportation cost. Effort was made to partially replace the conventional concentrate mixture with FPMW, to make the ration economical.

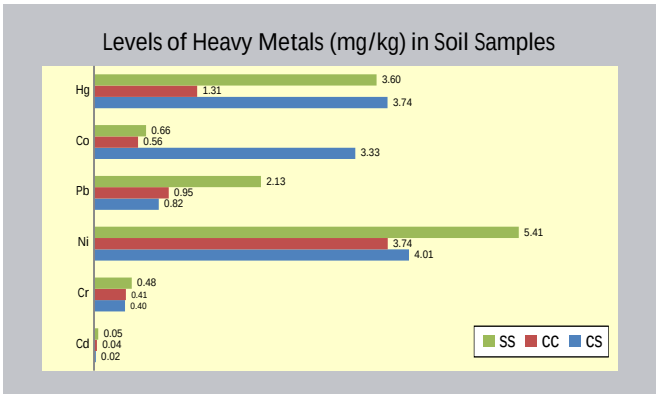
Its dry matter percent is about 30-40 percent when procured. Sun dried to a level of 70-80 percent DM, it was fed gradually to a level of 30-40 percent of concentrate mixture and fed initially in the form of Sanni, but later it was fed as part of the concentrate mixture. Feeding schedule was standardized in actual feeding experiment. Fifteen growing buffaloes 1-11/2yrs age divided in to three groups of five each. One control group fed normal farm ration and other two groups T-1 and T-2 fed filter press at two levels (20 & 40 percent) in the concentrate mixture. Feeding and growth trial continued for six months and digestibility trial done at the end. It was observed that the test material is sweet in taste but requires initial adaptation period. Compositional analysis of FPMW was comparable to concentrate mixture in terms of CP and EE, but found high in Crude fibre and ash content. During six months growth trial, a growth rate of 500g/h/d was recorded in all the groups. FPMW was found to be free from pathogenic bacteria like Salmonella and E. coli. Although there was no ill effect of feeding this FPMW on health of these animals however their was significant depression on the digestibility of nutrients like CP,EE,CF and DCP intake in the animal of group-III fed FPMW to the level of 40 percent of concentrate mixture. Depression in digestibility needed further investigation. Another long term feeding experiment was conducted on male buffalo calves at 25 percent inclusion of FPMW in the concentrate mixture. Further studies on semen quality and other biochemical parameters in blood of these animals are in progress.

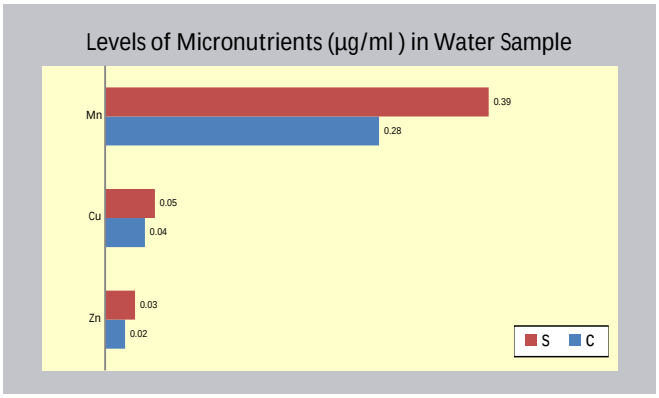
ENVIRONMENTAL POLLUTANTS & TOXICANTS: FEED QUALITY AND SAFETY

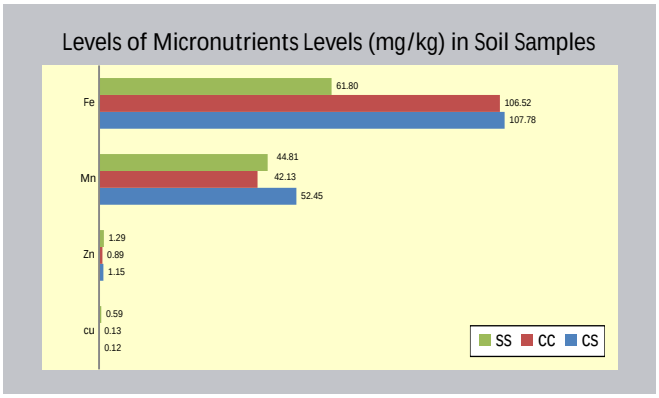
Studies were conducted on various parameters related to nutritional and anti-nutritional qualities of sorghum crop when irrigated with canal and sewage water in sixteen plots selected randomly. Analysis of samples of sewage and canal water used for irrigation of fodder was carried out. Analysed soil samples for their physico-chemical properties (soil quality analysis). Proximate analysis of fodder grown under sewage irrigation and canal irrigation was analysed and comparison of the same using statistical tools is in progress. The fodder samples were collected and analysed for the presence of heavy metals also. Significant differences in the two groups were observed for many of the metals. A relationship is being determined between the quality of irrigation water, soil and plant material. All the minerals estimated were marginally higher in sewage water samples compared to canal water and were found to be statistically different. Numerically the manganese concentration was very high in sewage water as compared to canal water. Cobalt, Nickel and Cadmium were high in sewage water whereas Lead and Chromium were high in canal water. Statistical analysis clearly shows that the differences were significant for all the metals.

Iron content was found to be higher in the soil samples which were irrigated with canal water. While concentration of manganese and zinc were only slightly different in soil samples and were statistically same/equal ($p<0.05$). So far as copper concentration is concerned the soil irrigated with sewage water showed higher levels and were statistically different at 0.5 percent level of significance. In all the samples where the irrigation was done by sewage water, immaterial of whether it was irrigated previously with canal or sewage water, showed higher concentration of heavy metals. The differences were significant for all the metals at 5 percent significant level except for chromium where no significant difference was observed.









AREA SPECIFIC MINERAL MIXTURE: REPRODUCTIVE PERFORMANCE

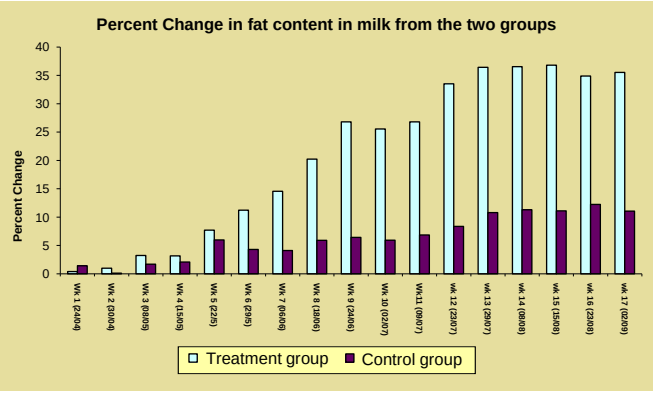
Twenty four animals of twelve animals in control and 12 in treatment group were selected randomly in Village Juglan. The ASMM was fed @ 50-60 g/day in concentrate mixture in the treatment group in addition to the normal feeding practices being adopted by the farmers. The trial was conducted for the period of six month and animals were observed regularly for their reproductive and production performances. A significant difference was observed between the two groups i.e. Control and Treatment in relation to their heat symptoms, cyclic changes and conception rate. It was observed that 75 percent of reproductive problems are due to deficiencies of essential minerals and can be overcome by supplementing ASMM. Average treatment time taken by animal showing no or silent heat to become normal cycler is 30.5 days. 50 percent of animals conceived after 21 days of feeding ASMM while 75 percent of animals conceive after 42 days of feeding. Number of AI per conception reduced significantly in the treatment group (2.7 AIs) as compared to the control group (4.5 AIs). The cost of feed per kg milk production was reduced by 0.45 rupees. Gain of Rs. 4400 per animal in a six months trial was observed due to increased milk production and indirect monetary gain of Rs. 6000 can be realized on account of improved reproductive performance by ASMM supple-mentation. Further efforts have been made to commercialize the technology. Selling of ASMM has been started from the institute at no profit no loss basis.

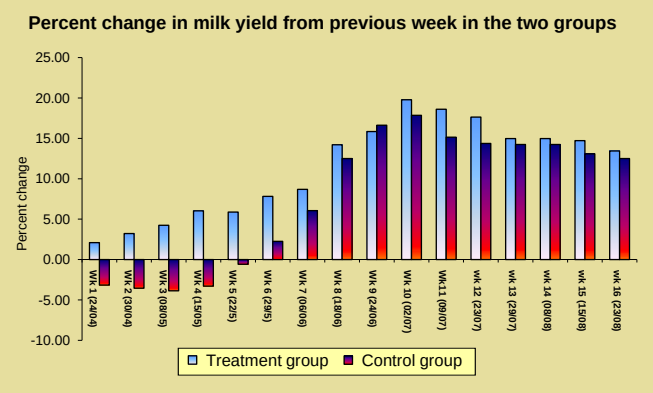
Scientists interaction with buffalo owner

SUPPLEMENTATION OF PROTECTED FAT ON HIGH YIELDING BUFFALOES

Under the AICRP on "Improvement of feed resources and nutrient utilization for raising animal production", where the NIANP is its coordinating unit; the technical programme given to this Institute was to carry out studies on feeding of bypass nutrients to milch buffaloes at field level. Accordingly an experiment on twenty high yielding buffaloes (Milk Yield > 8 Kg) in two groups divided randomly was conducted for supplementation of protected fat under field conditions in some dairies at Dabra Chowk, Hisar. The supplementation started from 3-4 months of lactation and the experiment was conducted for about four months. The encouraging results were obtained where it was observed that the milk fat increased considerably in the treatment group as compared to that of control group. Also, the drop in milk yield during the summer months was reduced significantly in treatment group.

Another experiment of supplementation of protected fat on high yielding buffaloes has been initiated where feeding started one prior to expected date of calving initiated in the small buffalo owners in the mill gate area of Hisar. Various parameters on production and reproduction performance are being recorded and analysed. The trial is to be carried out for whole lactation. Farmers/Buffalo Owners interaction meet was organized on March 15, 2010 and were informed about the recent advances in buffalo husbandry of high yielding buffaloes particularly the feeding schedules. The benefits of feeding protected fat to the pregnant animals were also briefed.





EVALUATION OF MFSH-4 MULTICUT SORGHUM FODDER

Fodder production is the backbone of dairy industry in India. Dairy farmers profit depends on the production of quality fodder at any farm. A good quality fodder will increase the profitability of the farmers. Many variety of fodder particularly sorghum are available in the market. Farmers are uncertain to select the right variety. This study is being undertaken to give clear cut understanding about the performance of commonly available varieties of sorghum. Under the Institute-Industry parternership between CIRB Hisar and Maharashtra Hybrid Seeds Company Ltd Mumbai to conduct research on the project titled," :"Evaluation of MFSH-4 multicut sorghum fodder for production potential in comparison to other popular available sorghum varieties in the market".

ISOLATION AND MOLECULAR CHARACTERIZATION OF SUPERIOR FIBRE DEGRADING ANAEROBIC FUNGUS

Under the project 176 strains of anaerobic fungi were isolated from faeces of different domestic and wild ruminants from different locations of India. The fungal isolates were evaluated for fibrolytic potential in axenic culture as well as in association with mixed rumen microbes of buffaloes. Superior isolates were characterized at molecular level by sequencing of its region and genes of different fibrolytic enzymes. A protocol was developed for encapsulation of strict anaerobic fungi for delivery of fungal inoculums as feed additive at farmers' door. Dosing of superior isolates in growing buffaloes at the rate of

Colony of an anaerobic fungal isolate belong to predominant genus *Orpinonyces* from rumen of buffalo

200 ml culture per week per animal resulted in stimulation of growth rate (20-30 percent increase) and digestibility of straw and rumen fibrolytic microbes but the effect subsided rapidly in post dosing period. Some protocols for preservation of anaerobic fungi were also developed.

PREDOMINANT CULTURABLE FIBROLYTIC FUNGI IN BUFFALO RUMEN

Under the project optimum culture condition for different genera were evaluated. Predominant culturable fungi in different diet and also under different stages of rumen fermentation are being evaluated by culture method and also for straw rich diet employing molecular biology approach.

RUMEN MICROBIAL DIVERSITY: IMPACT OF ADDITIVES ON METHANOGENESIS AND UTILIZATION OF POOR QUALITY FIBROUS FEEDS

About 25 fibre degrading bacteria were isolated from buffalo rumen and evaluated for ability to degrade wheat straw and produce fibrolytic enzymes in pure culture and in association with mixed rumen microflora of buffaloes. About 14 strains of sulphate reducing bacteria (SRB)were isolated and evaluated for ability to reduce methane production by mixed rumen fluid of buffaloes. Some of the SRB isolates reduced methane emission by 40 percent and hence looks promising. SRB isolates were characterized by sequencing of 16S ribosomal DNA and sequencing of dissimilatory sulphite reductase gene. In order to study diversity of fibre degrading microbes of buffalo rumen, DNA from rumen enrichment cultures were PCR amplified for 16S rDNA and cloned and sequenced. Analysis of sequence of over 100 clones indicated predominance of Prevotella in enrichment culture of fibre degrading microbes in buffaloes. Similarly, diversity of methanogenic archea are being studied by molecular biology approach.

RUMEN ECOSYSTEM AND ITS MANIPULATION IN BUFFALOES

The rumen is still considered as a 'black box' more so in buffaloes. Therefore, the project aims to gain and further improve the understanding of factors which control digestion and metabolism in the ruminant animals especially buffaloes on common farm rations with reference to the activities and contribution of three groups of microbes. During the period under report the project has been planned and discussed. Necessary background data 1 information have been gathered/analyzed. It is contemplated to proceed with the *in vitro* experiments.

AMELIORATIVE MEASURES ON PRODUCTION AND REPRODUCTION FOR NILI-RAVI BUFFALOES

A large amount of data have been generated on feed intakes, live weight gains, various physiological (haematological, biochemical, hormonal profiles) and reproductive aspects of animals and inferred that the various summer and winter stress ameliorative measures helped in improving productive and reproductive performance of animals. This was also reflected to some extent in the values of various parameters during the study.

BUFFALO MANAGEMENT PROGRAMME

EVALUATION OF SEMEN MICROBIAL LOAD: IMPACT ON SEMEN QUALITY PARAMETERS IN BUFFALO BULLS

Semen samples were collected from five buffalo bulls and subjected to assessment of microbial load and semen quality parameters at different stages, *viz*. fresh ejaculates, following equilibration of diluted semen and 7 days post-cryopreservation. Microbial load of semen samples was estimated by standard surface viable count procedure at corresponding stages. Ten-fold serial dilutions of samples in 0.9 ml aliquots were prepared with sterile 0.85 percent Normal Saline Solution (NSS) and inoculated in triplicate on Plate Count Agar. The plates were incubated aerobically at 37ºC for 72 hrs and Standard Plate Counts (SPCs) were determined and expressed as mean CFU ml^{-1} of neat or extended semen. Loopful of samples were also inoculated on 5 percent sheep blood agar. Predominant morphologically distinct colonies growing on blood agar or plate count agar were picked up at random and preserved in glycerol at -80ºC. Identification and characterization of these purified isolates was done. Different semen quality parameters, *viz.* sperm viability, motility, straightness and linearity, *etc*. were assessed using CASA (Computer-assisted sperm analyzer) at corresponding stages to perceive the impact of microbial load on aforesaid parameters. An assessment of comparative efficacy of semen processed either with egg-yolk-glycerol-tris based extender (EYGT) containing penicillin and streptomycin or a commercially available animal-protein free (CAPF) readymade extender containing Gentamicin, Lincomycin, Tylosin and Spectinomycin was done. Statistical analysis of the data was done by independent t-test, ANOVA and correlation using SPSS software to draw inferences.

Enumeration of microbial load of semen was performed in a total of 9 replicates pre-freezing and 7 replicates post-freezing from five different bulls diluted either with EYGT or CAPF extender. High levels of microbial counts were encountered in neat semen and were found to be considerably reduced after equilibration step before freezing of samples. The counts further reduced in frozen thawed samples.

PRE- AND POST-FREEZING MICROBIAL LOAD (MEAN CFU ml^{-1}) OF NEAT/EXTENDED SEMEN

Bull No.	Fresh Ejaculate	Before Freezing		Post Freezing	
		EYGT	CAPF	EYGT	CAPF
3267	$17.71x10^5$	$8.77x10^4$	$1.15x10^5$	$1.9x10^5$	$1.0x10^5$
3267	$6.46x10^5$	$2.06x10^4$	$2.51x10^4$	$0.92x10^4$	$0.24x10^4$
3255	$15.80x10^5$	$1.88x10^5$	$5.40x10^4$	$4.55x10^3$	$5.1x10^3$
3267	$3.6x10^5$	$2.5x10^4$	$3.76x10^4$	ND	ND
3226	$8.34x10^4$	$2.46x10^4$	$5.64x10^4$	$5.2x10^3$	$4.32x10^3$
3255	$2.24x10^5$	$1.52x10^4$	$8.25x10^3$	$8.1x10^3$	$9.05x10^3$
12	$7.4x10^4$	$9.8x10^3$	$5.85x10^3$	ND	ND
3255	$1.08x10^5$	$2.7x10^3$	$1.57x10^2$	$4.91x10^3$	$3.43x10^3$
3591	$7.3x10^4$	$3.36x10^3$	$3.3x10^3$	$3.35x10^3$	$2.28x10^3$

CASA-BASED COMPARATIVE EVALUATION OF SPERM PARAMETERS BEFORE AND AFTER-FREEZING WITH TWO EXTENDERS				
Parameter	Before Freezing (n=9)		Post-Freezing (n=7)	
	EYGT	CAPF	EYGT	CAPF
MOT (percent)	69.00±4.60	78.11±3.01	51.57±4.68	48.71±6.82
Prog MOT (percent)	43.77±4.28	57.22±2.77	27.57±4.19	26.28±5.89
Rapid MOT (percent)	62.00±4.81	72.33±3.51	44.00±4.89	41.00±6.98
Slow MOT (percent)	13.22±2.45	7.11±0.42*	16.71±1.87	16.57±1.58
VIA (percent)	89.59±1.92	85.75±2.64	64.71±4.38	62.01±5.50
VCL (μm sec^{-1})	161.11±5.36	166.50±8.65	143.87±10.52	139.20±10.52
ALH (μ)	6.11±0.23	6.26±0.27	5.85±0.31	5.71±0.49
BCF (Hz)	28.48±2.23	31.52±2.30	33.04±1.10	35.44±1.44
STR (percent)	83.11±1.35	85.33±0.89	83.14±0.70	84.28±1.24
LIN (percent)	56.55±1.80	54.33±1.67	54.28±1.18	55.71±2.22
SPC (CFU ml^{-1})	41884.44±20154.51	33961.89±12415.40	32187.14±26313.69	18082.86±13680.34

*Values differ significantly at (P<0.05)
EYGT – Egg yolk-Glycerol-Tris Extender, CAPF – Commercial Animal Protein Free Extender, VCL – Track Speed/Critical Velocity/Curvilinear Velocity, ALH – Amplitude of Lateral Head Displacement, BCF – Beat Cross Frequency, STR – Straightness, LIN- Linearity, MOT – Motility, ProgMOT – Progressive Motility, RapidMOT - Rapid Motility, SlowMOT – Slow Motility, VIA – Viability, SPC – Standard Plate Count

Samples were compared by computer-assisted sperm analysis to judge differences in the mean values of semen quality parameters observed in two groups at corresponding stages of freezing. Table below shows a comparative evaluation of seminal quality attributes between semen based on two types of extenders. A perusal of table indicates that there was no significant difference between EYGT and CAPF extender in pre-frozen (following equilibration of diluted semen) except with respect to slow motility. However, there were no significant differences in the values between two groups post-freezing. Mean pre-freezing microbial load in semen for EYGT and CAPF was 41884.44±20154.51 and 33961.89±12415.40 CFU ml^{-1}, respectively, which however, didn't differ significantly.

Correlation between microbial load and different semen quality parameters with respect to two extender groups pre- and post-freezing of semen is shown in the table. No significant correlation was found between Standard Plate Count and semen quality parameters. Pre-freezing non-significant negative correlation of microbial load was observed with viability, track speed and ALH in both the groups while post-freezing non-significant negative correlation was observed only with slow motility.

CORRELATION OF MICROBIAL LOAD WITH SPERM QUALITY PARAMETERS BEFORE AND AFTER FREEZING EMPLOYING DIFFERENT EXTENDERS				
Parameter	Before Freezing (n=9)		Post-Freezing (n=7)	
	EYGT	CAPF	EYGT	CAPF
MOT (percent)	.117	-.185	.476	.494
Prog MOT (percent)	.354	-.101	.574	.310
Rapid MOT (percent)	.220	-.219	.509	.035
Slow MOT (percent)	-.192	.319	-.514	-.466
VIA (percent)	-.191	-.041	.572	.619
TrackS (μm sec^{-1})	-.307	-.453	.394	.326
ALH (μm)	-.485	-.474	.352	.025
BCF (Hz)	.443	.488	-.243	.551
STR (percent)	.416	.549	.185	-.316
LIN (percent)	.156	-.235	-.055	-.213

A total of 13 purified bacteria isolated from freshly ejaculated semen were finally subjected to characterization. The bacteria identified belonged to the genus *Kocuria* spp., *Bacillus* spp., Atypical *Rhodococcus equi*, *Staphylococcus auricularis*, *Moraxella bovis*, *Staphylococcus chromogenes*, *Staphylococcus simulans* and *Enterobacter* spp.

DEVELOPMENT OF TRAINING MODULES FOR PROMOTING BUFFALO ENTREPRENEURSHIP

Four training programmes were organized during the period under report followed by pre and post evaluation. Training need score of respondents was elicited by seeking their response on three point continuum on the contents of training programme. It was seen that identification of heat symptoms in buffaloes (2.66) followed by balanced feeding for different categories of buffaloes (2.58), colostrum feeding in calves (2.54), management of buffaloes in winter and summer (2.48), mastitis and milk fever etc. ere considered most serious by the respondents. The data were further subjected to in depth analysis and logistic regression analysis was done to find out the impact of training programme on the pre and post

knowledge of respondents. The results indicated that there was significant gain in knowledge as indicated by the chi-square values of 60.01. It was further seen that extension contact and media exposure contributed significantly in measuring knowledge of respondents. In order to find out variation in the knowledge of respondents' independent variables, Friedman's two-way non parametric ANOVA was done. It was found that the younger respondents and the respondents with higher extension contact differed significantly with regard to their knowledge of improved buffalo husbandry practices.

MONITORING OF SOMATIC CELLS IN MILK OF NILI-RAVI BUFFALOES

The mean values of SCC for morning and evening during all the seasons were 1.18 and 1.15 x 10^5, respectively. The mean values during the hot humid period, were 1.42 and 1.37 x 10^5 cells / ml. Parity-wise value for SCC were higher for buffaloes in 3rd to 5th parity as compared to the young buffaloes in first to second lactation and older buffaloes i.e. 6th and above lactation. As regard stage of lactation buffaloes in early and late lactation had higher number of SCC than in mid lactation. SCC were low during the cool period (0.77x 10^5), and hot dry season (1.03 x 10^5) and was high during the hot–humid season (1.42 x 10^5), which differ significantly between hot-humid and hot dry / cool period. On an average, SCC recorded were 1.0 x 10^5 cells / ml of milk irrespective of time of milking, parity, stage of lactation and season. Higher count of SCC during the hot humid period indicates that the buffaloes are more prone to sub-clinical and clinical mastitis. Higher SCC during hot-humid period results in lower milk yield and has indirect positive effect on milk production and milk composition.

To investigate the effect of vitamin and mineral supplementation, trial was carried out on twenty four pregnant buffaloes in advance stage of pregnancy. They were supplemented with Vitamin E and selenium from 30 days before prepartum to 60 days after calving during hot humid season. Buffaloes were supplemented with Vitamin E 450 IU and 0.6 ppm selenium per buffalo prepartum and 150 IU vitamin E and 0.2 ppm selenium after calving during hot humid period. No difference was found for DMI and BW between non-supplemented and supplemented group of buffaloes. SCC except just one week after calving was significantly lower in the supplemented group than the non-supplemented group of buffaloes. Study reveals that supplementation of Vitamin E and selenium is efficient in lowering the SCC during stressful environment of hot humid period.

MID-TERM REVIEW MEETING OF NETWORK PROJECT ON BUFFALO IMPROVEMENT

The mid-term review meeting of Network Project on Buffalo Improvement was held on December 5, 2009 at CIRB, Hisar under the chairmanship of Dr CS Prasad, Assistant Director General (AP&B) / (AN&P), ICAR. Dr Vineet Bhasin, Principal Scientist (AG&B) ICAR, also participated. Dr CS Prasad in his inaugural address expressed satisfaction over the progress of various Buffalo Network centres. Dr RK Sethi, Director CIRB and PC (B) presented the brief technical programme, progress, achievements, financial sanctions of the project and release of funds to all the centers during the XI Plan as well as during the year 2009-10.

DEVELOPMENT OF TECHNOLOGIES AND THEIR TRANSFER TO END USERS

PRODUCTION AND MAINTENANCE OF SUPERIOR GERMPLASM DISSEMINATION OF NILI RAVI BULLS

Murrah and Nili-Ravi bulls of high genetic potential are bred at the Institute and its Sub Campus, Nabha. Young bull calves are selected on the basis of dam's milk yield and reared under intensive management system. The production potential of bulls is evaluated through progeny testing. The Institute has so far sold more than 432 Murrah bulls and 226 Nili-Ravi bulls of high genetic merit to village Panchayats and developmental agencies. These are expected to contribute towards overall improvement.

IMPROVED PROTOCOL FOR FREEZING OF BUFFALO SEMEN

A simple, reliable and economical method for freezing of buffalo semen has been developed. The improved procedure has been shown to be effective even to freeze the static ejaculates successfully a phenomenon specific to buffaloes which greatly reduces the efficiency of utilization of buffalo semen for artificial insemination.

EMBRYO TRANSFER TECHNOLOGY FOR BUFFALOES

Efforts have been made in developing and improving the embryo transfer technology for buffaloes which has resulted in the production of 16 calves at this Institute. Technology for large scale production of *in-vitro* matured and *in-vitro* fertilized embryos using slaughter house ovaries has been developed. Future projections include production of calves out of IVM/IVF embryos and embryo micromanipulation. The embryo cryopreservation technique has also been standardized.

TECHNIQUE FOR *IN-VITRO* MATURATION AND FERTILIZATION OF BUFFALO OOCYTES

For rapid multiplication of superior female germplasm in buffaloes, the technique of *in-vitro* fertilization has the potential. This technique has been standardized for *in-vitro* maturation of oocytes obtained from abattoir ovaries followed by their *in-vitro* fertilization and culture of the resulting embryos to transferable stage. The technique will be of immense use for faster multiplication of elite germplasm and progeny testing of bulls after collecting oocytes from live animals.

SEXING OF IVF PRODUCED BUBALINE EMBRYOS USING PCR METHOD

Sexing of *in-vitro* produced embryos was successfully done with PCR technique using bovine primers. Micromanipulation of the embryos was done for obtaining biopsy for sexing.

APPLICATION OF ULTRASONOGRAPHY FOR DIAGNOSIS AND MONITORING OF OVARIAN ACTIVITY

The non-invasive technique of ultrasonographic scanning was used for diagnosis of ovarian activity in pre-pubertal heifers, peripubertal heifers and parous buffaloes. The technique is very useful for detecting follicular dynamics and luteal structures in ovaries.

With the use of this technique, time of ovulation following estrus induction and synchronization therapy can be predicted very precisely to allow fixed time insemination without the need for estrus detection. This resulted in high fertility at induced estrus in anoestrus buffaloes and buffalo heifers. The technique proved very useful in modifying the conventional treatment protocols according to the pre-treatment ovarian picture for obtaining maximum success rates for induction of estrus.

SONOGRAPHY TECHNIQUE FOR EARLY PREGNANCY DIAGNOSIS AND FETAL SEX DETERMINATION IN BUFFALOES

Sonographic technique was used for confirmatory diagnosis of pregnancy in buffaloes as early as 25 days post-insemination. Furthermore, fetal sex determination was made at day 55 postinsemination based on the location of the genital tubercle.

ESTIMATION OF GESTATIONAL AGE IN BUFFALO

By ultrasonography fetal age can also be assessed accurately that is useful in better management of pregnant buffalo at the time of calving. The length of gestation in buffalo can be estimated by the following standard chart that is plotted for crownrump length of buffalo fetus on different days postinsemination. When this plot was used for determining the age of fetus in pregnant buffaloes of unknown mating, the exact date of mating (±2 days) could be predicted using this chart.

OVSYNCH PLUS PROTOCOL FOR OESTRUS INDUCTION IN BUFFALOES

Anestrus, either in pubertal heifers or in postpartum buffaloes, is the primary cause for low reproductive output of buffaloes. Anestrus is the state of ovarian acyclicity, reflected by complete absence of sexual activity, with no manifestation of estrus signs. The condition is associated with the presence of static ovaries, and though follicular development may occur, none of the ovarian follicles becomes mature enough to ovulate. In anestrus animals, dominant follicles (DF) underwent atresia instead of ovulations, possibly due to inadequacy of preovulatory LH surge. Analysis of ovarian response of anestrus buffaloes to 'Ovsynch' protocol revealed that only the buffaloes with a large DF (>9mm) at the time of first GnRH injection respond well to this treatment.

However, such an accurate assessment of follicular size is difficult under field conditions with routine per-rectal palpation. Hence, to ensure consistently similar ovarian follicular picture of all anestrus buffaloes at the time of first GnRH injection, we developed a new protocol and named it 'Ovsynch Plus'. In this protocol, an injection of PMSG is administered 72 h prior to first GnRH injection of Ovsynch treatment, in order to support ovarian follicular development so that at least one large follicle is available 72 h later for responding to the first GnRH injection with ovulation/ luteinization. Resulting luteal structure in the ovary is subjected to luteolysis by PGF given 7 days later. Further PGF_2 administration of GnRH ensures synchronous ovulations of preovulatory follicles to allow fixed time insemination of treated animals.

INDUCTION OF LACTATION IN INFERTILE BUFFALOES

Farmers rear the dairy animal for milk production and livelihood are commonly facing the problems of conception failure, long calving interval, anoestrous, cystic ovaries, non specific abortions and repeat breeding. They can benefit from the technique by inducing such animals into lactation and reduce herd culling losses and replacement costs by this therapy. The buffalo is weighed and appropriate dose of hormones, Estradiol-17β and progesterone (Sigma Chemicals Company, USA), each @0.1mg/ kg body weight / day is calculated for seven days therapy. The hormones are dissolved in 7 ml absolute ethanol each and stored in separate tubes. On the day of treatment, 1 ml of each hormone solution is mixed together and 1ml of this mixture is administered in the morning and evening at an interval of 12 hours subcutaneously. Site of injection is kept alternating from left to right side in the prescapular region. The injection schedule is repeated for seven consecutive days. Thereafter, on day 17, 19 and 21 of treatment, 10 ml Largectil injection and on day 16, 18 and 20, injection of 20 mg of Dexamethasone are also given intramuscularly. From 15th day onwards upto 21st day of the start of treatment, udder massage is given for fifteen minutes each in the morning and evening daily to simulate milk let-down. This practice is followed till the udder is turgid with milk, which is usually around 21st day of treatment, when milking is

started. The milk becomes normal in physical and chemical properties within 10 – 15 days of start of milking and the amount of milk yield increases with time. Almost 60-75 percent of the buffalo's milk yield potential can be achieved following induced lactation.

COLOSTRUM FEEDING FOR HIGHER GROWTH AND BETTER CALF SURVIVABILITY

Higher levels of absorbed immunoglobulins within 16 h of birth reduce the mortality in calves and result in faster growth rate by 20-22 percent. High titre of circulating immunoglobulins in calves at an early age of 24 h showed the association with weight gain upto the age of 2 years. Status of immunoglobulin levels at such an early age could also predict the health status of calves. A critical level of these blood proteins required for the survival of calves has been assessed.

SUPPLEMENTATION OF ANTIOXIDANTS FOR HIGHER IMMUNOGLOBULIN PRODUCTION AND ABSORPTION

The nutritive value of low-grade roughages and straws available in the country can be improved if these straws are given 4 percent urea treatment at 35 percent DM and 65 percent moisture and are ensiled / stacked for a minimum period of 30 days. These can become a complete maintenance ration when fed *ad-lib* alongwith 3-5 kg green fodder, 50 g mineral mixture and salt each to the adult buffaloes. Protein content of straw is raised from 3.0 to 7.0 percent and energy content in terms of TDN (Total Digestible Nutrients) is raised from 40 to 50 percent. The technique involves : 4 kg urea dissolve it in 200 liters of water and spray it on one quintal of wheat straw and mix it thoroughly just like Sanni is prepared by the farmers. In this way urea treated straw can be ensiled for 30 days. Open the pit after 40 days or stack after 10 days and straw is ready for feeding to adult animals. By feeding ammoniated wheat straw *ad-lib* + green berseem *ad-lib* + 1.5-2.0 kg available grinded cereals like wheat/barley/maize, a body weight gain of 500-600g/h/d can be obtained in growing buffalo calves (6-12 months) and this technology can easily be adopted by the farmers.

CONSERVATION OF GREEN FORAGES AS HAY OR SILAGE

The commonly grown fodders in India are legumes like berseem, lucerne or cowpea and non-legumes i.e. maize, bajra (pearl-millet), sorghum, oats, barley, guinea grass, rye grass, napier grass etc. Legumes are recommended for hay making, whereas, nonlegumes are preferred for silage making.

HAY-MAKING

The available legume crops have sufficient protein content and they can be conserved by drying carefully into good quality hay which can replace the costly concentrate mixture in the growing and lactating buffaloes. The main legume crop is the berseem, which is surplus with the farmers in the month of March and April particularly in Northern India.

SILAGE MAKING

Silage is generally prepared by wilting non-legume forage crops in the field and then chaffing (if required) the material at 35 percent DM. The fodder is pressed thoroughly and covered properly to create anaerobic environment. The silage is ready after 40 days and has the same nutritive value as the green crop.

UROMOL PREPARATION

Uromol is a compound prepared by heating urea and molasses in the ratio of 1:3 and then mixing it with equal amount of wheat bran/deoiled rice bran. Four kg urea along with 12 kg molasses is slowly heated in a container for 30 minutes. Then equal amount (16 kg) of wheat bran or deoiled rice bran is mixed in it and the mixture is cooled to room temperature. This material contains 36 percent DCP and 72 percent TDN and can replace conventional compound feeds in the ration of buffaloes yielding 8-10 litres milk/day.

UREA MOLASSES MINERAL BLOCKS (UMMB)

Urea molasses mineral blocks are prepared in the same way as Uromol, except with the addition of mineral mixture, salt and binder. By *ad-lib* feeding these blocks along with other feed ingredients, about 20 percent of the conventional concentrate mixture can be saved. UMMB prepared by the 'cold process' technology has yielded even better results.

AREA SPECIFIC MINERAL MIXTURE

Surveys of feeding practices carried out in the villages of Hisar district revealed deficiencies of essential minerals like calcium, phosphorus, zinc and manganese in 70 percent buffaloes. These buffaloes were given specially developed mineral mixture in their ration. Seventy per cent of the buffaloes conceived within a period of 2-4 weeks after feeding area specific mineral mixture.

SUPERIOR ISOLATES OF ANAEROBIC FUNGUS

Superior isolates of anaerobic fungus isolated and evaluated for ability to increase in vitro digestibility of straw by buffalo rumen micro flora when added to buffalo rumen liquor. Such isolates have potential for use as feed additives.

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सुशील कुमार फुलिया (2010) भैंसों में ब्यांत सम्बन्धी समस्याएं और समाधान। 9 फरवरी 2010 सायं 6:00 बजे। आकाशवाणी हिसार।

PRESENTATION IN CONFERENCES/ SYMPOSIA/ SEMINARS/OTHER

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Yadav PS (2009). Reproductive biotechnologies in Buffaloes. Proceedings "Indo- China Symposium" Central Institute for Research on Buffaloes, Hisar, October 19-20, p 24-46

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Yadav SP, Blassy Thomous M, Mathew Jancy, Jeyakumar S, Kundu A and Jaisunder Characterization of LH and FSH genes in indigenous goats of Andaman and Nicobar Islands (2010). National Symposium on *"Challenges in Domestic Animal Biodiversity and Action Plan for its Management and Utilization"* - SOCDAB, Febbruary 10-11, Anand, Gujarat, p 211

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INVITED LECTURES

Das K S (2009) Effect of animal welfare activities on meat quality. Lecture delivered to theICAR sponsored Winter School on *"Recent developments in post-harvest processing and value addition to livestock produce"* organized by Division of Agricultural Structures and Environmental Control, Central Institute of Post Harvest Engineering and Technology, November 21 to October 11, p- 74-80.

Laharia SN, Dixit VB and Sarkar SK (2010) Buffalo Production in India: Existing situation, problem and prospects. Proceeding of the International Buffalo Conference *"Optimizing Buffalo Productivity through Conventional and Novel Technologies",* New Delhi, February1-4, Vol I, p 363-369.

Lal D. and Saxena N. (2009). Role and relevance of minerals in buffalo production under prevailing feeding conditions. In: Proceedings of *"Indo-China Symposium"* on Buffalo Production held at CIRB, Hisar from October 19-20, p 69-75

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Punia BS (2010). Ciliate fauna of the buffalo rumen and effects of its defaunation. Proceedings of International Buffalo Conference on *"Optimizing Buffalo Productivity Through Conventional and Novel Technologies"* New Delhi, February 1-4, Vol II, p 306-391

Sethi RK (2009). Buffalo breeding in India. In: Proceedings of *"Indo-China Symposium"* on Buffalo Production held at CIRB, Hisar from October 19-20, p 19-28

Sethi RK (2010). Progney testing for genetic improvement in buffalo. Proceedings of International Buffalo Conference on *"Optimizing Buffalo Productivity Through Conventional and Novel Technologies"* New Delhi, February 1-4, Vol II, p 85-97

Sharma RK, Singh JK, Phulia SK and Singh I (2009). Hormonal control of ovarian activity: therapeutic interventions. Lead paper delivered at *"Interactive Meet on Buffalo Reproduction"*, ISSAR-Central Institute for Research on Buffaloes, Hisar, June 27, p 46-55

Singh Birbal and Yadav PS (2010). The Pursuit and Promise of Stem Cell Research in Domestic Animals Applications in Bubaline Research, Production and Conservation. Lead Paper, Proceeding of the International Buffalo Conference on *"Optimizing Buffalo Productivity through Conventional and Novel Technologies",* New Delhi, February1-4, Vol I, p 198-204

Singh I and Sethi RK (2010). Bufffalo production systems in India. Proceeding of the International Buffalo Conference on *"Optimizing Buffalo Productivity through Conventional and Novel Technologies",* New Delhi, February1-4, Vol I, p 381-385

TRAININGS/EXPOSITIONS ATTENDED

Event	Venue	Name of Participants
Hindi Conference	Hindi Conference at IARI, New Delhi from April 13-15, 2009	Virender Singh
ANA World Conference	February 14-17, 2009 at NASC Complex, New Delhi	BS Punia SS Paul
Yak Husbandry : Challenges and Strategies	April 22-22, 2009 at NRCY, Diring, Arunachal Pradesh	SM Deb
Department of Science and Technology, Govt. of India	April 20 - May 1, 2009 at ASCI, Hyderabad	VB Dixit
Workshop on Design of Experiments	April 29, 2009 at IASRI, New Delhi	SK Sarkar
Refresher Course on Developing Winning Research Proposal in Agricultural Research	May 28 - June 6, 2009 at CCS HAU Hisar	SP Yadav
MDP on Public partnership for Innovation in Agricultural	July 20-24, 2009 at IIM, Lucknow	PS Yadav
Methodological Workshop on Impact Assessment of Improved Agricultural Technologies	August 26-28 2009 at PUSA, New Delhi	VB Dixit
MDP on Data Mining and GIS for Decision Support in Agriculture	August 31 - September 11, 2009 at IIM, Lucknow	SN Kala
ICAR Winter School on Bioinformatics & Application in animal Health and Veterinary Research	September 2-22, 2009 at TANUVAS Madras Veterinary College, Chennai	Thirumaran SMK
National Symposium on Conventional and New age breeding and Biotechnology for the livestock centric growth and livelihood security and X Annual Conference of ISAGB	November 20-21, 2009 at Madras Veterinary College, Chennai	SM Deb, Ghansham Singh, KS Das
International Conference on Nurturing Arid Zones for people and Environment Issues and Agenda for the 21st Century	November 24-28, 2009 at CAZRI, Jodhpur, Rajasthan	BS Punia VB Dixit
Winter School on Bio-Informatics	December 1-21, 2009 at Kerala Agricultural University, Kerala	SK Sarkar
X Annual Conference of the Indian Society of Animal Genetics and Breeding	November 27-28, 2009 at Madras Veterinary College TANUVAS, Chennai	SMK Thirumaran
XIII Biennial Conference of Animal Nutrition Society of India	December 17-19, 2009 at National Institute of Animal Nutrition and Physiology, Bangalore	Navneet Saxena
Buffalo Husbandry and Artificial Insemination	January 11, 2010 at CIRB, Hisar	Gopal Dutt Tiwari
Indo-China Symposium on Buffalo Production	October 19-20, 2009 at CIRB, Hisar	D Lal, BS Punia, Inderjeet Singh, SM Deb, SS Dahiya, VB Dixit, P Sikka, A Bharadwaj, Pawan Singh, PS Yadav, RK Sharma, Navneet Saxena, PC Lailer, G Singh, N Rana, SK Phulia, KS Das, SP Yadav, Ashok Kumar, S Khanna

Training Attended

Event	Venue	Name of Participants
International Buffalo Conference	February 1-4, 2010 at NASC Complex, New Delhi	D Lal, BS Punia, Inderjeet Singh, SM Deb, SS Dahiya, A Bharadwaj, Pawan Singh, PS Yadav, RK Sharma, Navneet Saxena, PC Lailer, Neeraj Rana, SK Phulia, Ghansham Singh, KS Das, SS Paul, Raman Malik, SP Yadav, SK Sarkar, AK Balhara, SMK Thirumaran, Dharmendra Kumar, Ashok Kumar, SK Khanna, SR Bhardwaj, Surender Singh, ML Sharma, Rajiv Mehta, TP Singh, AKS Tomer, Ashwani Saini, Anita Mann, Shamem Ahmed and Chandar Mohan
National Symposium on Challenges to Domestic animal Bio-diversity and Action Plan for Its Management and Utilization.	February 10-11, 2010 at College of Veterinary Science and Animal Husbandry, Anand Agricultural University, Gujarat	PS Yadav SP Yadav
ICAR Technology Management Meeting-cum-Workshop	March 26-27, 2010 IVRI, Izatnagar	VB Dixit Aneesh KV

TRAININGS CONDUCTED

Title	Duration	Trainee	Venue / Sponsored	Expert
Two Training Programme	June 1 - 30, 2009 July 1 - 3 & 13-31, 2009 August 1 - 5, 2009	All Group D (Non-Matric & Non-ITI) Staff of CIRB	CIRB, Hisar	BS Punia SM Deb
Field Experience Training	June 26 - July 16, 2009	6 Scientists of 86th FOCARS from NAARM, Hyderabad	CIRB, Hisar	VB Dixit A Bharadwaj SK Sarkar
Buffalo Husbandry	August 17-20, 2009	28 Farmers of Hisar District	PNB Sachha Khera, District Jind	VB Dixit RK Sharma A Bharadwaj D Lal P Sikka Sudhir Khanna
Buffalo Husbandry	September 8, 2009	Livestock Farmers	CIRB, Nabha	G. Singh PS Oberoi KS Das R Malik SS Paul
Buffalo Husbandry	December 10, 2009	Livestock Farmers	CIRB, Nabha	G. Singh PS Oberoi KS Das R Malik SM Deb
Buffalo Husbandry	December 22-28, 2009	62 Farmers of Hisar District	CIRB, Hisar	VB Dixit RK Sharma P Sikka D Lal SK Phulia
Buffalo Husbandry and Artificial Insemination	Januaary 11-20, 2010	13 Unemployed youth from Haryana	CIRB, Hisar	RK Sharma SK Phulia Inderjeet Singh Dharmender Sudhir Khanna
Buffalo Husbandry and Farmers Visit	March 17-19, 2010	15 Farmers from Distt. Barabanki, UP	CIRB, Hisar Sponsored by DUSS Barabanki	VB Dixit RK Sharma A Bharadwaj SK Phulia PC Lailer

COLLABORATION FOR POST-GRADUATE AND DOCTORAL RESEARCH

Name of the Student	Degree	Title of Thesis/Dissertation	University	Co-Guide
RS Pippal	PhD	Effect of summer and winter stress and ameliorative measures on production and reproduction performance in Nili Ravi buffaloes	Dr BR Ambedkar University, Agra (UP)	BS Punia
TP Singh	PhD	Genetical & Non-genetical factors affecting production and reproduction traits in Nili Ravi buffaloes	Choudhary Charan Singh University Meerut (UP)	SM Deb
Ashok Kumar Balhara	PhD	Proteomic analysis of pregnancy specific serum proteins in buffaloes	CCS HAU, Hisar	Inderjeet Singh
Rajesh Kumar	PhD	Yet to be decided	CCS HAU, Hisar	Inderjeet Singh
Jarnail Singh	PhD	Umbilical cord cell culture	CDLU, Sirsa	PS Yadav
LC Ranga	PhD	Assessment of development of the testes and accessory sex glands by ultrasonography in buffalo bull	Dr BR Ambedkar University, Agra (UP)	SK Phulia
Sarla	PhD	Molecular Characterization of major candidate gene associated with reproductive traits in buffaloes	GJU S&T, Hisar	SK Phulia
Priti Singh	MVSc	Freezing of umbilical cord stem cells - effect of cryoprotectants	CCS HAU, Hisar	PS Yadav
Sandeep Kumar	MVSc	Follicular dynamics in anestrous Murrah Buffaloes during cyclicity induction using Ovsynch in diffferent combinations	CCS HAU, Hisar	RK Sharma
Lalit Mohan Sharma	MVSc	Effect of exogenous insulin on progesterone based estrus induction protocol in buffalo	CCS HAU, Hisar	RK Sharma
Inderjeet Yadav	MVSc	Therapeutic and ultrasonographic investigations on Mastitis in buffaloes	CCS HAU, Hisar	SK Phulia
Yogesh Kumar	PhD	Evaluation of various plant extract as agents for preventing the incidences of aflatoxin in animal feeds	University of Bikaner Rajasthan	N Saxena
Ms Promila	PhD	Effect of sewage water irrigation on nutritional and anti-nutritional qualities of forage crops	CDLU, Sirsa	N Saxena
Ms Sunita Kumari	M Phil	Impact of sewage water irrigation on soil fertility, chemistry and microbiology	CDLU, Sirsa	N Saxena
Ms Suman	M Phil	Determination of micro-nutrients and heavy metal in water, soil and plant materials under variation irrigation regimes	CDLU, Sirsa	N Saxena
Ms Manju Bala	M Phil	Variation in nutritive value of sorgium under variation irrigation regimes	CDLU, Sirsa	N Saxena

WOMEN AND GENDER ISSUES

Contribution of women in most of the buffalo husbandry activities is very well known. It has been observed that in Haryana women folk manage and care their buffaloes. They feed and water the buffaloes, they bathe and milk them, clean the sheds and process the milk. Since buffalo production takes place around the house, the role of women is paramount. Buffaloes also produce dung, milk and offspring much of which is managed in one way or another by the women of the family. Women spend more than 8 hours of their total working hours in a day performing different buffalo rearing practices. Feeding and milking of animals constitute 30 percent of the time spent, followed by shed cleaning and dung disposal activity.

In the field progeny testing programme of the Institute which is undertaken in 8 villages around Hisar, role of women was found to be significant in the popularization of the artificial insemination.

It was found that more than 30 percent women had the correct idea of heat symptoms. A sizeable proportion of women, i.e. 34 percent knew that the duration of estrus cycle in buffaloes was 21 days. Mucus discharge was also considered one of the most important heat symptoms by the majority of the women. More than 30 percent of women had the idea that buffalo should be inseminated after about 10-12 hours of onset of heat. It was seen in the adopted villages that out of the cases brought for artificial insemination 38 percent was reported by the women.

RESEARCH CO-ORDINATION & MANAGEMENT

The XII meeting of the Research Advisory Committee (RAC) was convened on November 6, 2009 under the chairmanship of Dr SK Ranjhan, Director, Hind Agro industries. The chairman outlined the importance of buffalo production in the country stating that India is blessed with the best breeds of buffaloes and every country is looking towards India for buffaloes; which are popular for milk, meat and draft. He further stated that this Institute should take a lead at International level to deal with the various aspects of buffalo production. Dr CS Prasad supporting the suggestion of chairman stated that our scientists should collaborate with other Institutions at national and international level. Dr RK Sethi, Director, CIRB welcomed the Chairman and other members of the RAC and presented the achievements of the institute and the action taken report on the recommendations of the XI RAC meeting.

RESEARCH ADVISORY COMMITTEE	
Dr SK Ranjhan, Director, Hind-Agro Industries, New Delhi	Chairman
Dr RK Sethi, Director, CIRB, Hisar	Member
Dr CS Prasad, ADG (AN & P), ICAR, New Delhi	Member
Dr AK Sinha, Ex Dean, BAU, Ranchi	Member
Dr TK Walli, Ex Head, NDRI, Karnal	Member
Dr Bharat Tondon, Chairman, Vetcare, Tetragon Chemie Pvt Ltd, Bangalore	Member
Ch Ved Pal, Former Dy Speaker, Haryana Vidhan Sabha Karnal	Member
Sh Viswas Chittle, Chittle Dairy Farm, Maharashtra	Member
Dr MG Govindiah, Ex Dean Veterinary College, Bangalore	Member
Dr M Rajasekhar, Ex Project Director PD ADMAS, Bangalore	Member
Dr D Lal, Principal Scientist, CIRB, Hisar	Member Secretary

INSTITUTE MANAGEMENT COMMITTEE

The XVIII meeting of Institute Management Committee (IMC) was held on November 11, 2009 at Central Institute for Research on Buffaloes, Hisar under the chairmanship of Dr RK Sethi, Director, CIRB. Chairman welcomed all the members of Management Committee of the Institute and presented the progress made by the Institute in research, infrastructure development (works), human resource development, overall organization/management and audit and accounts during the intervening period was highlighted. From Head Quarter Dr CS Prasad, ADG (Animal Nutrition and Physiology), New Delhi also participated.

INSTITUTE MANAGEMENT COMMITTEE	
Dr RK Sethi, Director, CIRB, Hisar	Chairman
Dr CS Prasad, ADG (AN & P), ICAR, New Delhi	Member
Ch Ved Pal, Ex Dy Speaker, Haryana Vidhansabha, Hisar	Member
Dr Inderjeet Singh, Pr Scientist, CIRB, Hisar	Member
Dr SM Deb, Pr Scientist and Officer-in-charge, Sub-campus, Nabha	Member
Dr VB Dixit, Pr Scientist, CIRB, Hisar	Member
Dr SC Arya, Representative of Dean, COVS, CCS HAU, Hisar	Member
Dr AS Khanna, Prof & Head, CCS HAU, Hisar	Member
Sh S George, Chief Finance and Accounts Officer, NDRI, Karnal	Member
Sh RK Sharma, Administrative Officer, CIRB, Hisar	Member Secretary
Smt Shammi Tyagi, Assistant Finance and Accounts Officer, CIRB, Hisar	Special Invitee

INSTITUTE JOINT STAFF COUNCIL

OFFICIAL SIDE	
Dr RK Sethi, Director, CIRB, Hisar	Chairman
Dr Inderjeet Singh, Pr Scientist, CIRB, Hisar	Member
Dr SM Deb, Pr Scientist and Officer-in-charge, Sub-campus, Nabha	Member
Dr S Khanna, Incharge, Animal Farm Section, CIRB, Hisar	Member
Sh Surender Singh, T-6 Technical Officer	Member
Sh RK Sharma, Administrative Officer, CIRB, Hisar	Secretary
STAFF SIDE	
Sh Satbir Singh	Secretary
Sh Baljeet Singh	Member
Sh Subhash Chander	Member
Sh Satbir Singh	Member
Sh Dharam Pal	Member
Sh Ashok Kumar	Member

PARTICIPATION OF DIRECTOR IN IMPORTANT MEETING/ WORKSHOP AND SYMPOSIUM

Director	Programme	Venue	Date/Duration
RK Sethi	Workshop on Rate of growth and overall development of Animal Husbandry and Dairying	Chandigarh	April 25, 2009
	National Seminar on New Paradigms in Dairying being organized by NDRI and Pixie Consulting Solution Ltd.	Pragti Madan, New Delhi	July 4, 2009
	Workshop on Breed promotion and conservation in rainfed Areas	Sadri (Rajasthan)	July 20-21, 2009
	2nd Agriculture Leadership Summit	New Delhi	September 4-51, 2009
	Indo-China Symposium on Buffalo Production	CIRB, Hisar	October 19-20, 2009
	X National Symposium on Conventional and New age breeding technology for livestock centric growth and livelihood secruity	MVC, Chennai	Novermber 27-28, 2009
	IAUA 34th Convention on Application of Bio-Nano technology in agricultural and animal sciences for food security	NDRI, Karnal	December 7-8, 2009
	International Buffalo Conference on Optimizing Buffalo Productivity through Conventional and Novel Technologies	NASC Complex, New Delhi	February 1-3, 2010
	Scientist meet of network project on Buffalo Genomics	NBAGR, Karnal	March 13, 2010

ON GOING APPROVED PROJECTS

Project	Investigators	Duration
Field progeny testing programme in buffaloes	A Bharadwaj, VB Dixit, RK Seti, SR Bhardwaj	2001 - continued
Setting baseline profile standards for hematological, hormonal and biochemical parameters in buffaloes	JK Singh, RK Sharma, SK Phulia, Ashok Balhara	2002-2010
Characterization of buffalo bulls using DNA polymorphic sequences in relation to production and fertility traits.	P Sikka, RK Sethi, P Singh, S Khanna	2007-2010
Effect of incorporating limiting amino acids rich supplements on growth and maturity of male buffalo calves	SS Dahiya, P Singh, PC Lailer, D Lal	2007-2010
Development of training module for promoting buffalo entrepreneurship	VB Dixit, A Bharadwaj, RK Sharma, D Lal P sikka, SK Phulia, SK Sarkar, RA Pachauri	2007-2010
Transcriptional analysis of HSP70 and GHR genes in relation to growth performance of buffalo calves kept on two dietary intake levels	Inderjeet Singh, SK Phulia, SS Dahiya, RC Upadhyay (NDRI)	2008-2010
Examination of genetic trends under selection programme in Murrah and Nili - Ravi herds	SN Kala	2009-2010
Studies on environment pollutants and toxicants affecting feed quality and safety	N Saxena, PC Lailer, JK Singh, SK Sarkar, ML Sharma, Krishan Kumar, D Lal	2009-2011

CIRB SUB-CAMPUS, NABHA

Project	Investigators	Duration
Genetic Improvement of Nili-Ravi buffaloes	SM Deb, PS Oberoi, Ghansham Singh, KS Dass	1989 - Continued
Assessment of current status, breed characteristics and genetic structure of Nili-Ravi buffaloes in its breeding tract	G Singh, SM Deb, RK Sethi (CIRB), BP Mishra, RS Kataria, DK Sadana, BK Joshi (NBAGR)	2008-2011
Impact of exogenous enzyme supplementation on the digestibility and growth of buffalo calves fed fibrous feed under wheat paddy grown areas.	R Malik, Ghansham Singh, SS Paul, KS Das and SS Kundu (NDRI)	2008-2011
Predominant culture able fibrolytic fungi in buffalo rumen	SS Paul, SM Deb, Ghansham Singh	2008-2010

NETWORK/AICRP/EXTERNAL AND COLLABORATIVE PROJECTS

Project	Investigators	Duration
Network Project on Genetic Improvement of Murrah buffaloes	RK Sethi, P Singh, SK Sarkar S Khanna	1991 - Continued
Network Project on Bhadwari buffaloes	BP Kushwaha	2001 - Continued
AICRP on Improvement of feed resources and nutrients utilization for raising animal production (In collaboration with NIANP, Banglore)	N Saxena, D Lal	2006 - Contunued
Isolation and molecular characterization of superior fibre degrading anaerobic fungus and development of protocol for their preservation and utilization for increasing digestibility of fibrous feeds in buffaloes (DBT sponsored)	SS Paul, SM Deb, BS Punia	2006 - 2009 2007-2010
Isolation culture and characterization of adult stem cells in buffaloes	PS Yadav, Inderjeet Singh RK Sharma	
Elucidating the physiological and genomic regulation process of follicular development, oocyte maturation and embryogenesis in buffalo	Inderjeet Singh RK Sharma	2007-2012
Buffalo genomics	RK Sethi, P Sikka, AK Pandey, SP Yadav	2008-2012

NEW IRC PROJECTS

Project	Investigators	Duration
Effect of cryopreservation on integrity of buffalo sperm membrane and DNA in relation to fertility	D Kumar, P Singh, SP Yadav PS Yadav	2010-2012
Studies on the rumen ecosystem and it manipulation in buffaloes for better environment friendly and economical production commonly fed low medium and high quality diets	BS Punia	2010-2014
Leptin and its receptor gene polymorphism and their association with milk production traits in Murrah breed of buffaloes (*Bubalus bubalis*)	SP Yadav, AK Pande, P Sikka, D Kumar, PS Yadav and RK Sethi	2010-2013

COMPLETED PROJECTS

Project	Investigators	Duration
Monitoring and surveillance of infectious diseases associated with mortality in buffalo calves	N Rana, A Saini	2006-2009
To study the effect of feeding complete feed blocks on growth and production performance of buffaloes	PC Lailer, SS Dahiya, D Lal, TR Chauhan	2005-2008
Effect of microbial load on quality and freezability of buffalo bull semen	N Rana, P Singh, SK Phulia	2007-2009
Mammary gland development in normal and induced lactation in buffaloes	SK Phulia, RK Sharma, S Khanna	2005-2009
Sperm dose for artificial insemination in relation to conception rates in buffaloes	PK Sharma, Inderjeet Singh, P Singh, JK Singh, PS Yadav	2006-2010
Monitoring of somatic cell count in Nili-Ravi buffaloes	Ghansham Singh, D Lal, N Rana, SK Phulia, N Saxena, KS Das	2005-2009

AWARDS / HONOURS

BEST PAPER

Singh Avtar, Oberoi PS and Joshi BK (2010). New Computer - Simulated Excel based software for analysis of Techno Economics Feasibility of Diary Farming. "38th Dairy Industry Conference", Bangalore, February 17-19, 2010

BEST POSTER

Dixit VB, Sarkar SK, Bharadwaj A, Phulia SK and Yadav SP (2010). International Buffalo Conference on "Optimizing Buffalo Productivity Through Conventional and Novel Technologies", New Delhi, February, 1-4

Kumar D, Anand T, Singh KP, Singh MK, Shah RA, Chauhan MS, Palta P, Singla SK and Manik RS (2010). International Buffalo Conference on "Optimizing Buffalo Productivity Through Conventional and Novel Technologies", New Delhi, February, 1-4

Phulia SK, Sharma RK, Singh I, Bharadwaj A and Khanna S. (2010). International Buffalo Conference on "Optimizing Buffalo Productivity Through Conventional and Novel Technologies", New Delhi, February, 1-4

Sharma RK, Phulia SK, Mahato D, Bishnoi SK, Khanna S and Singh Inderjeet (2010). International Buffalo Conference on "Optimizing Buffalo Productivity Through Conventional and Novel Technologies", New Delhi, February, 1-4

Yadav PS, Mann Anita, Singh Vijay, Kumar D, Sharma RK and Singh Inderjeet (2010). National Symposium of Society for Conservation of Domestic Animal Biodiversity (SOCDAB), February 10-11, 2010, Anand

VISITORS DURING 2009-10

Name of Visitor	Address	Date of Visit
15 members delegation	Bhutan	June 1, 2009
3 members Russian delegation	Different institutions of Russia	June 16, 2009
SK Singh	Agri. Specialists, VSDA//FAS, US Embassy, New Delhi	June 24, 2009
Dr SK Bandyopadhyay	Animal Husbandry Commissioner, Govt of India	June 27, 2009
Dr Dilip K Rath	Jt Secretary, Deptt of Animal Husbandry & Dairying	June 27, 2009
Dr KM Bujarbaruah	DDG (AS), ICAR	June 27, 2009
Dr CS Prasad	ADG (AN&P), ICAR	June 27, 2009
Dr Vineet Bhasin	Principal Scientist, ICAR	June 27, 2009
Dr Rajan Gupta	Principal Scientist, ICAR	June 27, 2009
Dr K S Khokhar	Vice Chancellor, CCS HAU, Hisar	Sept. 16, 2009
4 member delegation	CARP, Sri Lanka	
Sh KL Meena	Principal Secretary, Deptt of Backward Classes Development, Govt of UP	October 3, 2009
14 member Chinese delegation	Guangxi Buffalo Research Institute, China	October 19-20, 2009
Eduardo Daher Santos	Kakuri Dairy and Livestock, Brazil	November 7, 2009
Ch Ved Pal	Ex Dy Speaker, Haryana Vidhan Sabha	November 7, 2009
Dr S K Ranjhan	Director, Hind Agro Industries Ltd, New Delhi	November 7, 2009
Dr C S Prasad	ADG (AN&P), ICAR	November 7, 2009
Dr A K Sinha	Ex Dean, College of Vety Sciences, BAU, Ranchi	November 7, 2009
Dr TK Walli	Ex-Principal Scientist, NDRI	November 7, 2009
Dr O P Dhanda	Former ADG (AN&P), ICAR	November 7, 2009
Dr RS Dalal	Registrar, CCS HAU, Hisar	January 1, 2010
Dr A K Srivastava	Director, NDRI, Karnal	February 4, 2010
Dr Bhanu Chowdhary	College of Vety Medicine & Biomedical Sciences, TAMU, USA	February 20, 2010
Dr RP Narwal	Director of Research, CCS HAU, Hisar	March 12, 2010
Sh Brij Lal	President, Zila Parishad, Hisar	March 12, 2010

VISITORS IN CIRB

A total of 1024 number of farmers, veterinary students, foreign visitor, entrepreneurs and other dignitaries from different parts of the country visited the Institute during the report year and showed keen interest in buffalo production and related activities.

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वन महोत्सव

केन्द्रीय भैंस अनुसंधान संस्थान द्वारा 14 जुलाई 2009 को वन महोत्सव का आयोजन किया गया। इस अवसर पर संस्थान के अधिकारियों तथा कर्मचारियों द्वारा वृक्षारोपण किया गया । सभी उपस्थित लोगों ने इस अवसर पर कम से कम एक पौधे का नियमित रूप से ध्यान रखने का संकल्प लिया।

गणतंत्र दिवस पर्व

गणतंत्र दिवस का पर्व केन्द्रीय भैंस अनुसंधान संस्थान में बड़े धूमधाम से मनाया गया। ध्वजारोहण से शुरू यह कार्यक्रम सांस्कृतिक कार्यक्रम की मनमोहक प्रस्तुति के साथ सम्पन्न हुआ । संस्थान के निदेशक डा रमेश कुमार सेठी ने ध्वजारोहण किया तथा इस अवसर पर वैज्ञानिकों/अधिकारियों/कर्मचारियों को संबोधित करते हुए आह्वान किया कि हम केवल अथक मेहनत, लगन व कार्यनिष्ठा से ही संस्थान व देश को प्रगति के पथ पर ला सकते हैं । डा सेठी ने सभी को विश्वास दिलाया कि यह संस्थान सभी अधिकारियों/कर्मचारियों के सहयोग से प्रगति के पथ पर अग्रसर रहेगा । उन्होंने कहा कि संस्थान की स्थापना के 25 वर्ष पूर्ण होने पर संस्थान रजत जयंती मना रहा है, इस उपलक्ष्य में अंतराष्ट्रीय स्तर की कान्फ्रैंस एवं भैंस मेले का आयोजन भी किया जा रहा है । इस अवसर पर बच्चों का सांस्कृतिक कार्यक्रम का भी आयोजन किया गया।

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कृषि एक्सपो मीडिया की ओर से केन्द्रीय भैंस अनुसंधान संस्थान में कृषि मेला – कृषि एक्सपो–2009 का उद्घाटन 16.9.09 को डा के एस खोखर, उप–कुलपति, चौधरी चरण सिंह हरियाणा कृषि विश्वविद्यालय, हिसार ने किया। इस अवसर पर संस्थान के निदेशक डा रमेश कुमार सेठी एंव राष्ट्रीय अश्व अनुसंधान केन्द्र के निदेशक डा राज कुमार सिंह भी उपस्थित थे । उन्होंने किसानों के लिये इस मेले को काफी लाभप्रद बताया। केन्द्रीय भैंस अनुसंधान संस्थान के निदेशक डा रमेश कुमार सेठी ने मेले की गतिविधियों के बारे में बताते हुए कहा कि यह मेला पशुपालकों के लिये भी काफी उपयोगी होगा। 16 से 18 सितंबर तक चलने वाले इस मेले में विभिन्न प्रदेशों से कई व्यावसायिक कंपनियों द्वारा लांच की गई आधुनिक तकनीकों को प्रदर्शित किया गया। मेले में उत्तम गुणवत्ता की खाद, बीज, बागवानी हेतु पौधे, कीटनाशक दवाईयां तथा आधुनिक कृषि यंत्र प्रदर्शनी एवं बिक्री हेतु उपलब्ध थे।

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संस्थान के स्टाफ क्लब के तत्वाधान में 10 दिवसीय (8–15 अक्तूबर, 2009) योग शिविर का आयोजन किया गया। इस शिविर का शुभारंभ निदेशक, राष्ट्रीय अश्व अनुसंधान केंद्र के द्वारा दीप प्रज्जवलित करके किया गया। इस शिविर में पतंजलि योग समिति हिसार के योग शिक्षकों ने विभिन्न आसन और प्राणायाम के महत्व के बारे में जानकारी प्रदान की। इस शिविर के दौरान 50 कर्मचारियों/अधिकारियों ने अपने नेत्रदान करने का संकल्प लिया। शिविर के समापन पर संस्थान के निदेशक डा. रमेश कुमार सेठी ने योग के महत्व पर प्रकाश डाला तथा नेत्रदान का संकल्प लिया। डा. प्रेम सिंह यादव, प्रधान वैज्ञानिक इस शिविर के संयोजक थे।

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■ Independence Day Celebrations at the Institute

केन्द्रीय भैंस अनुसंधान संस्थान में स्वतंत्रता दिवस बड़े धूमधाम से मनाया गया। कार्यक्रम का आरम्भ निदेशक डा रमेश कुमार सेठी द्वारा ध्वजारोहण कर किया गया। यह कार्यक्रम सांस्कृतिक कार्यक्रम कीमनमोहक प्रस्तुति के साथ सम्पन्न हुआ। इस अवसर पर देश के वीरों और शहीदों को याद किया जिन्होंने अपने बलिदान द्वारा हमें स्वतंत्रता दिलवाई। निदेशक महोदय ने वैज्ञानिकों/अधिकारियों/कर्मचारियों को संबोधित करते हुए आहवान किया कि हमें संस्थान केउत्थान के लिये केवल अथक मेहनत, लगन व कार्यनिष्ठा से ही संस्थान व देश को प्रगति के पथ पर ला सकते हैं । डा सेठी ने सभी को विश्वास दिलाया कि यह संस्थान सभी अधिकारियों/कर्मचारियों के सहयोग से प्रगति के पथ पर अग्रसर रहेगा । इस अवसर पर बच्चों के सांस्कृतिक कार्यक्रम का भी आयोजन किया गया ।

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जनवरी, 2010 में खेल–कूद प्रतियोगिताओं का आयोजन किया गया। विभिन्न प्रतियोगिताओं में वैज्ञानिकों, अधिकारियों एवं कर्मचारियों ने बढ़ चढ़ कर भाग लिया। वैज्ञानिकों, अधिकारियों एवं कर्मचारियोंएवं बच्चों के मध्य क्रिकेट मैच का आयोजन किया गया ।

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केन्द्रीय भैंस अनुसंधान संस्थान में हिन्दी-पखवाड़ा का आयोजन 1-14 सितंबर, 2009 तक किया गया। इस दौरान हिन्दी की विभिन्न प्रतियोगितायें आयोजित की गई। दिनांक 14 सितंबर को हिन्दी दिवस को काव्य एवं भाषण प्रतियोगिता का आयोजन किया गया। इस अवसर पर मुख्य अतिथि डा सतीश चन्द्र चोपड़ा, पूर्व निदेशक, केन्द्रीय भैंस अनुसंधान संस्थान, हिसार ने हिन्दी को अपने कर्तव्यों में शामिल करने की अपील की । संस्थान के निदेशक डा रमेश कुमार सेठी ने सभी कर्मचारियों एवं अधिकारियों को हिन्दी में कार्य करने के लिये प्रेरित किया। विजेता रहे प्रतिभागियों को मुख्य अतिथि ने पुरस्कार वितरित किये ।

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4 फरवरी, 2010 को संस्थान के रजत जयंती वर्ष एवं अंतर्राष्ट्रीय भैंस सम्मेलन के समापन समारोह का आयोजन किया गया जिसमें संस्थान द्वारा अंगीकृत एवं प्रदेश के कई गांवों के किसानों ने अपनी भैंसों के साथ हिस्सा लिया । इस मेले में अमेरिका, ब्राजील, इटली, जर्मनी, ईरान, फिलीपीन, आस्ट्रेलिया, मलेशिया से लगभग 25 विदेशी मेहमान भी सम्मिलित हुए । मेले में विभिन्न श्रेणियों की भैंसों एवं झोटों के मध्य प्रतियोगिताओं का आयोजन किया गया । उत्तम पशुओं के चुनाव के उपरांत उन्हें पुरस्कृत किया गया । इस अवसर पर केंद्र सरकार के विभिन्न संगठनों, हरियाणा सरकार के अभिकरणों, बैंकों, दवा निर्माता कम्पनियों तथा प्रकाशकों ने अपनी प्रदर्शनी लगाई । इस अवसर पर राष्ट्रीय डेयरी अनुसंधान संस्थान के निदेशक डॉ एके श्रीवास्तव मुख्य अतिथि के तौर पर उपस्थित थे ।

विदेशी आगन्तुक विजयी मुर्रा भैंस के साथ


मेले का दृश्य

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केन्द्रीय भैंस अनुसंधान संस्थान ने प्रक्षेत्र संतति परीक्षण कार्यक्रम के अंतर्गत पांच अंगीकृत गांवों में दिसंबर और जनवरी माह में विभिन्न कटड़े-कटड़ियों की रेली, स्वास्थ्य शिविर एवं किसान संगोष्ठी का आयोजन किया गया।

■ xko tojk e dVM&dVfM;k dh jyh ,o fdlkuk l ckrphr

lrdrk lIrkg o lkçnkf;d lnHkkouk lIrkg

संस्थान में 3-9 नवंबर, 2009 सतर्कता जागरूकता सप्ताह का आयोजन किया गया। अधिकारियों एवं कर्मचारियों को उन्हें उपस्थिति, कर्तव्यों तथा कार्यक्षमता के प्रभावी एवं उचित उपयोग के लिए परामर्श दिया गया। संस्थान में 19-25 नवंबर, 2009 तक सांप्रदायिक सद्भावना सप्ताह का आयोजन सभी अधिकारियों एंव कर्मचारियों द्वारा शपथ ग्रहण के साथ मनाया गया ।

प्रशिक्षण कार्यक्रम

रजत जयंती वर्ष 2009-10 में केन्द्रीय भैंस अनुसंधान संस्थान, हिसार द्वारा 6 प्रशिक्षण कार्यक्रमों का आयोजन किया गया । इनमें से चार का आयोजन मुख्य परिसर हिसार में तथा दो का आयोजन संस्थान के उप-परिसर नाभा में किया गया । युवकों को भैंस पालन के विभिन्न पहलूओं जैसे कि भैंस आनुवांशिकी, प्रबंधन, पोषण, शरीर क्रिया विज्ञान, जनन, प्रजनन एवं स्वास्थ्य पर संस्थान के वैज्ञानिकों द्वारा प्रशिक्षण दिया गया। ग्रामीण युवकों के लिए 10 दिवसीय भैंस पालन एवं कृत्रिम गर्भाधान विषय पर प्रायोगिक प्रशिक्षण का आयोजन किया गया। 22 से 28 दिसंबर तक एक सप्ताह की अवधि हेतु किसानों के लिए भैंस पालन प्रशिक्षण का आयोजन किया गया। इस प्रशिक्षण कार्यक्रम में संस्थान द्वारा अंगीकृत गांवों व आस-पास के अन्य गांवों से लगभग 50 किसानों ने भाग लिया। संस्थान के वैज्ञानिकों द्वारा कृषकों को भैंस आनुवांशिकी, प्रबंधन, पोषण, शरीर क्रिया विज्ञान, जनन, प्रजनन एवं स्वास्थ्य के क्षेत्र में संस्थान द्वारा अर्जित की गई उपलब्धियों एवं अन्य नवीनतम जानकारियों से अवगत कराया। किसान प्रशिक्षणों के अलावा 6 नवोदित वैज्ञानिकों के लिए क्षेत्रीय अनुभव प्रशिक्षण कार्यक्रम का आयोजन जून 26, 2009 से जुलाई 16, 2009 तक किया गया।

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INTERACTIVE MEET ON BUFFALO REPRODUCTION

The Haryana Chapter of the Indian Society for Study of Animal Reproduction (ISSAR), in collaboration with the Central Institute for Research on Buffaloes, organized an Interactive Meet on Buffalo Reproduction on June 27, 2009. Impetus to the meet was provided by presentations on key issues by experts invited from leading institutes of the country including representation from ICAR, Dept. of Animal Husbandry and Dairying, Govt of India, scientists, faculty and students from animal sciences Institutes and SAUs; extension specialist from Krishi Vigyan Kendra, field veterinarians and trainers of Animal Husbandry Department, Haryana.

A view of participants during interactive meet

INDO-CHINA SYMPOSIUM

Indo-China Symposium on 'Buffalo production' was organized by Central Institute for Research on Buffaloes, Hisar on October 19-20, 2009. Dr RK Sethi initially presented the scenario on buffalo breeding in India exhibiting the growth pattern of cattle and buffalo population in India *vis-a-vis* Asia and world, buffalo breeds of India and their potentiality and trends of buffalo milk production and increased in per capita availability of milk since 1950-1951. Twelve delegates from China and 36 from India participated in the conference. Prof Huang Jiaxing from Guangxi Buffalo Research Institute, China presented the paper on buffalo breeding in China with emphasis on role on embryonic biotechnologies on cross breeding and improvement of Chinese indigenous water buffalo. Various aspects on buffalo production were discussed in the conference.

Chinese delegates participating in discussion during the conference

International Buffalo Conference

Central Institute for Research on Buffaloes, Hisar, a premier Institute dedicated to buffalo research in India, celebrated the Silver Jubilee of its foundation. To commemorate the occasion, the Institute organized an International Buffalo Conference during February 01-04, 2010 on the theme 'Optimizing Buffalo Productivity Through Conventional and Novel Technologies' in association

■ Participants during International Buffalo Conference

with Indian Society for Buffalo Development (ISBD) and Asian Buffalo Association (ABA). The conference was inaugurated by Dr S Ayyappan, Secretary, Department of Agricultural Research and Education and Director General, Indian Council of Agricultural Research, New Delhi. In his inaugural address, Dr Ayyappan emphasized that livestock rearing has remained the most effective employment generation and livelihood security enterprise for the uneducated and educated unemployed rural youth. Over the last three decades, livestock sector has consistently accounted for over 4 percent of the country's GDP, while its share in the GDP from agricultural sector steadily increased from 14 to 25 percent, while remaining greater than 20 percent over the last two decades. Milk is the major contributor to the GDP from livestock sector. He eulogized buffalo as 'Black Gold of India' and the preferred milch animal of the farmers. Dr Ayyappan added that today over half of the total milk produced in the country, 56-57 percent to be precise, is being contributed by buffaloes despite the fact that buffalo population (98 million) is nearly half to that of cattle (185 millions). With such high contribution of buffalo, today India is the largest milk producer in the world producing about 105 million metric tons per annum. He outlined the contribution of buffalo not only in providing wholesome milk to our vast vegetarian population, but also as a source of employment and livelihood to millions of our landless, marginal and small farmers. Prof KML Pathak, Deputy Director General (Animal Sciences) in his presidential address informed that milk production in India has witnessed a phenomenal increase of as high as 5.50 percent per annum during certain periods in last three decades, taking per capita milk availability to 241 g per day from a meager 124 g per day in 1950s. Dr CS Prasad, Asstt Director General (AN&P), Dr SK Ranjan, Patron-in-Chief of Indian Society for Buffalo Development and Chairman, Organizing Committee were also present on the occasion. Dr OP Dhanda, President Indian Society for Buffalo Development appraised the gathering about genesis of the Society and its activities. About 400 delegates from India and abroad like US, Brazil, Italy, Germany, Australia, Egypt, Iran, Malaysia, Philippines etc. participated in this conference covering various spheres of research in buffalo health, production, products processing, nutrition, *etc.* Scientists with outstanding contribution to buffalo research were awarded on the occasion. Organizing Secretary of the conference and Director, Central Institute for Research on Buffaloes, Dr RK Sethi, thanked delegates and guests for making this programme a great success. He informed that the conference is being sponsored by the ICAR, ABA, Rainfed Livestock Network (RLN), DST, DeLaval, IMV, Ayurvet, Hind-Agro and Poshak Feed.

CIRB Personnel

GENERAL ADMINISTRATION

Dr RK Sethi,	Director
Sh RK Sharma	AO
Sh J Ramani	AAO
Sh Jagjit Singh	AAO
Sh Raj Kumar	AAO
Smt Shammi Tyagi	AF&AO

SCEINTIFIC/TECHNICAL STAFF

Division of Buffalo Genetics & Breeding

Dr VB Dixit, PhD	Pr Scientist & Head
Dr (Mrs) P Sikka, PhD	Pr Scientist
Dr Anurag Bharadwaj, PhD	Pr Scientist
Dr AK Pandey, PhD	Pr Scientist
Dr SN Kala, PhD	Sr Scientist
Dr N Rana, PhD	Sr Scientist
Dr SP Yadav, PhD	Scientist
Dr Thirumaran SMK, MvSc	Scientist
Dr Susheel Kumar Sarkar, PhD	Scientist
Dr SR Bhardwaj	T-9 Vety Officer
Sh AKSTomer	Technical Officer
Sh Balbir Singh	T-4
Sh Baljeet Singh	T-3
Sh Dharam Singh	T-3

Network Project on Buffalo Improvement

Dr RK Sethi, PhD	PC (B)
Dr BP Kushwaha, PhD	Pr Scientist (IGFRI, Jhansi)
Mrs Sunesh Balhara, MSc	Scientist
Sh Ram Chander	T-4

Division of Buffalo Nutrition

Dr D Lal, PhD	Pr Scientist & Head
Dr BS Punia, PhD	Pr Scientist
Dr SS Dahiya, PhD	Pr Scientist
Dr PC Lailer, PhD	Sr Scientist
Dr Ashok Kumar Boora, MVSc	Scientist
Dr ML Sharma, PhD	T-6
Sh Mahender Singh	T-3

AICRP on Improvement of Feed Resources

Dr D Lal, PhD	Pr Scientist & PI
Dr N Saxena, PhD	Sr Scientist
Sh Krishna Kumar	T-5

Division of Buffalo Physiology & Reproduction

Dr Inderjeet Singh, PhD	Pr Scientist & Head
Dr Pawan Singh, PhD	Pr Scientist
Dr PS Yadav, PhD	Pr Scientist
Dr JK Singh, PhD	Sr Scientist
Dr RK Sharma, PhD	Sr Scientist
Dr SK Phulia, PhD	Sr Scientist
Dr AK Balhara, MVSc	Scientist (on study leave)
Dr Dharmendra Kumar, PhD	Scientist
Sh BS Sahu	T-7(8)
Sh Om Parkash	T-4

Project Monitoring & Evaluation Cell

Dr VB Dixit, PhD	Pr Scientist & Incharge
Dr RK Sharma, PhD	Sr Scientist
Dr N Rana, PhD	Sr Scientist
Sh Raj Kumar	T-5

Animal Farm Section

Dr Inderjeet Singh, PhD	Pr Scientist & Overall Incharge
Dr S Khanna, PhD	T-9 & Incharge
Dr Satish Kakkar	T-6 Veterinary Officer
Dr Ashwani Saini	T-5 Veterinary Officer
Sh Jitender Kumar	T-5
Sh Jagdish Lal	T-4
Sh Subhash Chander	T-4

fgUnh vuHkkx

Mk ftrUn dekj flg	iHkkjh fgUnh vf/dkjh
Jh lUnhi dekj	lfpo

Library

Sh VPS Poonia,	T-5

PIO

Dr RK Sharma,	Sr Scientist

ARIS Cell

Dr Susheel Kumar Sarkar, PhD	Scientist & Incharge
Sh Raj Kumar T-5	

Agricultural Farm

Dr PC Lailer, PhD	Sr Scientist, Overall Incharge
Dr RA Pachauri, PhD	T-5
Dr Shaitan Singh, PhD	T-5

Integrated Farming Unit

Dr PC Lailer, PhD	Incharge
Sh Mohinder Singh Kairon	T-4

Workshop

Sh Surender Singh	Overall Incharge
Dr Shaitan Singh, PhD	T-5 Incharge

Landscape Section

Dr Inderjeet Singh, PhD	Overall Incharge
Sh Surinder Singh	T-6 & Incharge
Sh Baljit Singh	T-3

Estate Section

Dr S Khanna	Overall Incharge
Sh BP Singh	T-6 & Incharge
Sh Dharam Chand	T-4

Electricity Unit

Dr JK Singh	Overall Incharge
Sh Rajesh Prakash	T-4, Incharge

Internal Security

Sh RK Sharma	Incharge
Sh Subhash Chander	T-4

Guest House

Sh AKS Tomar	T-5, Incharge

NEW ENTRANTS

Sh Rajesh Kumar Sharma
Joined as Administrative Officer
July 18, 2009

Dr Dharmendra Kumar
Joined as Scientist
August 28, 2009

Dr Ashok Kumar
Joined as Scientist
August 29, 2009

Dr A K Pandey
Joined as Pr Scientist
March 8, 2010

Smt Sunesh Balhara
Joined as Scientist
March 15, 2010

PERSONAL MILESTONES

PROMOTION

Dr PS Oberoi
Sr Scientist to Pr Scientist
July 27, 2006

Dr BP Kushwaha
Sr Scientist to Pr Scientist
July 10, 2008

Dr KL Mehrara
T-7 (8) to T-9 Vety Officer
February 28, 2002

Sh Girdhari
Sr Clerk to Assistant
June 24, 2009

Sh Ashok Kumar
Jr Clerk to Sr Clerk
June 24, 2009

TRANSFER

Sh Anil Behari transferred on July 13, 2009 to join at DOR, Hyderabad as Senior Administrative Officer

OBITUARY

Sh Dharambir Singh
T-2 (Driver)
Expired on February 5, 2010

Glimpses of the International Buffalo Conference 2010

Glimpses of the Buffalo Mela Feb 4, 2010