वार्षिक रिपोर्ट
Annual Report
2017-18

भाकृअनुप–राष्ट्रीय मिथुन अनुसंधान केन्द्र

मेड्जीफेमा, नागालैन्ड–797 106, भारत

ICAR-NATIONAL RESEARCH CENTRE ON MITHUN

Medziphema, Nagaland- 797106, India

www.nrcmithun.res.in

LOCATION AND TRAVEL INFORMATION

MAIN STATION

ICAR-NRC on Mithun, a research organization, under aegis of Indian Council of Agricultural Research (Department of Agriculture Research and Education, Ministry of Agriculture and Farmers Welfare, Govt. of India), is located at Medziphema, Dimapur District, Nagaland with the latitude of 25,757231N and longitude of 93,842366E.

Approximate Distances of ICAR-NRC on Mithun from Important places:

Guwahati: 290 km (Road)

Jorhat: 150 km (Road)

Silcher: 310 km (Road)

Dibrugarh: 300 km (Road), 57 km (Rail) and 212 km (Air)

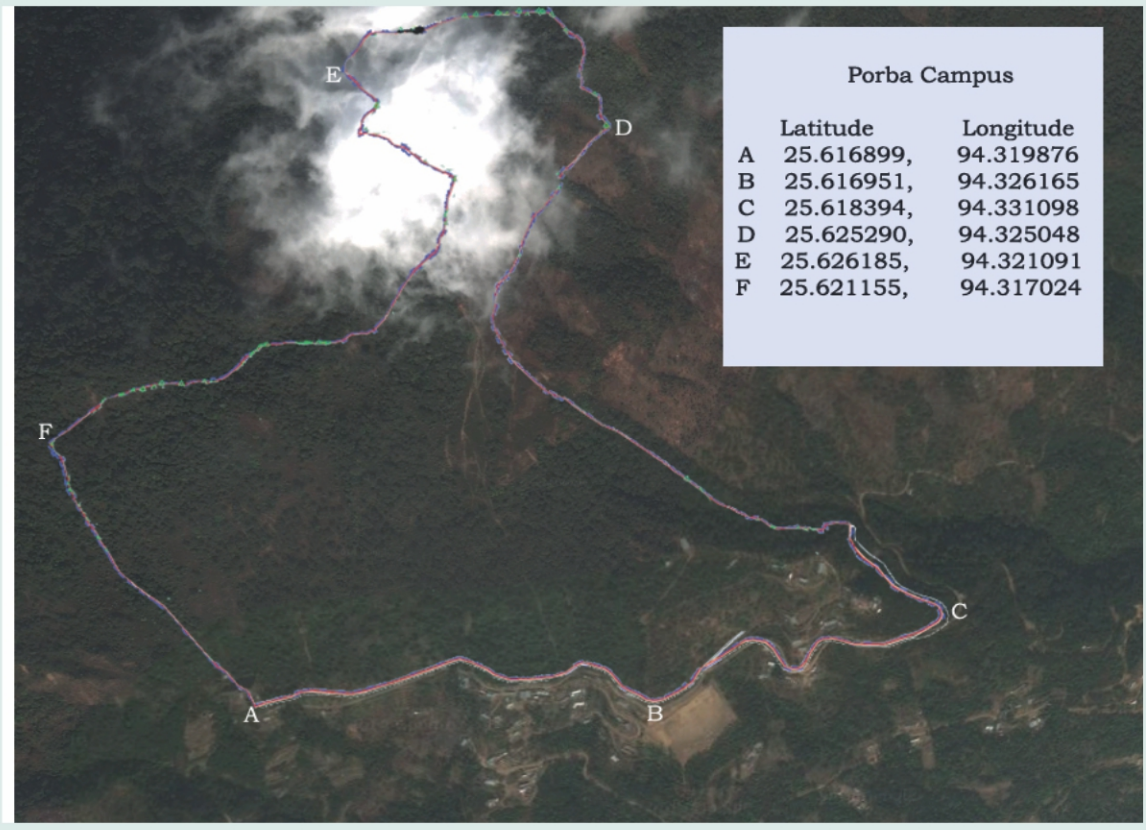
Delhi: 2198 km (Rail) and 1661 km (Air)

Kolkata 1280 km (Rail) and 657 km (Air)

Imphal: 201 km (Road)

PORBA CAMPUS

The campus is located at Porba village of Phek District of Nagaland which is approximately 125 km from the main campus, Medziphema, 81 km from Kohima and 150 km from Dimapur. Krishi Vigyan Kendra (KVK, Phek) of the Institute is located at the campus.



वार्षिक प्रतिवेदन
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CONTENTS

प्रस्तावना I PREFACE

सन् 1988 से भारतीय कृषि अनुसंधान परिषद की राष्ट्रीय मिथुन अनुसंधान केंद्र, उत्तर–पूर्वी राज्यों की अनोखी प्रजाति मिथुन (बॉस फ्रंटैलिस) के सुधार के लिए निरंतर काम कर रहा है। यह पशु अरुणाचल प्रदेश, नागालैंड, मणिपुर एवं मिजोरम के आदिवासी लोगों के सामाजिक–आर्थिक, धार्मिक और सांस्कृतिक जीवन से एकीकृत रूप से जुड़ा हुआ है, एवं इसमें मांस, दूध, चमड़ा एवं खेती का कार्य करने की अद्भुत क्षमता है।

परंपरागत रूप से ऐसा माना जाता है कि मिथुन को केवल एक उन्मुक्त वन पारिस्थितिक तंत्र (Free range forest ecosystem) के तहत ही रखा जा सकता है। जिसमें न्यूनतम निवेश एवं श्रम की आवश्यकता होती है परन्तु अकसर स्वास्थ्य देखभाल, नियंत्रित प्रजनन एवं रिकॉड संरक्षण सहित अन्य वैज्ञानिक हस्तक्षेप के कार्यान्वयन की असमर्थता का सामना करना पड़ता है। तथा जंगली मांसाहारी जानवरों के हमले के कारण विशेष रूप से बछड़ो का नुकसान होता है। एक विशाल वन क्षेत्र, जो कि इस तरह की उनमुक्त पालन प्रणाली का अभिन्न अंग है, निरंतर संकुचित हो रहा है। पारंपरिक प्रणाली की इन खामियों को ध्यान में रखते हुए, संस्थान ने अर्ध–गहन प्रणाली के तहत मिथुन पालन की प्रथाओं का एक वैकल्पिक व्यवस्था विकसित किया है। पिछले दो दशकों से संस्थान में मिथुन फार्म में इस अर्ध–गहन मॉडल के सफल कार्यान्वयन के उपरांत इसका विस्तार कृषि क्षेत्र में किया जा रहा है। 2017–18 के दौरान, कुल सात अर्ध–गहन इकाइयां स्थापित की गईं।

मिथुन को साधारणतः मांस के लिए पाला जाता है और मिथुन मांस इस क्षेत्र के निवासियों द्वारा अतिप्राचीन काल से खाया जाने वाला सबसे पसंदीदा मांस है। हितधारकों के साथ हमारे निरंतर प्रयासों एवं

Since 1988, ICAR-National Research Centre on Mithun, Nagaland has been working for the continual improvement of the unique bovine species of North- Eastern states, Mithun (*Bos frontalis*). The animal is not only integrally associated with the socio-economic, religious and cultural life of the tribal people North-Eastern hilly states of Arunachal Pradesh, Nagaland, Manipur, and Mizoram but also has a great potential for meat, milk, hide and draft power.

Traditionally it is believed that mithun can be reared only under a free-range forest ecosystem. The advantage of minimum investment and labor requirement of the traditional system is often discounted by the infeasibility of the implementation of scientific interventions including record keeping, controlled breeding, and health care. In addition, there is a loss of animals, particularly young ones, due to the attack of wild carnivores. Moreover, a huge forest area, which is a prerequisite of such free range rearing system, is becoming limited. Considering these drawbacks of the traditional system, the Institute has developed an alternative package of practices for mithun rearing under the semi-intensive system. After successful implementation in the Institute Mithun farm since last two decades, this semi-intensive model is being further extended under field conditions. During 2017-18, a total of seven semi-intensive units were established.

Mithun is primarily reared as a meat animal and mithun meat is being consumed by the inhabitants of this region since time immemorial as one of the most preferred meat. After our sustaining efforts and dialogue with the stakeholders, the proposal for

वार्ता के बाद मिथुन को एक खाद्य पशु के रूप में शामिल करने का प्रस्ताव FSSAI में सक्रिय है।

मिथुन पालन को एक बैंक योग्य प्रस्ताव बनाने के लिए हमने NABARD सहित कई हितधारकों, विशेषज्ञों और बैंकिंग संस्थानों के साथ एक संवाद शुरू कर दिया है। हमने बैंक ऋण योग्य प्रस्ताव विकसित करने के लिए मिथुन पालन का तकनीकी एवं आर्थिक मानकों को अंतिम रूप दिया है।

अनुसंधान के अनिवार्य क्षेत्रों में उत्कृष्टता लाने के प्रयास हेतु केंद्र ने 10 संस्थान द्वारा वित्त प्रेषित (IRC), एक आई.सी.ए.आर–नेटवर्क, एवं 3 बाहरी वित्त प्रेषित परियोजनाओं पर काम कर रही है। NMSHE परियोजना के अंतर्गत, जलवायु परिवर्तन और उपलब्ध वन क्षेत्र तथा मिथुन की आबादी के रुझान का अध्ययन किया गया है। पशु पोषण अनुभाग के वैज्ञानिकों ने पाया कि बछड़ो के माँ की उत्तम भोजन प्रबंधन के परिणाम स्वरूप उनके बछड़ों की वृद्धि बेहतर हुई है। मिथुन के दूध में संयुग्मित लिनोलेइक एसिड (CLA) और अन्य फैटी एसिड के स्तर का विश्लेषण किया गया है। पशु दैहिक और प्रजनन खंड के अथक प्रयास ने संस्थान के मिथुन फार्म में कृत्रिम गर्भधान को शत प्रतिशत संभव बना दिया है। मिथुन में मांस की संरचना और गुणवत्ता का अध्ययन किया गया है। मिथुन में फासिओला जिगांटिका संक्रमण के आणविक चरित्रकरण एवं पैथोलॉजिकल अध्ययन किए गए है।

संस्थान में विकसित तकनीकों एवं पैकेजों का किसानों के बीच प्रसार करने का हमारा निरंतर प्रयास रहा है। वर्ष के दौरान, आदिवासी उप–योजना (TSP) के तहत, जिसे बाद में अनुसूची जनजाति घटक (TSP) के नाम से बदल दिया गया, हमने 22 गतिविधियों का आयोजन किया जिसमें मिथुन मेला, किसानों की जागरूकता तथा आवश्यक सामग्री वितरण कार्यक्रम, स्वास्थ्य शिविर, इंटरफेस मीटिंग, एवं कई एक्सपोजर भ्रमण शामिल है, जिसके अंतर्गत 1898 से अधिक किसान लाभान्वित हुए।

संस्थान का एकमात्र कृषि विज्ञान केंद्र, फेक ने 39 ऑन–फार्म टेस्टिंग्स, 153 फ्रंट लाइन प्रदर्शन एवं 39 9 अन्य प्रसार गतिविधियों के माध्यम से 4193 से अधिक किसानों को लाभान्वित किया। इन गतिविधियों के अलावा, कृषि विज्ञान केन्द्र ने राज्य सरकार / एन.जी.ओ. के विस्तार कार्यकर्ताओं के लिए विस्तार संबंधित पांच प्रशिक्षण कार्यक्रम भी आयोजित किए।

सहयोग प्रदान करना संस्थान की एक महत्वपूर्ण

inclusion of mithun as a Food Animal under FSSAI is under active consideration.

In our continuous endeavor to make mithun rearing a bankable proposition, we have started a dialogue with the stakeholders, experts, and banking institutions including NABARD. We have finalized the techno-economic parameters for developing the bankable scheme for mithun farming.

To strive for excellence in the mandated areas of research, we have undertaken 10 IRC, one ICAR-Network, three externally funded projects. Under the National Mission for Sustainable Himalayan Ecosystem (NMSHE) project the population trends of mithun under climatic change and available forest coverage was studied. The Scientists of the Animal Nutrition section showed that optimum feeding management of dams resulted in better growth of pre-weaned mithun calves. Fatty acid analysis including the levels of conjugated linoleic acid (CLA) and other fatty acids in mithun milk was determined. The sincere efforts of Animal Physiology and Reproduction section have made it possible to 100% implementation of AI in the Mithun Farm of the Institute. The carcass composition and quality of meat in mithun were studied. Molecular characterization and pathological studies of *Fasciola gigantica* infection in mithun were carried out.

It is our continuous endeavor to disseminate the technologies and packages of practices developed in the Institute to the farmers' field. During the year, under Tribal Sub-Plan (TSP), later renamed as Schedule Tribe Component (STC), we organized 22 activities including Farmers Fare-*Mithun Mela*, Farmer's Awareness cum-input distribution programmes, Health Camps, Interface meeting, and several exposure visits benefiting more than 1898 farmers.

The KVK-Phek, the only KVK hosted by the Institute, carried out 39 On-farm testings, 153 front-line demonstration and 395 other extension activities benefitting more than 4193 farmers. Apart from these activities, KVK also conducted five training programmes for Extension Functionaries of State Govt./NGOs.

Imparting skill is an important activity of the Institute. Under the DBT-sponsored Biotech Hub and BTISnet programme, students and faculties of

गतिविधि है। डी.बी.टी. प्रायोजित बायोटेक हब और बीटीआईएसनेट कार्यक्रम के तहत, विभिन्न शैक्षिक संस्थानों के छात्रों और संकायों को आण्विक जीवविज्ञान तकनीकों और जैव सूचना विज्ञान में प्रशिक्षण दिया गया।

हमने केन्द्रीय कृषि विश्वविद्यालय, इम्फाल और इसके घटक नये कॉलेजों के साथ विशेष रूप से पशु चिकित्सा विज्ञान और पशुपालन, जलुकी, नागालैंड पशु चिकित्सा विज्ञान और पशुपालन, सेलेसिह, मिजोरम, बागवानी और वानिकी कॉलेज, पासीघाट एवं अरुणाचल प्रदेश के साथ एक सक्रिय सहयोग विकसित किया है। असम राइफल्स, और मिथुन पालन राज्यों के पशु पालन एवं पशु चिकित्सा विभाग, ATMA, अटारी–जोन III, NABARD, असम पशु चिकित्सा कॉलेज, AAU, खानापारा और इस क्षेत्र के अन्य ICAR संस्थान से प्राप्त समर्थन और सहयोग उल्लेखनीय हैं।

हमें कई प्रतिष्ठित व्यक्तियों और शिक्षाविदों की मेजबानी करने का सौभाग्य प्राप्त हुआ, जिसके लिए हम उनके प्रोत्साहन, स्पष्ट और मूल्यवान सुझाव के लिए ऋणी हैं। इंस्टीट्यूट मैनेजमेंट कमेटी (IMC), रिसर्च मैनेजमेंट कमेटी (RAC) और क्विनक्वीनियल रिव्यू टीम (QRT) समेत कई समितियों के सदस्यों ने हमें संस्थान की गतिविधियों के संचालन में मार्ग दर्शन दिया।

डॉ त्रिलोचन महापात्रा, माननीय सचिव DARE एवं महानिदेशक, आई.सी.ए.आर; डॉ जेके जेना, उप–महानिदेशक (पशु विज्ञान); डॉ एच रहमान, पूर्व उप–महानिदेशक (पशु विज्ञान); डॉ बी. एस. प्रकाश, सहायक महानिदेशक (एएन एंड पी); डॉ आर एस गांधी, सहायक महानिदेशक (एपी और बी), एवं डॉ अशोक कुमार, सहायक महानिदेशक (एएच) के निरंतर समर्थन, मार्गदर्शन और आशीर्वाद के बिना संस्थान की प्रगति एवं विकास संभव नहीं हो पाता। संस्थान उन सभी के प्रति कृतज्ञता व्यक्त करता है। डॉ. विनीत भसीन, प्रधान वैज्ञानिक (पशु आनुवंशिकी और प्रजनन), डॉ राजन गुप्ता, प्रधान वैज्ञानिक (पशु पोषण), डॉ नीलम गुप्ता, प्रधान वैज्ञानिक (पशु जैव प्रौद्योगिकी) और डॉ ज्योति मिश्री, प्रधान वैज्ञानिक (पशु स्वास्थ्य) द्वारा दी गई सहायता और सलाह के लिए हम कृतज्ञ हैं।

मुझे उम्मीद है कि इस वार्षिक रिपोर्ट में दी गई जानकारी सभी हितधारकों के लिए सहायक सिद्ध होगी।

''जय हिन्द''

(अभिजित मित्र)

various educational institutes were given hands-on training in molecular biology techniques and bioinformatics.

We have developed an active collaboration with the Central Agriculture University, Imphal and its constituent colleges particularly the newly established Colleges of Veterinary Sciences & Animal Husbandry, Jalukie, Nagaland; Colleges of Veterinary Sciences & Animal Husbandry, Selesih, Mizoram; and College of Horticulture & Forestry, Pasighat, Arunachal Pradesh. Support and collaboration received from Assam Rifles; Directorates of Veterinary Services & AH of mithun rearing states; ATMA, ATARI-Zone III, NABARD; Assam Veterinary College, AAU, Khanapara and other ICAR institutes of the region is noteworthy.

We are privileged to host several dignitaries and academicians to whom we are indebted for their encouragement, candid suggestions, and valuable inputs. The members of the several committees including the Institute Management Committee (IMC), Research Advisory Committee (RAC) and Quinquennial Review Team (QRT) guided us in conducting the activities of the Institute.

The progress and development of the Institute wouldn't have been possible without the constant support, guidance and blessings of Dr. Trilochan Mohapatra, Hon'ble Secretary, DARE and DG, ICAR; Dr. JK Jena, DDG (Animal Science), Dr. H. Rahman, former DDG (Animal Science); Dr. B. S. Prakash, ADG (AN&P); Dr. R. S Gandhi, ADG (AP&B); Dr. Ashok Kumar, ADG (AH). I offer my deep sense of gratitude to all of them.

The help and advice rendered by Dr. Vineet Bhasin, PS (Animal Genetics and Breeding), Dr. Rajan Gupta, PS (Animal Nutrition), Dr. Neelam Gupta, PS (Animal Biotechnology) and Dr. Jyoti Misri, PS (AH) are also acknowledged with gratitude.

I hope the information given in this Annual Report will be helpful to all the stakeholders.

"Jai Hind!"

(Abhijit Mitra)

School Children visiting ICAR-NRCM, Medziphema Campus

कार्यकारी सारांश I EXECUTIVE SUMMARY

संस्थान में पिछले वर्ष के दौरान किए गए विभिन्न अनुसंधान गतिविधियों को सारांशित रूप में दर्शाया गया है।

पशु अनुवांशिक एवं प्रजनन

राष्ट्रीय मिशन के तहत हिमालयी पारिस्थितिक तंत्र (NMSHI) परियोजना में किये गये अध्ययन में मिथुन जनसंख्या, प्रवृत्ति एवं वन क्षेत्रफल और वार्षिक वर्षा के बीच सकारात्मक सम्बंध होने का पता चला।

पशु पोषण

मादा मिथुन के भोजन प्रबंध का बछड़ों पर पड़ने वाले प्रभाव के अध्ययन से पता चला कि बछड़े तथा मादा मिथुन को परिरुद्ध (confinement) में रखकर हरा चारा एवं दाना खिलाने पर बछड़ों का औसत शारिरिक भार वृद्धि उन बछड़ो से ज्यादा होता है जहाँ मादा को खुला छोड़ दिया जाता है।

पशु शरीर क्रिया विज्ञान

शुक्राणु संरचना के दौरन ट्रिस एग योक ग्लाइसरोल (TEYG) में बी.एस.ए तथा एस्कोरबिक एसिड जैसे एंटी ऑक्सीडेंट्स मिलाने से लाभकारी प्रभाव देखा गया। जिसमें हिमकृत शुक्रणु के द्रवित होने पर शुक्रणु गातिशीलता एवं जीवित शुक्रणु की प्रतिशत में वृद्धि पायी गई है। परन्तु वाणिज्यिक एक्सटेंडर में एंटी ऑक्सीडेंट्स मिलाने का कोई लाभकारी प्रभाव नहीं देखा गया।

को–सिंच प्रोटोकॉल का उपयोग करके, कुल 40 पशुओ को सिंक्रोनाइज़ किया गया और उनमें से 82.50% (एन = 33) पशुओ में एस्ट्रस लक्षण देखा गया। इन एस्ट्रस पशुओ में कृत्रिम गर्भाधान करने पर 24 (72.72%) पशुओ में गर्भावस्था की पुष्टि हुई। रिपोर्टिंग अवधि के दौरान, कुल 17 बछड़े पैदा हुए।

मिथुन सांड को मेलाटोनिन (18 मिलीग्राम/किलोग्राम शारीरिक भार) इंजेक्शन देने पर ताजा एवं हिमकृत वीर्य में सुरक्षात्मक प्रभाव देखा गया। वीर्य एक्सटेण्डर में मेलाटोनिन (@ 3 mM) के मिलाने पर सभी मौसम में शुक्राणु कार्यात्मक मानकों पर लाभकारी प्रभाव देखा गया।

This section depicts various research activities of the Institute carried out during the preceding year in a summarized form.

ANIMAL GENETICS AND BREEDING

Studies under the National Mission for Sustainable Himalayan Ecosystem (NMSHE) project revealed a positive association of mithun population trend with forest coverage and annual rainfall.

ANIMAL NUTRITION

The study to evaluate the effect of feeding management of dam on body weight gain of pre-weaned valves showed a significantly higher average daily gain (ADG) of the calves when both the dams and calves are kept under confinement than the calves when either dams are let loose or both the dams and calves are let loose.

During different seasons, CLA level in mithun milk varied significantly but milk fat percentage remained unaltered.

ANIMAL PHYSIOLOGY & REPRODUCTION

Addition of anti-oxidants, Bovine Serum Albumin (BSA) and Ascorbic Acid, to Tris Egg Yolk Glycerol (TEYG) extender showed the beneficial effect on post-thaw sperm motility (51.25±1.88 vs 41.33±1.60%) and live sperm percentage (57.50±2.31 vs 53.33±1.28 %), however, these beneficial effects could not be observed while using the commercial extenders

Using Co-synch protocol, a total of 40 animals were synchronized and among them, 82.50% (n=33) animals exhibited the estrus signs. On artificial insemination of these estrous animals, pregnancy was confirmed in 24 (72.72%) animals. During the reporting period, a total of 17 calves were born.

Exogenous administration of melatonin (@18 mg/kg b.wt.) in mithun bull exhibited a significant protective effect on sperm parameters both in fresh as well as cryo-preserved semen. Addition of melatonin (@ 3mM) in semen diluents also showed

पशु स्वास्थ्य

आणविक मार्कर जैसे आईटीएस –1 और माइटोकॉन्ड्रियल एंजाइम कॉक्स 1 की मदद से फैशियोला जाइगैंटिका से संक्रामित मिथुन में, फैशियोला जाइगैनटिक आणविक लक्षण तथा पशुओं में उत्पन्न विकारों का अध्यन किया गया।

पशुधन उत्पादन एवं प्रबंधन

मिथुन के विकास प्रदर्शन को प्रभावित करने वाले अनुवांशिक और गैर अनुवांशिक कारकों का अध्ययन करने के लिए, मासिक / साप्ताहिक अन्तराल पर बछड़ो तथा वयस्क मिथुन का वजन दर्ज किया जा रहा है।

पशुधन उत्पाद प्रौद्योगिकी

मिथुन मांस की विशेषताओं तथा भौतिक और रसायनिक गुणों पर अध्ययन से ड्रेसिंग प्रतिशत 51-65 ± 1-2 9%, 71-18 ± 0-95% नमी, 22-24 ± 0-64% प्रोटीन, और वसा 0-5 9 5 ± 0-14% पाया गया।

विस्तार और जनजातीय उप योजना (टीएसपी)

जनजातीय उपयोजना (टीएसपी) जिसे बाद में अनुसूचित जनजाति घटक (एसटीसी) के रूप में नामित किया गया, के अंतर्गत 07 अर्ध–गहन इकाइयों की स्थापना सहित 22 कार्यक्रम, आयोजित किये गये। जिसके अंतर्गत मिथुन मेला, किसान जागरूकता कार्यक्रम, एक्सपोजर भ्रमण, तथा कार्यशालाओं का आयोजन मिथुन निवासित सभी चार राज्यों जैसे अरुणाचल प्रदेश, मणिपुर, मिजोरम और नागालैंड में आयोजित किया गया जिसके अंतर्गत कुल 1898 किसान लाभान्वित हुये।

कृषि विज्ञान केन्द्र, फेक

- कुल 89 प्रशिक्षण कार्यक्रमों का आयोजन किया गया जिसके अंतर्गत 1176 किसानों, 313 ग्रामीण युवक और 80 विस्तार कार्यकर्ता लाभान्वित हुये।
- ग्रामीण युवाओं के लिए पांच व्यावसायिक प्रशिक्षण का आयोजन किया गया जिसमें राज्य सरकार/एनजीओ के 23 विस्तार कार्यकर्ताओं ने हिस्सा लिया।
- 394 अन्य विस्तार गतिविधियों द्वारा 4913 किसानों को लाभ पहुंचाया गया।

a beneficial effect on sperm functional parameters irrespective of the season.

ANIMAL HEALTH

Molecular characterization and pathological studies of Fasciola gigantica infection in mithun using molecular marker viz., ITS-1 and mitochondrial enzyme cox 1assess the histopathological alteration caused by Fasciola infestation110 animals.

LIVESTOCK PRODUCTION AND MANAGEMENT

In order to study the genetic and non-genetic factors influencing the growth performance of mithun, the monthly/ weekly body weight of calves, grower and adult mitun are being recorded.

LIVESTOCK PRODUCT TECHNOLOGY

The studies on carcass characteristics and physicochemical properties of mithun meat revealed: Dressing percentage 51.65±1.29%, 71.18±0.95% moisture, 22.24±0.64% protein, and 0.595±0.14% fat.

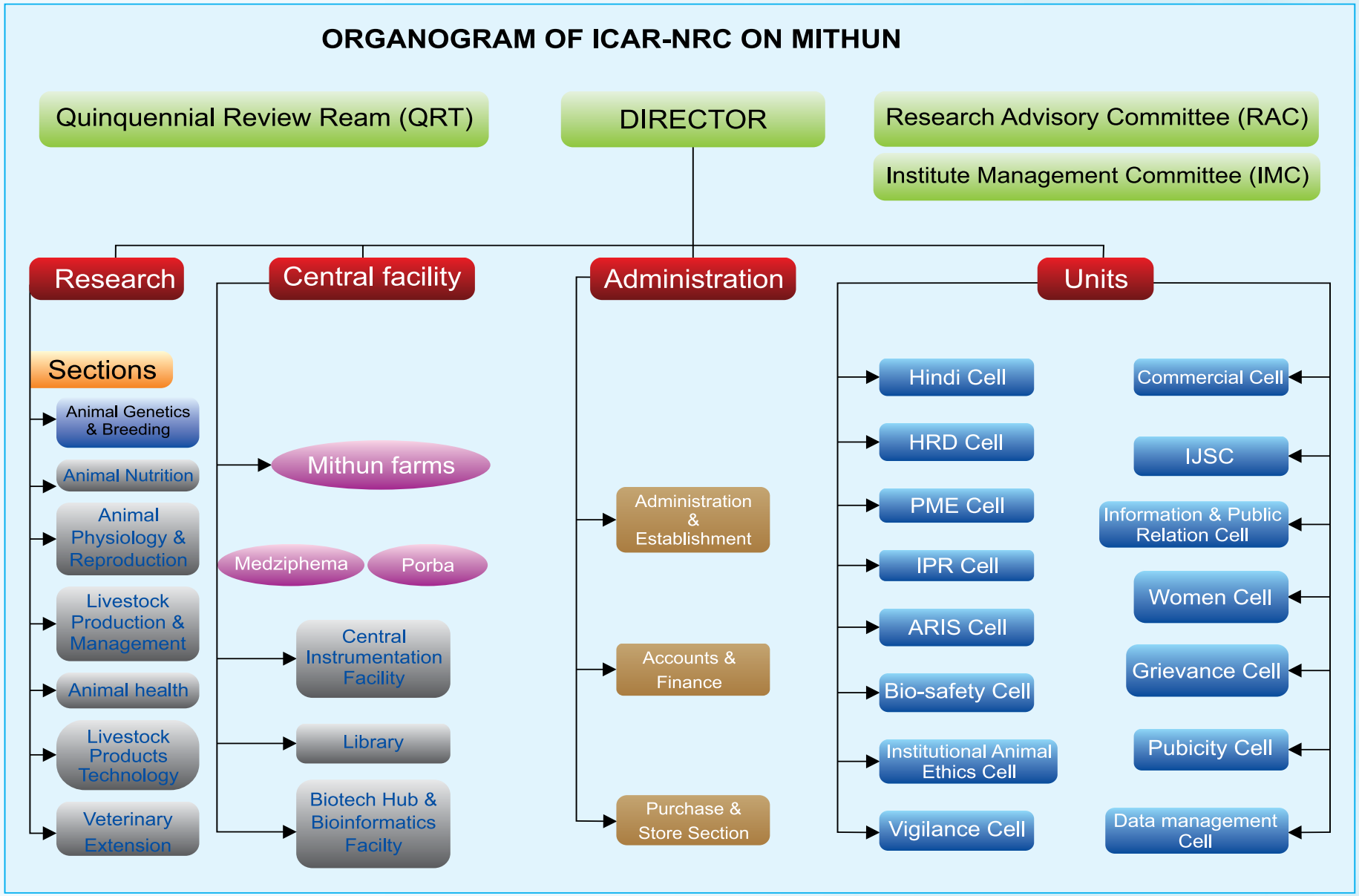
EXTENSION AND TRIBAL SUB PLAN (TSP)

Under Tribal Sub Plan (TSP), later renamed as Schedule Tribe Component (STC), 22 programmes including the establishment of semi-intensive units (n=7), Mithun Mela, Farmers' Awareness programme, Farmers Training programme, Exposure visits, Workshops and stakeholders' meet in all the four mithun inhabited states viz., Arunachal Pradesh, Manipur, Mizoram, and Nagaland. A total of 1898 farmers were participated/benefited from this programme.

KRISHI VIGYAN KENDRA (KVK), PORBA, PHEK

- Carried out 89 training programmes benefiting 1176 farmers, 313 rural youths and 80 extension functionaries
- Conducted five vocational training for rural youths and extension functionaries of State Govt./NGOs attended by 23 participants.
- Carried out 394 other extension activities benefiting 4913 farmers.

ORGANOGRAM OF ICAR-NRC ON MITHUN



29th Foundation Day: 2nd June, 2017

Shri Yitachu Fithu, Hon'ble Minister for School Education & SCERT, Govt of Nagaland and Dr. Chandan Rajkhowa, former Director, ICAR-NRC on Mithun distributing tree saplings.

Dignitaries with the farmers and SFS School Band, Medziphema participated in the Foundation Day celebration

INTRODUCTION

The Institute

ICAR-National Research Centre on Mithun, established in the year 1988, being the only research organization in the world, is exclusively working for the continual improvement and conservation of Mithun (*Bos frontalis*). During the last more than 29 years, the Institute has not only generated invaluable scientific data towards the understanding of this unique species but also developed several packages of practices and technologies. Conservation efforts including taming of mithun and demonstrating an alternative system of semi-intensive rearing of mithun resulted in the complete domestication of the species. Popularization efforts led to the adoption of scientific rearing of mithun by the tribal communities of North Eastern Region (NER) with better returns. Some of the salient achievements of the Institute are:

- Genetic and molecular characterization of different mithun populations and delineating evolutionary relationship of mithun with gaur (*Bos gaurus*).
- Protocol for collection and freezing of semen, estrus synchronization and AI in mithun, and successful implementation in the institute farm and farmers' fields.
- Protocol for collection and cryopreservation of embryo in mithun leading to the birth of the World's first embryo transfer mithun calf from a cryopreserved embryo "Mohan"
- Area-specific mineral mixture and feed block using locally available tree leaves/shrubs and industrial by-products
- Chemical and nutritional evaluation of 260 feed resources (e.g., tree leaves/ shrubs/grasses) for incorporation in the total mixed ration (TMR).
- Supplementation of spent grain and wheat bran/ rice bran in the diet of mithun increased dry matter and gross energy intake
- Methods for drying high moisture content agro-industrial by-products (wet cake) and successful incorporation in paddy straw based feed blocks
- Determination of age by dentition pattern of mithun under field conditions

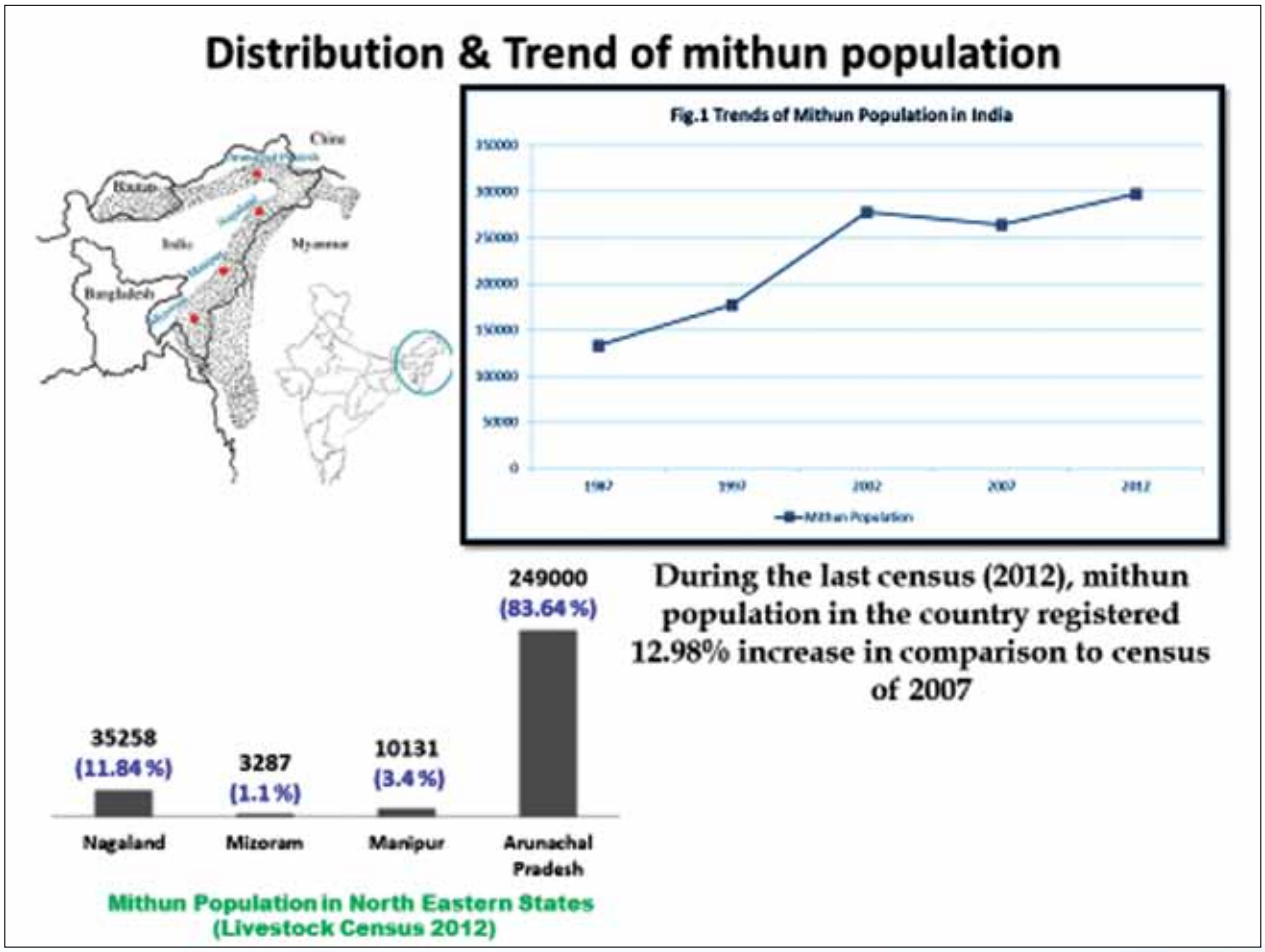
- Surveillance of important parasitic, bacterial, and viral diseases in mithun and development of control measures
- Diversified use of mithun:
  - value-added milk products (paneer, lassi, dahi and rasgolla)
  - meat (meat block, patties, nugget and meat powder)
  - skins and hides (leather jacket, ladies bag, shoe, wallet, portfolio bag)
  - Draftability
- Semi-intensive system of rearing of mithun as a farming system model

Geographical Distribution and Population Status of Mithun

Mithun is distributed within a limited geographical boundary. It is mainly found in the North-Eastern Region of India viz., Arunachal Pradesh, Mizoram, Nagaland, and Manipur. It is also found in Myanmar, China, Bangladesh and Bhutan. It is difficult to ascertain the world total population of mithun as no systematic population record is available in mithun inhabited areas except in India. According to the 19th Livestock Census (2012), out of 298264 total population of mithun in India, 249000 mithuns are available in Arunachal Pradesh, followed by 34871 in Nagaland, 10131 in Manipur and 3287 in Mizoram.

Mithun is traditionally reared under a forest ecosystem and can easily thrive at an elevation of 300–3000 MSL. Several factors including inbreeding, indiscriminate slaughter, cross-breeding with cattle and habitat destruction are responsible for poor or slow population growth of mithun. Considering the social as well as economic importance, this animal species deserves a special attention for the conservation, improvement, and propagation.

In the following sections, a brief account of the research and extension activities undertaken by the Institute, and man-power, funding status, ongoing projects, and other information during the period of 2017-18 is presented..



VISION, MISSION, MANDATE

संदृश्य / VISION

किसानों के बेहतर पोषण एवं सामाजिक–आर्थिक सहायता हेतु उच्च गुणवत्ता के मिथुन जननद्रव्य की परिरक्षा, संरक्षण एवं प्रसारण तथा संधारणीय उत्पादन प्रणाली का विकास।

To preserve, conserve and propagate superior quality mithun germplasm for a sustainable production system and subsequent utilization for better nutritional and socioeconomic support to the farmers.

ध्येय / MISSION

प्रजनन एवं स्वास्थ्य हेतु वैज्ञानिक प्रबंधन एवं निरूपण, आहार पद्वति तथा जैव प्रौद्योगिकी का प्रयोग एवं मिथुन पालकों के हित हेतु आर्थिक रूप से व्यवहार्य एवं संधारणीय प्रौद्योगिकी का विकास।

Formulation and adoption of scientific management, feeding practices and advanced bio-techniques for reproduction and health with an ultimate objective to develop economically viable and sustainable technologies for the benefit of the farming communities rearing mithun.

अधिदेश / MANDATE

- देश में उपलब्ध मिथुन के जननद्रव्य की पहचान, मूल्यांकन एवम गुणवर्णन करना।
- Identification, evaluation and characterization of mithun germplasm availanle in the country.
- दुग्ध एवं मांस उत्पादन के लिए मिथुन का गुणवर्धन एवम संरक्षण करना।
- Conservation and improvement of mithun for meat and milk.
- मिथुन सूचना केन्द्र के संग्रह के रूप में कार्य करना।
- To act as repository of information on mithun

Visit of the Members of QRT to Mithun Farm on September 6, 2017

ORGANIZATINAL SETUP

STAFF POSITION AS ON 31.03.2018

Category	Sanctioned Strength	In Position	Vacant
RMP	1	1	0
Principal Scientist	2	1	1
Senior Scientist	4	1	3
Scientist	12	5	7
T6	3	2	1
AO	1	0	1
AAO	2	1	1
AF&AO	1	1	0
Assistant	4	2	2
PA	1	0	1
UDC	1	0	1
LDC	4	2	2
Junior Steno	1	1	0
T2	0	0	0
T1	2	2	0
Supporting	8	8	0
Total	47	27	20

IN-CHARGE AND MEMBERS OF DIFFERENT CELL

A.O. & Head of Office	Miss Aloli Rengma Dr. (Mrs.) Saroj Toppo
D.D.O. Cell	Miss Aloli Rengma Dr. J. K. Chamuah Dr. S. S. Hanah
Cashier	Mrs. Achuno Solo Sh. Surjit Kumar
Establishment/Administration	Miss Aloli Rengma Sh. Th. Dipal Meitei
Store	Miss Aloli Rengma Dr. Kobu Khate Sh. Th. Dipal Meitei
AF & AO	Sh. Safal Chetri Dr. Kezhavituo Vupru Dr. S. S. Hanah
Estate	Dr. Kezhavituo Vupru Dr. Kobu Khate Sh. K. M. Chusi
Farm	Dr. Kobu Khate Dr. S. S. Hanah
Guest House	Sh. Th. Dipal Meitei Dr. S. S. Hanah
Library	Dr. (Mrs.) Saroj Toppo Dr. Lalchamliani
AKMU/ITMU/Innovation/IPR	Dr. J. K. Chamuah Dr. S. S. Hanah
Bio-Safety Cell	Dr. J. K. Chamuah
Data Cell	Dr. J. K. Chamuah

Hindi Cell	Dr. (Mrs.) Saroj Toppo Dr. M. H. Khan Sh. Surjit Kumar
PME Cell	Dr. S. Mukherjee Dr. (Mrs.) Saroj Toppo
RTI/ Information and Public Relation Cell	Dr. M. H. Khan Dr. Kobu Khate
Sport Cell	Dr. S. S. Hanah Dr. Lalchamliani
TSP Activities	Dr. M. H. Khan
Vehicle Cell	Dr. Kezhavitou Vupru Sh. Surjit Kumar Sh. Th. Dipal Meitei
HRD Nodal Officer	Dr. S. Mukherjee Dr. (Mrs.) Saroj Toppo
Seminar & Meeting Hall	Dr. Lalchamliani Dr. (Mrs.) Saroj Toppo
Swachh Bharat Mission	Dr. Kobu Khate
Extension Cell	Dr. S. S. Hanah

Institute Management Committee (IMC)

Position	Name and Designation
Chairman (Director, NRC on Mithun)	• Dr. Abhijit Mitra
Member (Representative of the State Govt. concerned with the research in the Institute nominated by President, ICAR)	• Director, Dept. of Veterinary & Animal Husbandry, Govt. of Nagaland, Kohima.
Member (Representative of any other State Govt. concerned with the research in the Institute nominated by President, ICAR)	• Director, Dept. of Veterinary & Animal Husbandry, Govt. of Manipur.
Member (A representative of the Agricultural University under the jurisdiction nominated by the President, ICAR)	• Dean, Faculty of Veterinary Science, Assam Agriculture University, Khanapara, Assam.
Member (Four Scientists of Council's Institute to be nominated by the DG)	• Dr. S. M. Deb, Director, ICAR-NRC on Yak, Arunachal Pradesh • Dr. N. Haque, Principal Scientist, ICAR-NRC on Mithun, Medziphema, Nagaland. • Dr. Madan Kumar Tamuli, Principal, ICAR-NRC on Pig, Guwahati • Joint Director, ICAR Research Complex for NEH Region, Nagaland Centre, Medziphema
(Two non-official persons representative Agricultural Rural interest to be nominated by the President, ICAR)	• Shri Lachit Kachari • Shri Jaangsillung Gonmei
(Concerned ADG)	• Dr. R. S. Gandhi, ADG (AP&B), ICAR Krishi Bhavan, New Delhi
The Financial Advisor of the Council or DARE or the Accounts Officer of the same or another institute	• AF&AO of ICAR-NRC on Pig, Guwahati, Assam.
Member Secretary Asstt. Administrative Officer	• Ms. Aloli Rengma, AAO, ICAR-NRC on Mithun, Medziphema, Nagaland

Research Advisory Committee (RAC)

Position	Name and Designation
Chairman (An eminent scientist from outside the ICAR system nominated by the DG, IC)	• Dr. Dharmeshwar Das, Former Joint Director (Academic), ICAR-IVRI, Izatnagar, U. P.
Members (4-5 external experts (ex-retired scientist of ICAR representing the major areas of the research development programme nominated by the DG, ICAR)	• Dr. Kusumakar Sharma, Former ADG (Education), ICAR, Krishi Bhavan, New Delhi. • Dr. A. Aziz, Prof. & Head, Animal Genetics & Breeding, AAU, Khanapara-22, Assam. • Dr. K. K. Baruah, Former Director, ICAR-NRC on Yak, Dirang, Arunachal Pradesh. • Dr. A. Chakravarty, Director Research, AAU, Khanapara, Assam.
Member (Director of the Institute)	• Dr. Abhijit Mitra, Director, ICAR-NRC on Mithun, Medziphema, Nagaland
Member (Two persons representing/rural interests on the Management Committee for the period of their membership of the Management Committee)	• Sh. Lachit Kachari, IMC Member & Progressive Farmer, Dimapur • Sh. Jaangsillung Gonmei, IMC Member & Progressive Farmer, Dimapur.
Member Secretary	• Dr. Nazrul Haque, Principal Scientist, ICAR-NRC on Mithun, Medziphema, Nagaland.

Institute Research Committee (IRC)

Position	Name and Designation
Chairman	Dr. Abhijit Mitra, Director, ICAR-NRC on Mithun, Medziphema, Nagaland
Members	All the Scientists of ICAR-NRC on Mithun, Medziphema, Nagaland
Member Secretary	Dr. Nazrul Haque, Principal Scientist, ICAR-NRC on Mithun, Medziphema, Nagaland.

Quinquennial Review Team (QRT)

Position	Name and Designation
Chairman	Dr. S. P. S. Ahlawat, Former Director, IVRI, Bareilly, Izatnagar, U. P.
Member	Dr. K. S. Risam, Director of Extension, SKUAST, Jammu and Kashmir.
Member	Dr. N. Kondaiah, Former Director, ICAR-NRC on Meat, Hyderabad.
Member	Dr. J. R. Rao, Former Principal Scientist & Head, Dept. of Parasitology, IVRI.
Member	Dr. Dyal Singh Chawla, Former Principal Scientist & I/C, CIRB, Nabha, Punjab
Member	Dr. S. V. S. Verma, Former Principal Scientist & Head, CARI, 139, Yasoda Kunj, Mavana Road, Meerut-250001.
Member Secretary	Dr. Sabyasachi Mukherjee, Principal Scientist, ICAR-NRC on Mithun, Medziphema, Nagaland.

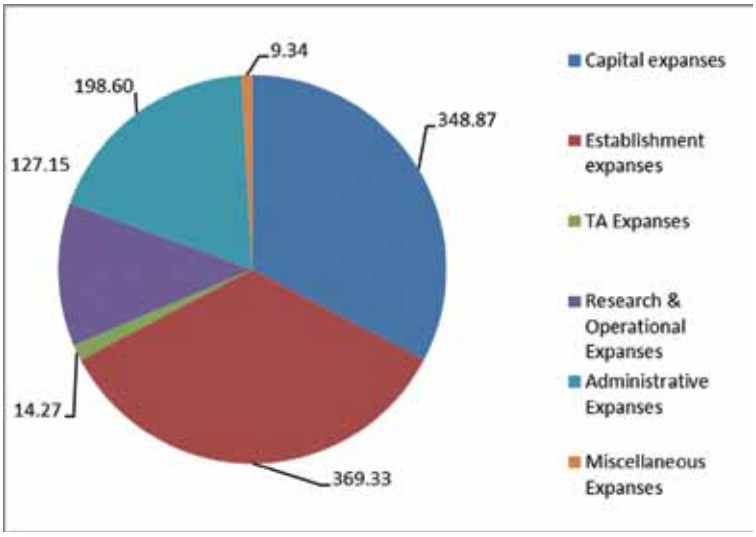
FINANCIAL STATEMENT 2017-18

Detail of Allocation vis-a-vis Expenditure the F.Y 2017-18 Under Institute Main Grant in AID

(Rs. in Lakhs)

Sl. No	Head	Allocation	Expenditure
A	GRANT IN AID - CAPITAL:		
1.	Works	343.41	343.41
2.	Information Technology	2.90	2.90
3.	Library Books and Journals	0.06	0.06
4.	Livestock	2.75	2.50
	Total- Grant in Aid Capital		
B	Establishment Expenses (Salaries):		
1.	Establishment Charges	338.00	337.62
2.	Wages	32.00	31.71
	Total-Establishment Expenses (Grant in Aid -Salaries)	370.00	369.33
C	Grant in Aid-General:		
1.	Pension & Other Retirement Benefits	43.14	42.95
2.	Travelling Allowances	15.00	14.27
3.	Research & Operational Expenses:	-	-
i	A. Research Expenses	50.00	49.90
ii	B. Operational Expenses	77.25	77.25
	Total- Research & Operational Expenses:	127.25	127.25
4.	Administrative Expenses:		
i	Infrastructure	45.50	45.30
ii	Communication	1.00	0.64
iii	Repair & Maintenance:		
	Equipments, Vehicles & Others	8.00	7.74
	Office Building	26.90	26.90
	Residential Building	12.16	12.16
iv	Minor Works	6.94	6.39
v	Others (excluding TA)	172.00	99.47
	Total - Administrative Expenses	272.50	198.60
5	Miscellaneous Expenses		
i	HRD	2.00	1.86
ii	Publicity & Exhibitions	5.00	4.50
iii	Other Miscellaneous	10.00	2.98
	Total-Miscellaneous Expenses	17.00	9.34
	Total--Grants in Aid-General	474.89	392.30
	Grand Total (Capital +Establishment+General)	1,194.01	1,110.50
	Loans and Advances	10.00	3.00

Institute Grant Expenditure during F.Y 2017-18 (Figures in Lakhs)



LIST OF CIVIL WORKS INITIATED / COMPLETED DURING 2017-18

Sl. No	Name of Deposit work	Estimated Cost (Rs in Lakhs)	Status as on 31/3/18
1	Laying of GI Pipe 80mm diameter for a distance of 6 km at NRCM Porba	84.60	completed
2	Black Topping Road (2 km) at NRCM Porba, Nagaland	116.18	ongoing
3	Retaining wall (RCC Structure) 1 km at NRCM Porba	271.56	ongoing
4	Fencing of Mithun Farm (6 km) at NRCM Porba	361.00	ongoing
5	Fencing of Grazing Area in 2 locations of 1 hectare each (2 units) at NRCM, Medziphema	49.61	completed
6	Type-III Quarters (2 nos) at NRCM Medziphema	63.61	completed
7	Boundary Fencing of Miithun Fram (3 km) at Medziphema	179.88	ongoing
8	Training Hostel cum Guest House at NRCM, Medziphema	102.31	ongoing
9	Central Instrumentation Lab with Museum at NRCM Medziphema	119.54	ongoing
10	Shed for digital Weighing Balance at NRCM Medziphema	5.00	completed
11	2 Nos experimental Shed at NRCM Medziphema	27.00	completed
12	2 Nos Breeding Enclosures at NRCM Medziphema	11.50	completed
13	Blacktopping Farm Road at NRCM Medziphema	50.93	completed
14	Carpeting of Campus Road (5000 sqm) (NRCM)	16.93	completed

ADMINISTRATIVE REFORMS

- Public Financial Management System (PFMS)
- Biometric Attendance System
- Cashless transactions through Swipe Machine and Easy Pay Card
- MIS-FMS
- E-Procurement and GeM implemented

Mitun Mela at Boasimla, Arunachal Pradesh

RESEARCH ACHIEVEMENTS

Mithun Draught Power: Mithun bulls are being trained for ploughing

ANIMAL GENETICS AND BREEDING

National Mission for Sustainable Himalayan Ecosystem (NMSHE TF-6)

The effect of climatic elements and forest coverage on the population trend of mithun of three major Mithun rearing districts of Nagaland (Kohima, Phek and Tuensang) was evaluated (see Figure below). A decreasing trend in mithun population corresponded with the decreasing trend of annual rainfall and forest coverage in Kohima and Tuensung. However, an increasing trend of mithun population was recorded in Phek district with a corresponding increase in forest coverage.

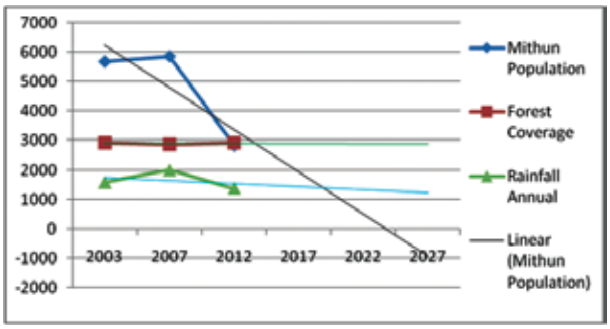


Figure: Trends of mithun population, rainfall and forest coverage in Kohima District

Mithun ecology and habitat was also studied through survey and interactions with mithun farmers during field trips. Mithun bulls, which are mostly solitary, are diurnal in nature, and after the sunset they generally come down on the roadside, away from the human locality, to rest with their herds.

Figure: Mithuns on the road-side away from human locality after sunset

ANIMAL NUTRITION

Feeding management of dams resulted in better growth of pre-weaned mithun calves

In order to assess the effect of feeding management of dams on the growth performance of pre-weaned calves, dams along with their calves were reared under three different management systems as per the details given in Table below.

Particulars	Group 1	Group 2	Group 3
Number of dams	7	5	5
Management system	Reared under a semi-intensive system where calves were let loose along with dams for grazing	Reared under a semi-intensive system where calves were kept in confinement but dams were let loose in the forest	Reared under an intensive system where both the calves and dams were kept confined
Concentrate mixture (kg)	2.5	2.5	3.5
Roughage (Paddy straw + green fodder; 2:1)	No	No	Ad lib
Grazing in the forest	Day time	Day time	No grazing

The body weights of the calves were recorded every month until weaning. At 4th month, the average body weights of the calves of these groups were recorded as 48.0±2.81, 58.6±7.20 and 84.7±11.91 kg, respectively. The average daily gain (ADG) varied significantly across the groups (see Figure). The highest ADG of 500.7±98.90 g/d was observed in group 3 which was higher ($P<0.05$) than that of group 1 (209.3±19.51 g/d) and 2 (304.7±51.78 g/d). However, the ADG in groups 1 and 2 did not vary significantly.

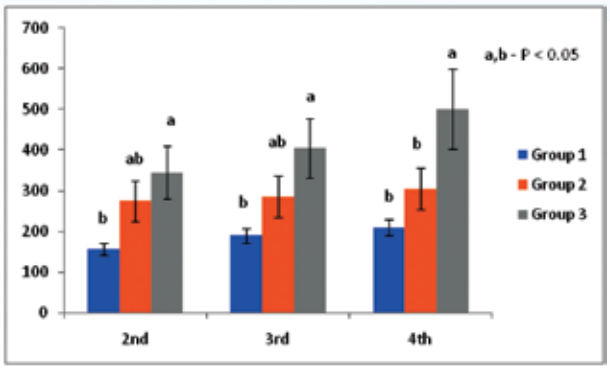


Fig. 1: Trends in Average daily Gain (ADG) of mithun

Fatty acid analysis of mithun milk

Milk samples (n=13) of mithuns, maintained at the Institute farm, were collected during monsoon, post-monsoon, and winter. Milk samples were analyzed using gas chromatography to determine the levels of conjugated linoleic acid (cis-9 trans-11+trans-9 cis-11 CLA) and other fatty acids (C4 to C24 all *cis* and *trans* forms).

The CLA levels didn't vary between the different seasons and ranged from 6.76 to 9.18 mg/g milk. The level of CLA (cis-9 trans-11+trans-9 cis-11 CLA) varied from 2.83 to 23.99% in mithun milk. The fat percent of mithun milk ranged between 4.22 to 15.89% with a mean value of 8.90±0.63 which was not affected by the season. However, level of saturated fatty acid (SAF), monounsaturated fatty acid (MUFA) and polyunsaturated fatty acids (PUFA) were 72.89±1.77, 24.79±1.71 and 2.32±0.22% of total fatty acids, respectively. The content of MUFA and PUFA was significantly ($P<0.05$) higher during post-monsoon compared to monsoon and winter. However, the level of long chain fatty acids (i.e. more than C16 carbon length) was significantly lower ($P<0.05$) during monsoon and winter months than post-monsoon. The omega-3 fatty acids and omega-6 fatty acids were 0.63±0.14 and 1.76±0.25 µg/g milk and a non-significant effect of the season were observed on these fatty acids.

ANIMAL PHYSIOLOGY AND REPRODUCTION

Effect of anti-oxidants on post-thaw sperm motility and viability

The success of artificial insemination with frozen semen is greatly influenced by the post-thaw motility and viability of spermatozoa. During the last decades, an extensive research has been carried out in ICAR-NRC on Mithun to standardize and perfect the artificial insemination including semen collection, choice of diluents, the rate of dilution, the rate of cooling and freezing under controlled condition and rate of thawing. However, it is a continuous endeavor to further augment the already optimized protocol of semen freezing.

Oxidative damage of spermatozoa during cryopreservation is a potential cause of the decline in motility and fertility. Bovine serum albumin (BSA), an anti-oxidant, is reported to have the protective effect of lipid peroxidation and the maintenance of sperm motility. Ascorbic acid is known to reduce the magnitude of DNA damage. In order to further improve the post-thaw motility and viability, an experiment was carried out to evaluate the effect of the addition of Bovine Serum Albumin (BSA) and Ascorbic Acid in the semen extender. The results have demonstrated the beneficial effect of addition of BSA (@ 1.5 and 2.0 mg/ml) and Ascorbic acid (@ 3 mg/ml) in the semen extender on post-thaw sperm motility (51.25±1.88 vs 41.33±1.60%) and live sperm percentage (57.50±2.31 vs 53.33± 1.28%) when frozen in TEYG (Tris Egg Yolk Glycerol) extender. However, these beneficial effects could not be observed while using the commercial extenders.

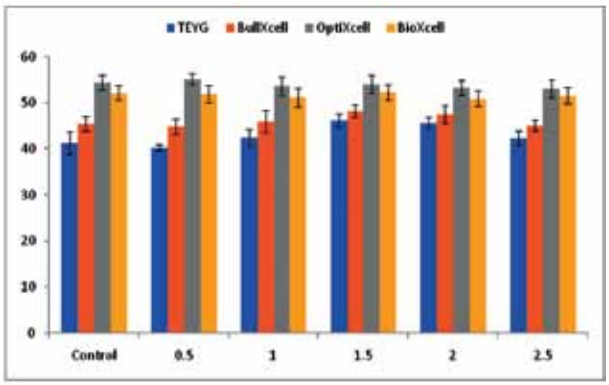
Estrus synchronization and Timed-AI

Artificial Insemination (AI) is not only a very efficient technology for rapid genetic improvement but also it helps in reducing the inbreeding. Due to silent estrus and shy nature of mithun bull, estrus detection in mithun is a major obstacle in the implementation of AI programme in the Farm as well as under field condition. In order to address this problem, estrus synchronization with Timed AI was initiated. A total of 40 animals were synchronized using Co-synch protocol during the period. 82.50% (n=33) animals which exhibited the estrus signs were artificially inseminated. Pregnancy

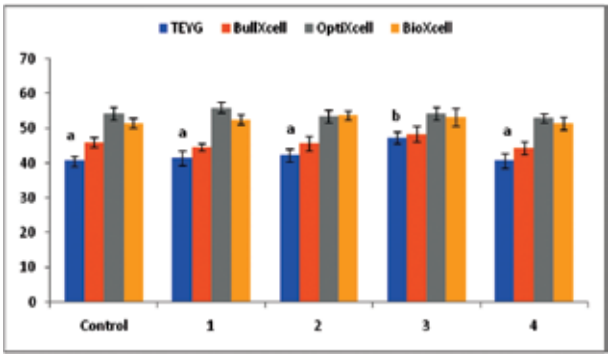
was confirmed in 24 (72.72%) animals. During the reporting period, a total of 17 calves were born.

Effect of Melatonin on reproductive efficiency of mithun bulls

There is a marked seasonal variability in the reproductive behavior of mithun bull which is evident by differences in the semen quality and fertility during different seasons. Since melatonin and its receptors are known to play a vital role in seasonal reproduction, the present study was aimed to assess the role of melatonin on sperm characteristics and fertility in mithun bulls. Under the study, the seasonal variations in melatonin production and its association with other reproductive hormones in different seasons have already been reported. Since melatonin is also known for its potent antioxidant potential, an attempt was made to improve the quality, freezability, and fertility of mithun semen through subcutaneous melatonin implants. Melatonin implant (@18 mg/kg b.wt.) exhibited a significant protective effect on sperm parameters both in fresh as well as cryo-preserved semen. Further, the addition of melatonin (@ 3mM) in semen diluents also showed a beneficial effect on sperm functional parameters irrespective of the season.



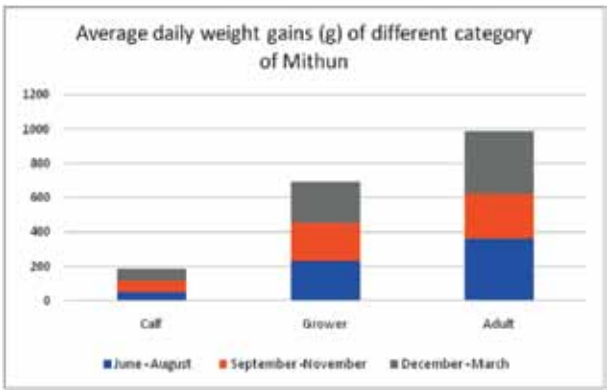
Addition of BSA (mg/ml of extender)



Addition of Ascorbic Acid (mg/ml of extender)

LIVESTOCK PRODUCTION AND MANAGEMENT

Mithun is primarily reared as a meat animal. Genetic improvement of mithun for growth is important. Therefore, a project was undertaken to analyse the genetic as well as non-genetic factors influencing the growth performance of mithun. Monthly/ weekly live body weights of farm animals are being recorded. All the historical data are also being digitized for further analysis. Average daily weight gains (g) of the presently available population of mithun are presented graphically below.



Recording of monthly live body weight of mithun

LIVESTOCK PRODUCTS TECHNOLOGY

Carcass characteristics and physico-chemical properties of mithun meat

A study was undertaken to analyze the carcass composition and meat quality of mithun. Dressing percentage of mithun was recorded as 51.65±1.29. Among the edible offal, liver, heart, kidney, spleen consisted of 1.22±0.09, 0.416±0.01, 0.19±0.02, and 0.23±0.02 percent of the live weight, respectively, whereas skin/hide contributed 6.49±0.56 percent.

The proximate analysis of mithun meat revealed 71.18±0.95% moisture, 22.24±0.64% protein and 0.595±0.14% fat suggesting that mithun meat is a leaner as compared to other species. The calorific value (kcal/100 g) of mithun meat is 113±3.93 and cholesterol content is 34.93±3.93 mg/100 g. The degree of marbling (intramuscular fat) of mithun meat, judged by exposing the rib eye area on the 12th rib of the carcass on the basis of a standard photograph of USDA marble scoring guide by visual appraisal, showed a moderate to slight marbling.

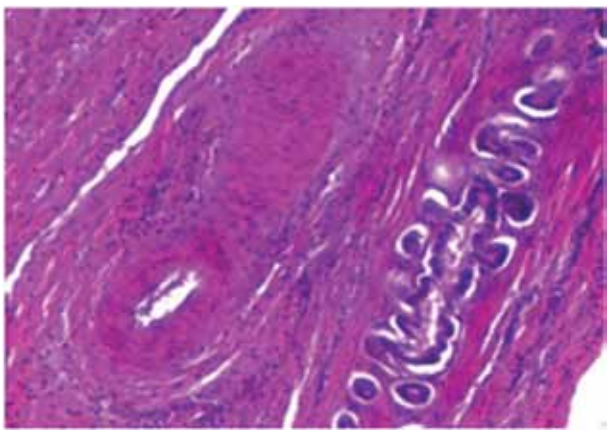
Fig: Mithun meat for judging of marbling by visual appraisal

ANIMAL HEALTH

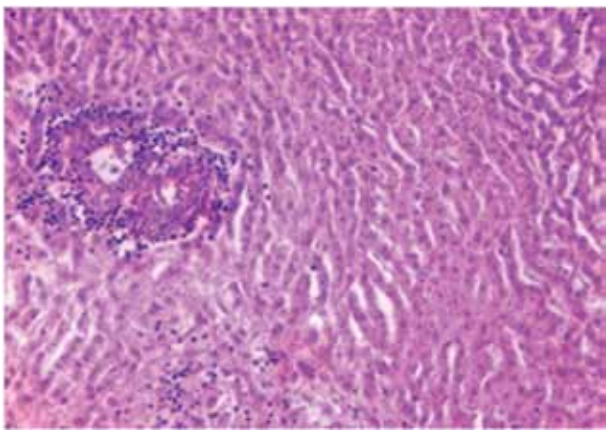
Molecular characterization and pathological studies of *Fasciola gigantica* infection in mithun

The identification of *Fasciola gigantica* was carried out using molecular marker viz., ITS-1 and mitochondrial enzyme cox 1. Based on the sequence analysis, the parasite collected from both mithun and cattle was confirmed as *F. gigantica*. The morphological studies also confirmed the species identity of parasites as *F. gigantica*.

In order to assess the histopathological alteration caused by *Fasciola* infestation110 animals were examined during the period of 2010-2016. Out of them, eight liver specimens were positive. The histopathological examination of the infected liver exhibited an extensive fibrous connective tissue proliferation with necrosis of hepatocytes with infiltration of the polymorphonuclear cell. There was an evidence of migratory tract of parasites with loss of normal lobular hepatic architecture. Bile duct proliferation followed by congestion of portal vein with perivascular cuffing with surrounding degeneration of hepatocytes was evident. The hepatocytes showed pyknosis with hyperplasia of the bile duct.

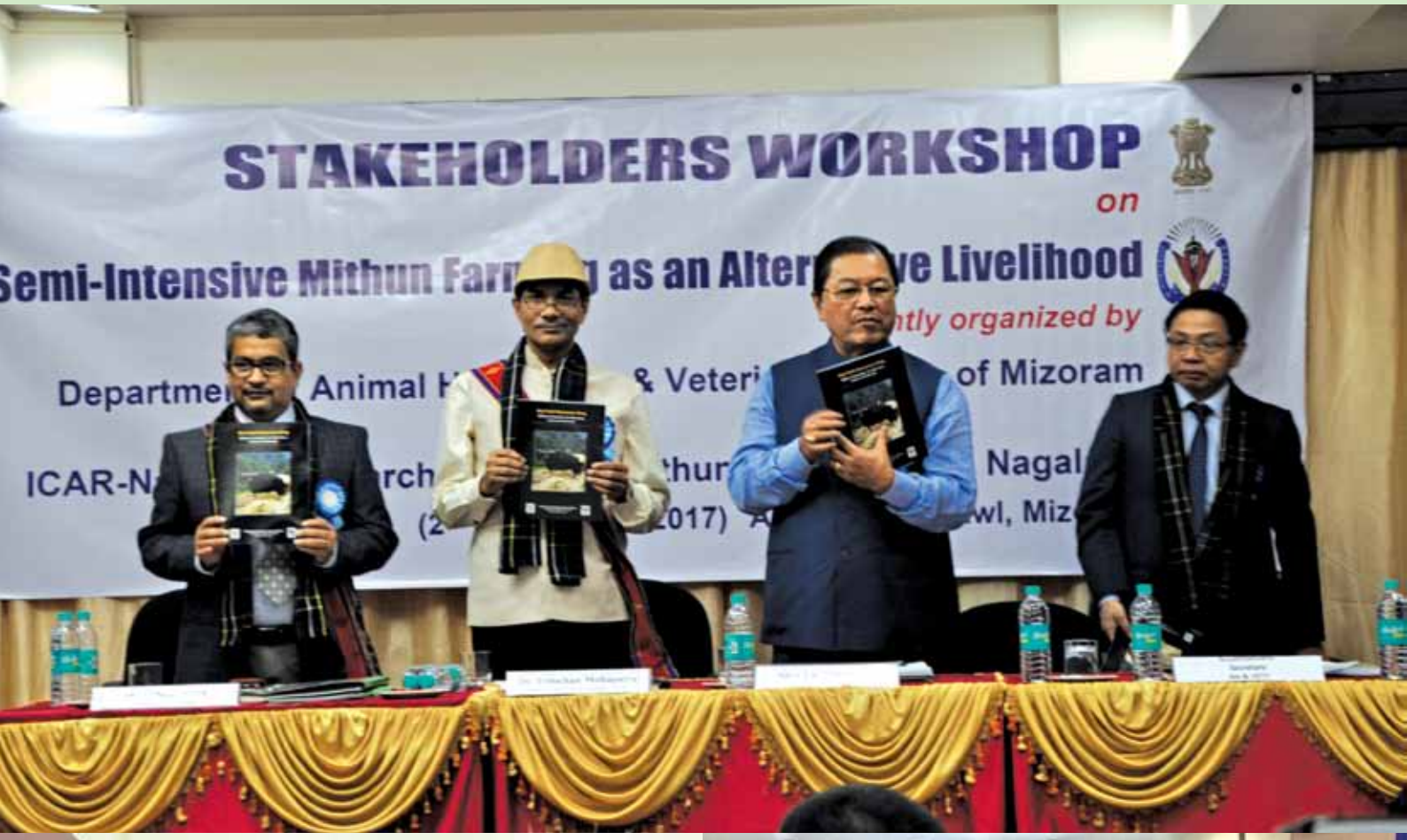


Parasitic tract with fibrous proliferation in liver parenchyma and bile duct with infiltration of inflammatory cells.10X H&E.



Congestion of portal vein with perivascular cuffing with surrounding degeneration in the cytoplasm of hepatocytes with mild focal inflammatory cell aggregation in between the hepatocytes in the hepatic parenchyma. 20X H&E.

TRANSFER OF TECHNOLOGY



Shri Lal Thanhawla, Hon'ble Chief Minister of Mizoram and Dr. Trilohan Mohapatra, Secretary, DARE & DG ICAR gracing the stakeholders workshop on "Semi-intensive-e Mithun Farming as Alternative source of livelihood" on 2nd September 2017 in Aizwal Mizoram

STAKEHOLDERS WORKSHOP ON SEMI-INTENSIVE MITHUN FARMING IN MIZORAM

On 2nd September 2017, a one-day Stakeholders Workshop on "Semi-intensive Mithun Farming as Alternative Source of Livelihood", jointly organized by ICAR- NRC on Mithun, Medziphema, Nagaland and Animal Husbandry & Veterinary Department of Govt. of Mizoram, was held at Aizawl, Mizoram. The Workshop was inaugurated by the Chief Guest, Hon'ble Chief Minister of Mizoram, Sri Lalthanhawla. A statue of mithun was unveiled by Hon'ble Chief Minister. Dr. Trilochan Mohapatra, Secretary, DARE and DG, ICAR Govt of India graced the occasion as Guest of Honour. The Local MLA Shri T. Sangkunga also graced the occasion.

Sri Lalthanwala, Hon'ble CM, Mizoram launched the "Mithun Production and Development Project" to provide aid to the Mithun breeders of the State under the flagship program New Land Use Policy (NLUP) and New Economic Development Policy (NEDP). It is hoped that the newly launched 'Mithun Production and Development Project' of Rs. 39 crores will address the issues for productivity enhancement and betterment of mithun keepers across the state.

Dr. Trilochan Mohapatra, Secretary, DARE and DG, ICAR assured full commitment of ICAR towards the development of the agricultural sector as a whole in the North Eastern states through financial and technical backstopping for the promotion of mithun farming. Further, he mentioned that ICAR-NRC on Mithun will sign a memorandum of understanding with the state and also open two demonstration units to support and provide requisite scientific hand-holdings for promoting semi-intensive mithun rearing in the state. He expressed that NABARD can play an important role in providing financial support to schemes for establishing community-based centers for provisioning various inputs like fortified feed blocks, medicines, hygiene slaughterhouse, etc. for the benefit of the livestock keepers of the state.

The Secretary, Department of Animal Husbandry, Govt. of Mizoram, informed that there are around only 3200 mithun in Mizoram and looking into the importance of this species, the state has launched Mizoram Mithun Production and Development Project under NEDP wherein the A.H & vety Dept intends to establish one intensive mithun farm and five semi-intensive mithun ranches at Thenzawl in Mizoram.

A presentation made by Dr. Abhijit Mitra, Director, ICAR-NRC on Mithun, Nagaland highlighted the potential of mithun as a multi-purpose livestock species as a source of meat, milk and hide (leather). Since mithun can easily move on the difficult mountainous terrain, it can be explored as a draught animal. The need for a bankable scheme for mithun farming and promoting mithun as a "nature's gardener" was also emphasized.

ICAR-NRC on Mithun put up a stall exhibiting the technologies and package of practices developed by the Institute for the benefit of the stakeholders and participating farmers. Different value-added products developed from mithun milk, meat and hide were also displayed.

In the Technical Session, a detailed deliberation on different aspects of feeding, breeding, and management of mithun was made by the Scientists and Technical officers of the Institute. It was followed by Scientist-Farmers-Stakeholders interactions. A total of 500 farmers from the different districts of Mizoram participated in the programme. Besides, officials from NABARD, other banking institutions, NGOs and Agri-allied department of Govt. of Mizoram also attended the day-long workshop.

EXTENSION ACTIVITIES

During 2017-18, under Tribal Sub-plan (TSP), a total of 22 programmes were organized which includes the establishment of semi-intensive mithun rearing units, distribution of mithun bulls in the field, organization of health camp-cum-technology injection programme and Mithun *mela*, conducting farmers exposure visits and imparting farmers training. The programmes were carried out in four mithun rearing states namely Arunachal Pradesh, Mizoram, Manipur, and Nagaland benefitting more than 1898 farmers.

ESTABLISHMENT OF SEMI-INTENSIVE MITHUN REARING UNITS

Traditionally it is believed that mithun, the unique domesticated animal of the North-Eastern hilly region, can be reared only under a free-range forest ecosystem. Under this extensive rearing system, animals are let loose in the forest and they survive at the sole mercy of nature. As a result, the cost of inputs per unit area including the labor requirement is very low. However, rendering

LIST OF ACTIVITIES UNDER TSP

S. No.	Place of Activity/Training	Date	Beneficiaries
1.	Distribution of mithun bull in Tening village, Peren district, Nagaland	25.04.17	40
2.	Distribution of mithun bull in Mezoma village, Kohima district, Nagaland	10.04.17	50
3.	Distribution of mithun bull in Khonoma village, Kohima district, Nagaland	10.04.17	69
4.	Distribution of mithun bull in Ayeng village, East Siang district, Arunachal Pradesh	25.04.17	80
5.	Distribution of 05 mithun heifers in Medziphema village under the semi-intensive system.	06.09.17	30
6.	Establishment of semi-intensive mithun rearing model in Gidimi village, Phek Dist. Nagaland	23.11.17	30
7.	Establishment of semi-intensive mithun rearing model in Yimchong village, Longleng Dist. Nagaland	15.01.18	150
8.	Establishment of semi-intensive mithun rearing model in Boasimla, Lower Subansiri Dist. Arunachal Pradesh	22.03.18	200
9.	Establishment of semi-intensive mithun rearing model in Medziphema village, Dimapur, Nagaland	06.09.17	30
10.	Awareness programme for the scientific rearing of mithun in Yangkhullen village, Senapati, Manipur	08.06.17	200
11.	Three days Farmers training on "Scientific Mithun Husbandry" for the farmers of Arunachal Pradesh.	7- 9 March 2018	16
12.	Mithun Mela cum Technology Injection programme in Boa simla, Lower Subansiri Dist. Arunachal Pradesh.	22.03.18	250

Vanraja poultry bird distribution cum awareness programme on livelihood improvement in Disaguphu village, Dimapur, Nagaland

scientific interventions including record keeping, controlled breeding, and health care is almost impossible. Further, farmers often suffer from loss of animals, particularly young ones, due to the attack of wild carnivores. With the ever decreasing trend of forest cover and the prerequisite of a huge forest area for free-range rearing system, it has become imperative to find an alternative rearing system.

The package of practices of semi-intensive mithun rearing model developed by ICAR-NRC on Mithun has already been practiced successfully in the Institute Mithun farm since last two decades. Now, the Institute is extending the alternative system in the field. During 2017-18, a total of seven semi-intensive units were established as per the details given below.

List of semi-intensive Mithun rearing units established during 2017-18

Name of the State	Village/Dist.	Number of Beneficiaries
Arunachal Pradesh	Boasimla, Lower Subansiri Dist.	250
Manipur	Hengbung, Senapati Dist.	Input materials have been handed over to Senapati KVK
Mizoram	Champhai Dist	Input materials have been handed over to the Vety & AH Department of Mizoram
	Saiha Dist	
Nagaland	Yimchong village, Longleng Dist.	150
	Gidimi village, Phek Dist.	30
	Medziphema village, Dimapur Dist.	30
	Tobu village, Mon Dist.	150

Under 'semi-intensive' system, mithuns are provided with a night shelter. The animals are let loose for grazing during the day. In the evening, animals are brought back to the shelter and may be fed with supplements like fodder grass, paddy straw with little concentrate. The supervision of individual animals, additional feeding, watering, and medication can be done during the late afternoon or early morning. The biggest advantage of this system is that the animals can be monitored by the owner regularly for growth, reproduction and health care, and breeding.

Dr. R. S. Gandhi, ADG, ICAR hands over an insignia of Mithun during the introduction of semi intensive mithun rearing at Gidimi village, Phek, Nagaland

Distribution of barbed wire and CGI sheet in Gidimi village under TSP

Fencing of the forest and construction of mithun shed

BULL EXCHANGE PROGRAMME

Under the traditional free-range system of rearing, female mithuns are generally mated with a dominant bull over a long period of time resulting in inbreeding. Consequently, the population suffers from the delayed age of puberty and maturity, longer inter-calving interval, reduced adult body weight, and reduced body size. To avoid this, ICAR-NRC on Mithun initiated bull exchange programme where a

Mithun herd under free range system

mithun bull is given to the village under TSP and/ or bull from one village is exchanged with the bull from another village. During 2017-18, four mithun bulls were distributed in Ayeng village, East Siang Dist. Arunachal Pradesh; Tening village, Peren Dist; Mezoma village, Kohima Dist; and Khonoma village, Kohima Dist. of Nagaland.

MITHUN MELA at BOA SIMLA, ARUNACHAL PRADESH

One day Mithun *Mela-cum*-Technology Injection Programme was organized at Boasimla, a remote village of Lower Subansiri Dist., Arunachal Pradesh on 22.03.2018. The Programme was jointly organized by ICAR-National Research Centre on Mithun, Nagaland and Dept. of AH, Vety and Dairy Development, Govt. of AP. The total of 250 mithun farmers from the different village of Boasimla circle participated in the Mela. Farmers also brought 105 mithuns at the *mela* site where 38 mithuns were treated by the team of Veterinary Doctors. 77 mithuns were vaccinated against FMD. To avoid the ownership dispute and for the identification, microchips were implanted.

The *mela* was inaugurated by Shri Tamar Murtem, Hon'ble Parliamentary Secretary (AHV &DD), Govt. of Arunachal Pradesh as a Chief Guest.

Vaccination and microchip implantation in mithun

The programme was also attended by Dr. N. D. Minto, Director, AH, Vety and Dairy Development, Govt. of Arunachal Pradesh, Dr. Taba Heli, Mission Director, Arunachal Yak and Mithun Conservation Mission and other Officials.

ICAR-NRC on Mithun, Department of Animal Husbandry, Govt. of Arunachal Pradesh, NGOs, and various SHGs showcased different technologies through exhibition stalls, which included feed and fodder, Artificial Insemination in mithun, common veterinary medicines, disease diagnosis laboratory, value addition of mithun horns, etc. An interaction programme between the farmers and Scientists of ICAR-NRCM was also held to address the different issues faced by the mithun farmers.

AWARENESS PROGRAMME ON SCIENTIFIC MITHUN REARING IN YANGKHULLEN VILLAGE, MANIPUR

On June 8, 2018 one awareness programme on scientific rearing of mithun was conducted at Yangkhullen, one of the remotest villages in Manipur state located 87 km away from its district headquarter Senapati. The village has more than 300 mithuns reared under free-range forest ecosystem.

Apart from paddy cultivation, mithun husbandry is one of the major sources of livelihood. Under Tribal Sub Plan inputs including barbed wire, CGI sheet, gumboot, rain coats and veterinary medicines were distributed to the farmers. In order to address the ownership disputes among the mithun farmers, the farmers were demonstrated with the technology of animal identification and the animals were vaccinated against FMD, BQ, and HS.

INTRODUCTION OF MITHUN IN NON-MITHUN REARING AREA

In order to popularize mithun husbandry among the educated unemployed youths, ICAR-NRC on Mithun initiated the introduction of mithun rearing under semi-intensive conditions. During 2017-18, a semi-intensive model was developed in Medziphema village, Dimapur Dist., Nagaland and introduced 05 numbers of mithun heifers. A low-cost mithun shed was prepared with the provision of the manger and water trough within the forest and entire 2 km forest area was fenced with barbed wire. Regular health care management is being taken by the Institute.

TRAINING AND EXPOSURE VISITS

Model training programme on Small-scale Dairy Development

Eight days model training course on "Small scale dairy development as a means of livelihood improvement in North-Eastern region" was organized from 24th to 31st Oct., 2017 with an objective to popularize small-scale dairy enterprise to improve the socio-economic status of farmers through livelihood improvement.

The training programme was sponsored by Directorate of Extension, Ministry of Agriculture & Farmers' Welfare, Government of India.

The participants of Model Training Course on Small Scale Dairy Development

Farmers Training programme

A three days training programme for Livestock Service Providers (LSP) of Tuensang and Kiphire districts of Nagaland was conducted by ICAR-NRC on Mithun, Medziphema in collaboration with Northeast Initiative Development Agency (NEIDA), an initiative of TATA Trusts from October 11 to 13 at ICAR-NRCM, Medziphema.

During this training, the participants witnessed the scientific rearing of mithun under semi-intensive and intensive systems in the Institute's farm. The participants were given theoretical as well as hands-on training on various subjects including breeding, restraining and identification, artificial insemination (Al), housing management, draught capability, feeding and minerals supplementation, prospects of processed mithun meat, health and preventive measures.

Workshop and interactive meetings

Second Stakeholders Workshop on Bankable Mithun Project

The 2nd meeting of the stakeholders on *"Finalization of techno-economic parameters for developing bankable mithun project"* was held on October 31, 2017, at Medziphema campus. A total of 36 delegates including Veterinary officers, KVK personnel, Scientists and officials from NGOs and banking institutions of the mithun rearing states namely Arunachal Pradesh, Nagaland, and Manipur participated in the meeting. Mr. M. K Mero, Commissioner, and Secretary, Department of Veterinary and Animal Husbandry, Govt of Nagaland, who chaired the session, stated in his introductory remarks that one of the major obstacles in adopting mithun farming as an economic activity is lack of bankable schemes. Prof. S. Pan, Senior professor of West Bengal University of Animal & Fishery Sciences, Kolkata, as an expert, explained the house about the technicalities of the techno-economic parameters and stressed that success of any bankable scheme would depend on the consensus on the techno-economic parameters by the stakeholders. Sri S. K. Dhumal, General Manager, NABARD, Nagaland apprised the house about the requirement of the banking institutions while developing a bankable project and importance of the provision of sufficient security in the form of joint liability group and other collaterals. Other prominent participants were Dr. HZ Kiba, Managing Director, Nagaland Livestock Development Board (NLDB), Kohima; Mr. H. C. Biswas, AGM, NABARD, Dimapur; Mr. Vizo Kere, Manager, State Co-operative Bank, Nagaland; representatives from NEIDA and Entrepreneur Associates. After a thorough deliberation, a consensus arrived on techno-economic parameters for the bankable mithun scheme.

Visit of Veterinary Officials of Govt. of Mizoram

Consequent upon the decision taken during the last Regional Committee Meeting (RCM) held on 30-31st May 2017 in Imphal, Manipur, Dr. S. Sailo, Director and Dr. Lalhmingthanga, Deputy Director, Dept. of A. H. & Veterinary, Govt of Mizoram visited ICAR-NRC on Mithun, Medziphema to have an interaction with the Scientists and to get the technical expertise for launching the Mithun Project in the state on 3- 4th July 2017.

In the afternoon of 3rd July 2017, they visited the Mithun Farm of the Institute and the demonstration unit of semi-intensive mithun farming in the farmer's field at Molvom village. On 4th July 2017, an Interaction Meeting was held. It was informed by the visiting officials that in order to increase the dwindling mithun population in the State the department would launch a Mithun Project of Rs. 3.82 crores under New Economic Development Policy (NEDP). Under the project, the department would like to establish one intensive Mithun Farm and five ranches, of 500 hectares each, for semi-intensive mithun farming. After thorough discussions, ICAR-NRC on Mithun would extend the technical expertise for the implementation of

the project. As a first step, to increase awareness of the scientific mithun rearing in the State, the Dept. of A. H. & Vety, Govt. of Mizoram and ICAR-NRC on Mithun would jointly organize a Stakeholders workshop in Aizawl.

Visit of Veterinary Officials of Govt. of Manipur

For improvement of mithun husbandry practices in Manipur, an interactive meeting was held at ICAR-NRC on Mithun, Medziphema with the Department of Veterinary & Animal Husbandry, Govt. of Manipur on 16th December 2017.

A three-member delegation of Department of Vety & AH, Manipur led by Dr. Ng. Ibotombi Singh,

Interactive meeting for improvement of mithun husbandry practices

Joint Director accompanied by Dr. Arunkumar Singh and Dr. Bhubaneswar Singh attended the meeting to discuss the possible collaboration and technical back stepping from ICAR-NRCM for improving mithun husbandry system in order to increase the dwindling mithun population in Manipur.

The team visited the mithun farm, which is the only intensive farm of mithun in the world. They witnessed the use of mithun bull as a draught animal. They also visited the demonstration unit of Semi-intensive mithun rearing in the farmers' field at Molvom village.

It was agreed that ICAR-NRC on Mithun would jointly organize a stakeholders workshop in Imphal and extend the technical expertise in project formulation and provide all the technical know-how to the Department of Vety & AH, Manipur.

PROGRAMME PARTICIPATED

Regional Agri-Fair at College of Fisheries, Lembucherra, Tripura

ICAR-NRC on Mithun participated in **Regional Agri-Fair** on 5-7 November 2017 organized by College of Fisheries, CAU. The Institute put up a stall exhibiting the different aspects of mithun husbandry and potential of mithun as a multi-purpose livestock suitable for rearing in North-East region. The technologies and package of practices developed by the Institute including different value-added products developed from mithun milk, meat and hide were also displayed. A total of 172 delegates including farmers and students visited the stall.

North- East Zonal Agri Fair in Barapani

ICAR-NRC on Mithun participated in **North-East Zonal Agri Fair** held at ICAR-NEHR, Barapani from 6th-9th January 2018. The programme was graced by Shri. Radha Mohan Singh, Hon'ble Union Minister of Agriculture and Farmers' Welfare. In the fair, the Institute put up a stall exhibiting the technologies and package of practices developed by the Institute. Different value-added products developed from mithun milk, meat and hide were also displayed. A total of 350 delegates including farmers and students visited the stall.

105th Indian Science Congress

The Institute participated, 105th Indian Science Congress 2018, organized by Indian Science Congress at Manipur University from 16-20th March 2018 under the theme **"Reaching the Unreached through Science and Technology"**. The programme was inaugurated by Shri Narendra Modi, Honourable Prime Minister, Govt. of India.

To popularize Mithun and to showcase the different activities carried out by the Institute a stall was put up. Dr. Harsh Vardhan, Hon'ble Minister of Science and Technology, Govt. of India, visited the stall. A total of 196 delegates including Scientists, Professors, school teachers, research scholars and school going students visited the stall. On the concluding day, the Mithun statue, exhibited in the stall, was presented to the Department of Veterinary and Animal Husbandry, Govt of Manipur.

NRC Mithun Stall in Indian Science Congress

ACHIEVEMENTS OF KRISHI VIGYAN KENDRA, PHEK

Annual Report of Krishi Vigyan Kendra-Phek

Krishi Vigyan Kendra, Phek was established in 2003 to augment the farmers with latest technological knowledge with the aim of reducing the time lag between technology generation and its transfer to the farmer's field for increasing production and achieving sustainability. The mandatory activities of the organization include imparting trainings, conducting on-farm testing (OFT), demonstrating proven technologies of agriculture and allied sector and organizing various extension activities for the farmers, rural youth and extension personnel of the district. The activities carried out during 2017-18 are given below.

Table 1. Training and extension activities conducted during 2017-18

Training Programmes					Extension Activities			
Number of Courses			Number of Participants		Number of Activities		Number of Participants	
Clientele	Targets	Achievement	Targets	Achievement	Targets	Achievement	Targets	Achievement
Farmers	48	63	1176	1429	314	394	2957	4193
Rural youth	14	24	313	412	NA	NA	NA	NA
Extn. Functionaries	5	2	80	32	NA	NA	NA	NA
Total	67	89	1569	1873	314	394	2957	4193

Table 2. Vocational training programmes conducted during 2017-18

Thematic Area	Date (Duration)	Training Title	Participants		
			Male	Female	Total
Post-harvest management	5th to 8th August 2017 (4 d)	Post-harvest management and value-added product in soybean	5	7	12
Vermicomposting	21st to 24th August 2017 (4 d)	Vermicompost production	2	8	10
Fruit production	5th to 9th March 2018 (2 d)	Production technology of Kiwi and Persimmon fruit	10	0	10
IPDM in fruits	18th to 21st October 2017 (4 d)	Insect pest and disease management in important fruits (Khasi mandarin & Banana).	5	5	10
Livestock rearing	26th to 30th April 2017 (5 d)	Entrepreneurial opportunities in pig and poultry farming	0	23	23

Under NICRA project at Thipuzumi village, 15 numbers of training programmes were conducted for practicing farmers. Altogether 363 farmers participated in the capacity building programme. One Animal Health *cum* vaccination camp was also organized in the adopted village.

'*Mera Gaon Mera Gaurav*' a farmer-oriented programme initiated by GOI under which Phugi Village under Sekruzu and Chizami block has been adopted to take up various developmental activities in agriculture and allied sector. Four training programmes on eight courses were imparted in the villages benefitting 102 beneficiaries.

Vocational training programme on Kiwi and Persimmon production technology

Vocational training on Post-harvest management and value addition in Soybean

Method demonstration on Oyster mushroom production under NICRA project

Training programme on Insect-pest management in King chilly under Mera Gaon Mera Gaurav

Table 3. On farm trials (OFT) and Frontline (FLD) demonstrations conducted during 2017-18

Discipline	On Farm Trials			Frontline Demonstrations		
	Crops/ Enterprises	No of technology	No of trials	Crops/ Enterprises	No of technology	No of demonstrations
Agronomy	Pigeon pea, Soybean	2	8	Potato, Paddy, Field pea	3	50
Soil Science	French bean, Cabbage	2	8	Potato, Vermicomposting	2	30
Horticulture	Tomato, Bitter gourd	2	6	Onion, Garden pea	2	20
Plant Protection	Tomato, Potato	2	6	Paddy, Cabbage	2	13
Animal Science	Duckery, Piggery	2	11	Rabbitry, Chicken	2	40
Total		**10**	**39**		**11**	**153**

Agronomy

Under the discipline Agronomy, eight numbers of 'on farm trials' in pigeon pea and soybean were conducted. Fifty numbers of front line demonstrations on potato, paddy and field pea were conducted in farmers field covering different villages of Phek district.

OFT on performance of pigeon pea var. UPAS 120

FLD on popularization in field pea var. Prakash in farmers field.

Soil Science

In soil science division, trials were conducted to assess the effect of bio-fertilizer on growth and development of cabbage and french bean. 30 frontline demonstrations (FLD) were conducted for popularizing low cost vermicomposting and use of bio-fertilizer in potato.

OFT on Assessment of vermicompost and Azotobacter + Phosphotika in cabbage conducted at Kami and Porba village.

FLD on Low-cost HDPE Vermicomposting at Gidemi Village (on-going)

KVK Phek is also engaged in analysis of soil sample of farmers from different villages and distribution of soil health cards to the beneficiaries.

Table 4. Soil Sample Analysis / Soil Health Cards (SHCs)

No.	Samples	Sample Analysed	Farmer beneficiaries	Number of Villages to cover
1.	Soil sample	200	400	3
	Total	**200**	**400**	**3**

Horticulture

Under Horticulture division, on farm trials on performance of tomato var. *Arka rakshak* and bitter gourd were assessed. Front line demonstrations (FLD) on two proven technologies i.e. onion var. *AFDR* and garden pea var. *Arkel* were conducted benefiting 20 farmers of the district.

On farm trial on performance of tomato var. Arka Rakshak

Frontline demonstration on Onion var. Agrifound Dark Red at Porba village

Plant Protection

Pest and diseases plays an important role in crop production and influences the productivity of crop per unit area. Trials were conducted on management of tomato leaf miner using water trap and red ant management in potato through organic approach. Demonstrations on stem borer management in paddy and cutworm management in cabbage were conducted in farmers' field benefitting 13 farmers.

Animal Science

Under Animal Science division, two on farm trials were conducted on performance of *AAUVETMIN* in crossbred pigs and performance of White Pekin ducks in Phek district. Two FLD programs were also conducted for popularizing Soviet Chinchilla rabbit and Srinidhi poultry birds under backyard rearing system.

On farm trial on management of leaf miner in tomato using pheromone water trap

OFT on performance evaluation of AAUVETMIN in crossbred pig

Frontline demonstration on stem borer management in paddy using *Trichogramma japonicum*

FLD on popularization of Srinidhi birds under backyard farming system

Extension activities and celebration of important days

Scientist visit to farmers field at Chizami village

Exposure visit under NICRA

World Soil Day celebrated on 6th December 2017

Webcasting of Prime Minister's Address in Krishi Unnati Mela-2018

Tribal mithun owners performing traditional dance in Mithun Mela Boasimla

Sankalp Se Siddhi

A programme on "*Sankalp Se Siddhi*" was organized on 30th August 2017 by Krishi Vigyan Kendra, Phek and ICAR-NRC on Mithun at Porba village, Nagaland for doubling farmer's income by 2022. Sri K. G. Kenye, Rajya Sabha MP, Nagaland and the Chief Guest of the programme, inaugurated the Exhibition on the theme of doubling farmers' income and led a "*Sankalp se Siddhi March*" from KVK-Phek Campus to Porba village Panchayat Hall. Sri Kenye led the pledge taking ceremony and urged the farmers to adopt improved technologies and schemes for increasing the farmer's income. Dr. R. S. Gandhi, ADG (AP&B), ICAR, New Delhi graced the occasion as a Guest of Honour. He said that although India has become self-sufficient in terms of food grains, yet there are huge post-harvest losses that have to be checked. Dr. Abhijit Mitra, Director, ICAR-NRC on Mithun, Nagaland while formally welcoming the dignitaries and other participants, emphasized on the importance of semi-intensive mithun rearing as a component for doubling farmers' income. One such unit of semi-intensive mithun rearing was also introduced in Gidemi village during the programme.

Inauguration of *Sankalp Se Siddhi* programme by Sri K. G. Kenny Honourable MP , Rajya Sabha at Porba village

LINKAGES AND COLLABORATION

State Vety & AH Depts.
Nagaland,
Arunachal Pradesh,
Manipur, Mizoram

ICAR HQ

NGOs
SHGs
Mithun Farmers' Club

SAUs - WBUAFS,
CoVS (AAU), MAFSU

Nagaland University
CAU (Imphal)

Public & Private
R&D Organizations
CCMB, IIT

Doordashan
All India Radio
Electronic &
Print Media

ICAR Institutes
ICAR Res. Complex,
IVRI, NDRI, NBAGR

Banking Institutions
NABARD, SBI

KVKs of NEH Region

ICAR HQ

Security Agencies
Assam Rifles, CRPF

ONGOING RESEARCH PROJECTS

A. INSTITUTIONAL

Name of the Project/ Project Number	PI	Co-PI	Start Date	End Date
Genetic characterization of mithun (Bos frontalis) populations through mitochondrial genome sequencing (IXX13444)	Dr. Sabyasachi Mukherjee	Dr. S. S. Hanah Dr. Kezhavituo Vupru Dr. Kobu Khate Dr. Abhijit Mitra	June, 2017	June, 2018
Genetic improvement of growth performance of mithun (*Bos frontalis*) (IXX13617)	Dr. S. S. Hanah	Dr. S. Mukherjee Dr. M. H. Khan Dr. S. Toppo Dr. N. Haque Dr. J. K. Chamuah Dr. Lalchamliani	May 2017	April 2020
Effect of feeding agro-industrial by-product based feeds on growth performance of mithun and its adoption in field condition (IXX13905)	Dr Nazrul Haque	Dr. Saroj Toppo Dr. Kezhavituo Vupru	May, 2017	April, 2018
Effect of dietary supplementation of unsaturated fatty acids on conjugated linoleic acid (CLA) levels ina milk and meat of mithun (IXX12403)	Dr Saroj Toppo	Dr. Nazrul Haque Dr. Kobu Khate	May, 2016	April, 2018
Profiling gut microbiome of Mithun	Dr Saroj Toppo	Dr. Nazrul Haque Dr. Sabyasachi Mukherjee Dr. Abhijit Mitra	May, 2017	April, 2018
Optimization of mithun semen freezing protocol through controlled freezing and minimizing sperm damage (IXX10754)	Dr Meraj Haider Khan	Dr. Perumal P Dr. S. Mukherjee Dr. Vidya Singh	April, 2014	September, 2017
Development of mithun based integrated farming system model for sustainability and livelihood security of small and marginal farmers (IXX10749)	Dr Meraj Haider Khan	Dr. Nazrul Haque Dr. S. Mukherjee Dr. Perumal P Dr. Rakesh Kumar Dr. Rajesha. G Dr. Kobu Khate	April, 2014	September, 2019
Phytoformulation for effective control of leech infestation in mithun (*Bos frontalis*) (IXX13463)	Dr Jayanta Kumar Chamuah	Dr. S. S. Hanah Dr. Kezhavituo Vupru	June, 2017	May 2018

Name of the Project/ Project Number	PI	Co-PI	Start Date	End Date
Chemical fingerprinting of traditionally known medicinal herbs and in-vitro testing against bacterial and helminthes parasitic diarrhoea in mithun (Bos frontalis) (IXX11575)	Dr Nazrul Haque	Dr. J. K Chamuah Dr. Vidya Singh Dr. P. R. Dutta Dr. Atul Borgohain Dr. K. K. Baruah Dr. R.K. Singh	April, 2015	March, 2018
Carcass characteristics and physicochemical properties of mithun meat (IXX13418)	Dr. Lalchamliani Chhangte	Dr. S. S Hanah, Dr. Kobu Khate, Dr. Saroj Toppo, Dr. Abhijit Mitra	June, 2017	May, 2018

B. EXTERNALLY FUNDED

Name of the Project/PI	Funding Agency	Start Date	End Date	Total Cost (Rs. in lakhs)
Onset of puberty and induction of estrus: Role of Kisspeptin (kiss1) in bovine species (mithun and cattle): Dr Meraj Haider Khan	DBT	April, 2014	September, 2017	67.00
Evaluation of melatonin as a fertility marker in mithun (Bos frontalis) bulls: Effect on circadian rhythm and seasonal variation in semen quality parameters: Dr Meraj Haider Khan	DBT	April, 2014	November, 2017	48.79
National mission for sustainable Himalayan ecosystem (NMSHE): Dr Sabyasachi Mukherjee	DST	May, 2015	May, 2020	90.58

C. ICAR-NETWORK PROJECT

Name of the Project/PI	Funding Agency	Start Date	End Date	Total Cost (Rs. in lakhs)
AICRP on FMD: Dr Jayanta Kumar Chamuah	ICAR	July, 2014	June, 2019	7.20

D. INFRASTRUCTURE PROJECTS

Name of the Project/PI	Funding Agency	Start Date	End Date	Total Cost (Rs. in lakhs)
Establishment of bioinformatics infrastructure facility for biology teaching through bioinformatics (BIF-BTBI) under the BTISnet: Dr Nazrul Haque	DBT	March, 2011	Continued	18.00
Establishment of institutional level biotech hub (IBT hubs) by DBT under special programme for North-Eastern states of India: Dr.Sabyasachi Mukherjee	DBT	October, 2011	Continued	27.00

HONOURS, AWARDS AND RECOGNITION

Oral presentation award

- **Dr. M. H. Khan:** Received Best Oral Presentation award for the article entitled "Enhancement of Reproductive Efficiency through Estrus Synchronization and Timed AI in Mithun (*Bos Frontalis*) under Semi-Intensive System" ***In*** National Seminar on ***"Smart Farming for Enhancing Input Use efficiency, Income and Environmental Security (SFEIES)"*** organized by Indian Association of Hill Farming (IAHF) at ICAR RC NEHR, Barapani from 19th-21sr September, 2017.
- **Dr. Akhilesh Kumar:** Received Second Best oral presentation for the article "Comparative Evaluation of Humoral Immune Status in Mithun (*Bos frontalis*) and Tho-Tho Cattle under Different Physiological Stage" ***In*** 36th Annual Convention of Indian Society of Veterinary Medicine & National Symposium on ***"Animal Health Service Delivery-the Priority of the Professional for Enhancing Farmers income"*** held at OUAT, Bhubaneswar, Orissa from 1-3rd Feb, 2018.

Ph. D. degree

- **Dr. Debojyoti Borkotoki:** Awarded with Ph. D degree (Veterinary Pathology) by West Bengal University of Animal and Fishery Sciences, Kolkata.

Sri Pankaj Kumar, IAS, Chief Secretary, Govt. of Nagaland gracing the Conference on Linking Startups on August 10, 2017

PUBLICATION

Papers in peer reviewed Journal

- Singh V, Mishra N, Kalaiyarasu S, Khetan R K, Hemadri D, Singh R K, Rajukumar K, Chamuah J K, Suresh K P, Patil S S and Singh V P. (2017). First report on serological evidence of bovine viral diarrhea virus (BVDV) infection in farmed and free ranging mithuns (*Bos frontalis*) Tropical Animal Health Production. DOI 10.1007/s11250-017-1310-z
- Khan M H, Sinha P, Perumal P and Hazarika S B. (2017). Morphometric analysis of mithun sperm from fresh and frozen-thawed semen. Indian Journal of Animal Sciences 87 (7): 829–833.
- Khan M H, Sinha P, Perumal P and Hazarika S B.(2017). Cryopreservation of mithun semen: comparative study of conventional vs controlled freezing. Indian Journal of Animal Sciences 87 (6):728–730.
- Khan M H, Sinha P, Hazarika S B and Perumal P. (2017). Study on sperm motility and velocity parameters of freshly collected mithunsemen through computer-assisted sperm analyser (CASA). Indian Journal of Animal Sciences 87 (3): 293–296.
- Khan M H, Hazarika S B, Perumal P, Baruah K K, Yasotha T and Singha Papiya. (2017). *Kiss 1* and *GPR54* mRNA expression, endocrine profile, follicular development and onset of estrus following kisspeptin administration in pre-pubertal mithun heifers. Indian Journal of Animal Sciences 87 (4): 427–431.
- Joardar S N, Mukherjee S, Alam S K S and Mukherjee A. (2017). Native leptin protein from mithun (Bos frontalis) shows serodiagnostic potentiality. Indian Journal Comp Microbiology Immunol and Infectious Disease 38(2): 11-121

Book/Manual chapters/ Popular/ Technical Article

- Chamuah J K, Lalchamliani and Hanah S S. (2017). Epidemiology and control measure of gastrointestinal parasites of bovines. *In*: Compendium for Model Training Course on Small Scale Dairy Development as a means of livelihood Improvement in North Eastern Hill Region. Pp:88-98.
- Chamuah J K, Hanah S S, Lalchamliani, Khan M H and Vupru K. (2017). Overview of Zoonotic Parasites and their control measures. *In*: Compendium for Model Training Course on Small Scale Dairy Development as a Means of Livelihood Improvement in North Eastern Hill Region. Pp:58-68
- Hanah S S, Lalchamliani, Chamuah J K, Vupru K, Khate K and Khan M H. (2017). Calf survival: a challenge to dairy industry. *In*: Compendium for Model Training Course on Small Scale Dairy Development as a Means of Livelihood Improvement in North Eastern Hill Region. Pp:99-107
- Lalchamliani, Hanah S S, Chamuah J K, Vupru K and Khate K. (2017). Ensuring clean milk production: a farm to table approach for hygienic milk production. *In:* Compendium for Model Training Course on Small Scale Dairy Development as a Means of Livelihood Improvement in North Eastern Hill Region. Pp:115-121
- Lalchamliani, Hanah S S, Chamuah J K, Vupru K and Khate K. (2017). Technology of dairy development and its products. *In:* Compendium for Model Training Course on Small Scale Dairy Development as a Means of Livelihood Improvement in North Eastern Hill Region. Pp:138-151
- Hanah S S, Lalchamliani, Chamuah J K and Vipru K. (2017). Scope and prospect of dairy farming in North Eastern Region of India. *In:* Compendium for Model Training Course on Small Scale Dairy Development as a Means of Livelihood Improvement in North Eastern Hill Region. Pp:8-14
- Hanah S S, Lalchamliani, Khan M H, Mukherjee S, Haque N, Toppo S, Khate K and Vupru K.

(2017). Mithun Husbandry: An Alternative Means of Livelihood (SialVulh: EizawnnaTling) (Bulletin with bilingual version in Mizo), Published by Director, ICAR-NRC on Mithun, Medziphema, Nagaland, Pp: 1-20.

- Haque N and Toppo S. (2017). Strategy to enhance production efficiency of dairy animals. *In*: Compendium for Model Training Course on Small Scale Dairy Development as a Means of Livelihood Improvement in North Eastern Hill Region. Pp: 27-51
- Haque N and Toppo S. (2017). Feeding management of dairy cattle under hill ecosystem. *In*: Compendium for Model Training Course on Small Scale Dairy Development as a Means of Livelihood Improvement in North Eastern Hill Region. Pp:162-170
- Toppo S and Haque N. (2017) Nutritional Management and feeding principles for dairy cattle. *In*: Compendium for Model Training Course on Small Scale Dairy Development as a Means of Livelihood Improvement in North Eastern Hill Region. Pp:152-161
- Khan MH, Mitra A, Haque N and Mukherjee S. (2017). Mithun Se Prapt Khadya Uttpad. Kheti70(7):17-20
- Khan M H. (2017). Reproductive management of dairy cattle for enhancing productivity. *In:* Compendium for Model Training Course on Small Scale Dairy Development as a Means of Livelihood Improvement in North Eastern Hill Region. Pp: 69-77
- Khan M H. (2017). Common reproductive diseases of dairy cattle, its prevention and treatment. *In:* Compendium for Model Training Course on Small Scale Dairy Development as a Means of Livelihood Improvement in North Eastern Hill Region. Pp: 129-137
- Khan M H. (2017). Cryopreservation of semen: principles and applications. *In:*Compendium for Model Training Course on Small Scale Dairy Development as a Means of Livelihood Improvement in North Eastern Hill Region. Pp: 129-137
- Borkotoky D and Singh R K. (2018).Livestock Vaccination and Health Record Book-*published by* KVK, NRC on Mithun (ICAR), Phek, Nagaland 1st Edition March 2018
- Singh R K and Sezolu. (2017). Biodiversity protection practices of the Chakhesang. In: Traditional Preservation System of Biodiversity in Northeast Bharat: Heritage Explorer 8: 61-63
- Singh R K, Hiese N, Hiese Z, Rovilhounuo, Pongen T and Borkotoky D. (2017). Plant Resources of Mithun Ranges in Porba Village of Phek, Nagaland, ICAR – NRC on Mithun, Porba, Phek, Nagaland Pp: 104

Presentation in Conference/Symposium/ Interface meeting/Other forum

- Mukherjee S, Longkumar I, Jamir Y, Pongen P, Haque N, Khan M H, Chamuah J K and Mitra A. (2017). Population trend of Mithun with corresponding forest coverage and climatic factors in mithun rearing districts of Nagaland. *In:* the Compendium of National Seminar on "Smart Farming for Enhancing Input Use Efficiency, Income and Environmental Security". Pp: 68
- Dutta P R, Chamuah J K, Borkotoky D, Dowerah R, Khan M H and Mitra A. (2017). Acaricidal efficacy of certain herbal and chemical ectoparasiticides against *Rhipicephalus microplus* infestation in Mithun (*Bos frontalis*). *In:* the Compendium of National Seminar on "Smart Farming for Enhancing Input Use Efficiency, Income and Environmental Security". Pp: 216.
- Chamuah J K, Borkotoky D, Jacob S S, Khate K, Dutta P R, Lalchamliani, Raina O K and Mitra A. (2018). Genetic characterization and detection of pathological alteration of fasciolosis in mithun (*Bos frontalis*). *In*: XXVII National Congress of Veterinary Parasitology and National Symposium on "Technologies for Sustainable Parasite control and Redressal of Detection Methods Directed for Upliftment of Rural Economy organized by College of Veterinary and Animal Science, Udaipur, Rajasthan-313601
- Singh V, Kumar A, Chamuah J K, Singh R K, Khate K and Rajkhowa C. (2017). Papillomatosis in mithun under semi intensive and free ranging condition. *In:* Compendium

for ISVP Conference organized by Veterinary College, Hebbal, Bengaluru, 560024, Karnataka, India, on 9-11 Feb,2017.

- Singh V, Kumar A, Chamuah J K, Singh R K and Borkotoky D. (2017). Clinico-pathological investigation of foot and Mouth Disease in mithun. *In*: Compendium for ISVP Conference organized by Veterinary College, Hebbal, Bangalore, 560024, Karnataka, India, on 9-11 Feb,2017.
- Khan M H, Hazarika S B, Perumal P, Mukherjee S and Mitra A. (2017). Enhancement of reproductive efficiency through estrous synchronization and timed AI in Mithun (*Bos frontalis*) cows under semi-intensive system. *In:* Compendium of National Seminar on "Smart Farming for Enhancing Input Use Efficiency, Income and Environmental Security". Pp: 182
- Singh R K and Borkotoky D. (2017). Mithun based farming system an alternative option for doubling farmers' income in North-Eastern Hills. *In:* 8th National Seminar on Potential, Prospects and Strategies for Doubling Farmers' Income: Multi-stakeholder Convergence held from November 9– 11, 2017 at Assam Agricultural University, Khanapara, Guwahati Pp: 41

Invited lecture

- Mukherjee S, Mukherjee A, Mech M, Longkumer I, Haque N, Vupru K, Khate K, Jamir Y, Mitra A and Sahana G. (2018). Genomic characterization and bio-diversity of Indian mithun (*Bos frontalis*). *In:* International Conference on Genomics Analysis and Technology Conference (GATC 2018), Guwahati, 7-9 January.
- Mitra A and Pramod KR (2018) Spermatozoa' - a potential choice for transgenic livestock production *In*: XXXIII Annual Conventions and National Symposium of the Indian Society for study of Animal Reproduction at WBUAFS, Kolkata. 9th to 11th February.
- Mitra A and Pramod KR (2017) Transgenic livestock: present status and prospects *In*: 17th Indian Veterinary Congress and National Symposium on "Newer Generation vaccines, Diagnostics for Improvement of Animal Health & Productivity vis-a-vis Genomic Interventions for the Societal Benefit" at IVRI, Izatnagar. 6-7 April.
- Mukherjee S, Longkumer I, Jamir Y, Haque N, Khan M H, Chamuah J K and Mitra A. (2017). Population trend of mithun with corresponding forest coverage and climatic factors in mithun rearing districts of Nagaland. 2017. *In:* National Seminar on Smart Farming for Enhancing Input Use efficiency, Income and Environmental Security, ICAR-ICAR Research Complex for NEH Region, Umiam, Meghalaya, 19-21 September.
- Mitra A and Pramod K R (2017) In: XXIV Annual Convention and National Symposium of Indian Society for Veterinary Immunology and Biotechnology (ISVIB), College of Veterinary and Animal Sciences, Maharashtra Animal & Fishery Sciences University, Parbhani-431 402 (M.S.). 5-7 December.

TRAINING AND CAPACITY BUILDING

TRAININGS ORGANIZED UNDER HRD

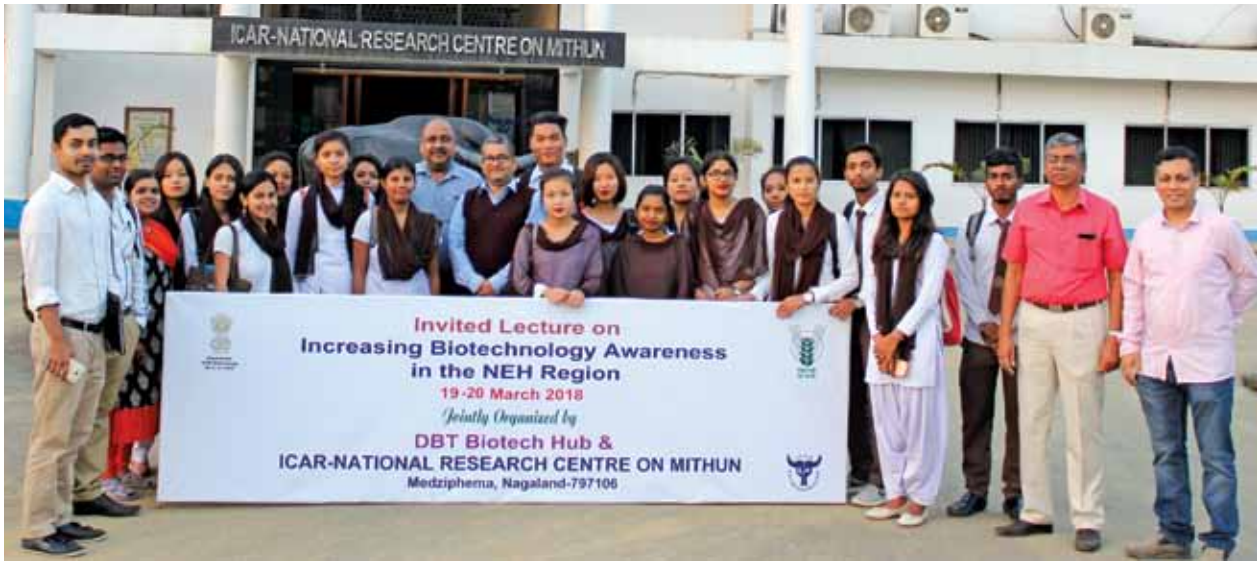
Training for all categories of ICAR Employee

On 19th March 2018, under HRD activity one day workshop on "Inspiration, Team Leadership and Personality Development" was held for all the categories of employees (Scientific, Technical, Administrative and Supporting Staff). Dr. P. Manikandan, former Head of HRM Section, ICAR-NAARM was the resource person. A total of 50 staffs of the Institute participated in the workshop.

TRAININGS UNDER DBT BIOTECH HUB

Training and Invited Lectures for Creating Awareness of Biotechnology in the NEH Region

Three days hands-on training programme on "Awareness of Biotechnology in NEH Region" was organized from 21-23rd February 2018 in the Institute under DBT Biotech Hub. The training programme was attended by the faculties as well as large number of Graduate and Post-graduate



Participants in the workshop on Inspiration, Team Leadership and Personality Development

Trainees in the Awareness Programme of Biotechnology

students from SASRD, Nagaland University and Patkai Christian College, Dimapur and imparted by Scientists of the Institute.

Apart from the training programme, two invited lectures were also organized in the Institute for spreading the awareness of Biotechnology knowledge among the science students of Nagaland during 19-20 March 2018.

PARTICIPATION IN CONFERENCE/ WORKSHOP/ TRAINING

Sl. No.	Name of Programme	Name of staff
1	17th Indian Veterinary Congress and Annual Conference of IAAVR & National Symposium at IVRI on 8 - 9 April 2017 at IVRI, Bareilly, Izatnagar.	Dr. A. Mitra
2	National Seminar on "Smart Farming for Enhancing Input Use Efficiency, Income and Environmental Security" organized by Indian Association of Hill Farming (IAHF) held at ICAR RC for NEH Region Barapani, Meghalaya from 18- 21September, 2017.	Dr. M. H Khan and Dr. Sabyasachi Mukherjee
3	Workshop on "Biosafety was held at AAU, Jorhat in collaboration with BCIL, New Delhi on 10th October 2018.	Dr. J. K. Chamuah
4	8th National Seminar on Potential, Prospects and Strategies for Doubling Farmers' Income: Multi-stakeholder Convergence held at Assam Agricultural University, Khanapara, Guwahati, from November 9– 11, 2017	Dr. R. K. Singh Dr. D. Borkotoky
5	Seminar on "10th Northeastern Bioinformatics Network (NEBInet) meeting held on 16th November, 2017 at St Edmund's College, Shillong, Meghalaya	Dr. J. K. Chamuah & Dr. N. Haque
6	XXIV Annual Conference of ISVIB and VIBCON2017 National Conference on "Recent Trends in Veterinary Immunology and Biotechnology for Doubling Farmers' Income through Livestock Health Production" College of Veterinary and Animal Sciences, Parbhani, MAFSU, Maharashtra, from 5 -7 December 2017.	Dr. A. Mitra
7	International Conference on Genomics Analysis and Technology Conference (GATC 2018), Guwahati, 7-9th January.	Dr. Sabyasachi Mukherjee
8	XXXIII Annual Conventions and National Symposium of the Indian Society for Study of Animal Reproduction (ISSAR) at WBUAFS, Kolkata from 9 - 11th February 2018.	Dr. A. Mitra

Participants of training programme for increasing mithun production

DISTINGUISHED VISITORS

	Name (in chronological order)	Date
1	Dr. R. S. Gandhi, ADG (A.P. & B), ICAR, New Delhi	02.5.2017
2	Shri Yatachu Fithu, Minister of School Education & SCERT, Govt. of Nagaland	02.06.2017
3	Dr. Chandan Rajkhowa, Former Director, ICAR-NRC on Mithun	02.06.2017
4	Dr. Vishal Nath, Director, ICAR-NRC on Litchi, Muzaffar, Bihar	05.08.2017
5	Sh. S. N. Pradhan, Joint Secretary, DONER, GoI, New Delhi	19.09.2017
6	Dr. Uttam Kr. Paul, Professor & HOD, Dept of LPT, Rajiv Gandhi Veterinary College, Pondicherry	16.11.2017
7	Dr. Randhir Singh, ADG (AE), ICAR, New Delhi	21.11.2017
8	Dr. P. Manikandan, Retired Head & P. C. ICAR-NAARM, Hyderabad.	19.03.2018

PERSONNEL

INSTITUTE STAFF as on 31st March 2018

Cadre Name	Name	Designation
RMP	Dr. Abhijit Mitra	Director
Scientific	Dr. Nazrul Haque	Principal Scientist
	Dr. (Mrs.) Saroj Toppo	Principal Scientist
	Dr. Sabyasachi Mukherjee	Principal Scientist
	Dr. Meraj Haider Khan	Principal Scientist
	Dr. Jayanta Kumar Chamuah	Scientist
	Dr. Lalchamliani	Scientist
	Dr. Sapunii Stephen Hanah	Scientist
Technical	Dr. KezhavituoVüprü	CTO Animal Science (T-9)
	Dr. Kobu Khate	CTO Animal Science (T-9)
	Mr. RokongulieKrose	Senior Technician (T-3)
	Mr. Vizekrol Kikhi	Senior Technician (Driver, T-2)
Administration	Miss. Aloli Rengma	AAO
	Mr. Safal Chetri	AFAO
	Mr. Th. Dipal Meitei	Assistant
	Mr. Surjit Kumar	Assistant
	Mr. K.M. Chüsi	LDC
	Mrs. Achüno Solo	LDC
	Miss. Vikhobeinuo Kiso	Stenographer Gr.III
	Mr. Shatrughan Verma	SSS
Supporting	Mr. Zakahi	SSS

Mithun Farmers participating in a training programme in the Institute

Cadre Name	Name	Designation
	Mr. Vezato	SSS
	Mr. Zhophuhu	SSS
	Mr. Povetso	SSS
	Mr. Vecüzo	SSS
	Mr. Thupuvoyi	SSS
	Mr. Vezhocho	SSS
Staff of KVK	Dr. R.K. Singh	Senior Scientist & Head
	Mrs. Hannah K. Assangla	ACTO (Agronomy) (T-7-8)
	Mrs. T. Esther Longkumer	ACTO (Soil Science) (T-7-8)
	Mr. Rinku Bharali	ACTO (Horticulture) (T-7-8)
	Mrs. Liza Barua Bharali	ACTO (Plant Protection) (T-7-8)
	Dr. D. Borkotoky	STO (Animal Science) (T-6)
	Mr. Nukusa T. Vadeo	Technical Officer (Computer Science) (T-5)
	Mr. Kenisetuo Chücha	Farm Manager (TechnicalAssistant, T-4)
	Mrs. R. Imsennaro Longchar	Jr. Steno cum Computer Operator
	Mr. Bodan Ch. Kachari	Technical Asstt (Driver cum Mechanic, T-3)
	Mr. Vevo	SSS
	Mr. Shetsonyi Puro	SSS

PERSONALIA

Shri Ajen Lama, Administrative Officer superannuated from the Council's service w.e.f. 30th November 2017.

MAIN STATION

Animal Genetics & Breeding Section

This section is engaged in the research activities on identification, evaluation, characterization and conservation mithun germplasm. Complete cytogenetic analysis including karyotyping and different chromosomal bandings (C-banding and R-Banding) carried out in the section revealed that the normal diploid number of mithun was 58XX and 58 XY for male and female. In order to find out the karyotypic evolution of mithun, FISH technique was used on the metaphase chromosome of mithun as well as wild ancestral species, Gaur. Besides, several economically important genes including kappa casein, leptin, and growth hormones were also characterized. In the recent past, this section also carried out the microsatellite based characterization of different mithun population and muscle transcriptome analysis. Presently, whole genome sequencing of mithun for the construction of a draft genome assembly and genomic characterization of mithun using bovine HDchip estimating population diversity parameters in farm and field mithun population is underway.

Animal Nutrition Section

Identification, nutritional evaluation and preservation of locally available feeds and fodders, and determination of nutrient requirements and feed efficiency of mithun are the central areas of research. Barring few, most of the forages, that were analyzed for their nutrient contents, can serve as good sources of protein and energy for mithun and contained phenolic compounds within the limit. Assessing the macro- as well as micro-mineral contents of soil, feeds and fodders as well as in the serum of mithun, an area specific mineral mixture,

entitled with the trademark 'μthimin', was developed. Determining the protein requirement of growing mithun calves, it is suggested that male growing mithun calves can be reared on 80% crude protein requirement of NRC (1989) recommendations meant for growing dairy cattle. The studies on growth rate and feed efficiency are under progress. Recently much emphasis is being given to preserve the feeds and fodders as well as to exploit the locally available agro-industrial byproducts like spent grain from breweries industries and wet cake and dried distillery grains and soluble (DDGS) from distillery industry in the form of feed blocks. This will help in feeding mithun during scarcity period and economization of mithun rearing systems, especially the intensive and semi-intensive rearing.

Animal Physiology and Reproduction

Conservation and propagation of mithun germplasm and augmentation of fertility are the core area of research. Artificial Insemination (AI) protocol standardized by the section and is being used successfully under farm as well as in field condition. Successfully developed superovulation and ETT protocol for mithun and produced first embryo transfer calf 'BHARAT' on 27th March 2012. This section hosted one Post Doctorate, five Doctorate and four Post Graduate Scholars in last 5 five years. Currently, research on standardization of cryopreservation protocol using controlled freezing technique, improvement in the quality of the cryopreserved semen using additives and selection of bulls for breeding purpose through breeding soundness evaluation and endocrine profiling is under progress. Estrus synchronization with timed AI and early induction of puberty in pre-pubertal heifers through the administration of neuropeptide 'kisspeptin" has been standardized. Studies are also being carried out to compare the reproductive efficiency of bulls during different seasons. Since, August 2016, artificial insemination (AI) has been introduced in the Mithun Farm of Medziphema.

Animal Health Section

This section has generated valuable information on the epidemiology of various diseases of mithun in the North-Eastern hilly region of India. During the past two decades, periodic studies conducted at the Institute and the field level survey indicated that mithun are also susceptible to a wide variety of diseases including viral, bacterial, fungal and parasitic diseases. Many diseases have been recorded in clinical form while others have been recorded in seroprevalence studies conducted in the Institute farm as well as in field level survey in mithun inhabiting states. This section also prioritized onto developing safe, environment-friendly alternative therapeutics for animal health care by screening rich floral biodiversity of NEH. The section is engaged in providing the health care services to institute mithun farms at Medziphema and Porba as well advanced diagnostic services to Department of Veterinary & AH, Govt. of Nagaland.

Livestock Products Technology

Mithun is traditionally reared as a meat animal and is generally sacrificed for a feast on religious and social occasions. However, the potential of mithun as a meat animal is yet to be exploited. Further, even though, mithun produces only 1 to 1.5 liter of milk, but its nutraceutical value is yet to be determined. One of the mandates of the Institute is to conserve and improve mithun for meat and milk. Accordingly, conducting research in the frontier areas of meat science and to develop value added products from mithun milk and meat are the core area of research of this section. Preliminary studies have been carried out to study the proximate analysis of mithun meat and milk. Several value-added mithun meat and

milk products developed in the Institute have been showcased in farmers' fields, food festivals and agriculture fare. A technology to process the skin of mithun, which is also a delicacy among certain tribes, as leather has also been developed. Presently, this section is developing appropriate and relevant processing technologies for different value added mithun meat products for improving palatability and enhancing shelf life.

Institutional Level Biotech Hubs

The Institutional Level Biotech Hub was established during 2011-12 under the special scheme for North Easter Region of India by Department of Biotechnology, Government of India. Since inception, the Hub has conducted 15 hands-on trainings, eight outreach programmes and delivered the eight invited lectures in Undergraduate (UG) and Post-graduate (PG) institutions in the area of molecular biology and Biotechnology. Till date, more than 1500 UG and PG students have been benefitted.

Bioinformatics Infrastructure Facility

The institutional Level Biotech Hub was established in the year 2012 under the special scheme for North East India by Department of Biotechnology, Government of India. The Institute bioinformatics centre is equipped with 100 Mbps internet facility, high and medium end server and 10 computers. The center is regularly organizing hands on training to the under& post-graduate scholars of various institution viz., School of Engineering and Technology and Management (SETAM), Nagaland University, Patkai Christian College, Dimapur and School of Agricultural Sciences and Rural Development (SASRD), Medziphema, Nagaland. Till date, six hands on training programmes were organized benefitting 150 research scholars.

Central Biotech Infrastructure Facility

The facility was created with the special grant from Department of Biotechnology, Government of India in 2012. This state of the art facility is equipped with the modern instruments for carrying out research in the area of molecular biology, reproductive physiology, and ethnomedicine. The facility is having Real Time-PCR, Gradient PCR, Nanodrop, Biological safety cabinet (Class II), Ultracentrifuge, Nucleic acid Extractor, Gel Doc, Western Blot and SDS-PAGE apparatus, Bioanalyzer, Ultrasonicator, CO_2 incubator, Clean Work Station, High-Performance Thin-Layer Chromatography (HPTLC), Computer Assisted Semen Analyzer (CASA), refrigerated centrifuge and deep freezers (-40 °C and-80 °C). The facility is extended for use to all the research scholars of NEH and Department of Veterinary & AH, Govt. of Nagaland.

Mithun Farm, Medziphema

Management practices

The mithun in the Institute farm are reared under semi-intensive as well as intensive systems. Three hectors of farm land are under fodder cultivation where Congo signal, hybrid napier,

maize and some fodder trees are grown. The harvest of green fodder from the cultivated plot was 250749 kg which is 62132 kg production increased from the same plot as compare to last year production. Preventive measures for prevalent diseases for mithun like FMD, BQ and HS are taken by vaccinating the animals. Tick is one of the major ecto-parasitic problems persisting throughout the year. Occurrence of FMD was seen in the farm in very mild form during March 2018 but there was no mortality due to FMD related disease.

Herd Size

Young Stock		Adult		Total	
Male	Female	Male	Female	Male	Female
09	12	41	41	50	53

New initiatives

Traditionally, mithun are reared under free range of forest eco-system where regular care was not possible for which many mithun used to die from epidemic diseases, predators and many environmental factors. Institute has introduced semi-intensive system with some refinement as a model farm for rearing of mithun.

Breeding and reproduction through artificial insemination has been adopted as a breeding tool in the farm. A total of 12 calves were born through AI during the year.

Construction of boundary fencing, two breeding enclosures, fencing of grazing area (2 hectare), and internal farm road with premix carpeting were some of the new addition during the year.

राजभाषा अनुभाग

राष्ट्रीय मिथुन अनुसंधान केन्द्र में 14 से 20 सितंबर 2017 के दौरान हिन्दी सप्ताह का आयोजन किया गया । 14 सितंबर को हिन्दी सप्ताह का शुभारंभ संस्थान के निदेशक डॉ. अभिजित मित्रा द्वारा दीप प्रज्वालित करके किया गया । इस अवसर पर संस्थान के समस्त अधिकारी एवं कर्मचारी उपस्थिति थे। हिन्दी सप्ताह के दौरान संस्थान में, हिन्दी भाषा को बढ़ावा देने के लिए विभिन्न प्रतियोगिता तात्कालिक भाषण, टिप्पणी एवं प्रारूप लेखन, हिन्दी अनुवाद, स्मरण शक्ति, अंताक्षरी, परिसर के बालक बालिकाओं के लिए निबंध लेखन एवं चित्राकला का आयोजन किया गया जिसमें संस्थान के सभी अधिकारियों, कर्मचारियों एवं परिसर के बालक एवं बालिका ने उत्साह पूर्वक हिस्सा लिया।

20 सितंबर 2017 को हिन्दी सप्ताह का समापन समारोह एवं पुरस्कार वितरण समारोह आयोजित किया गया । इस अवसर पर संस्थान के निदेशक डॉ. अभिजित मित्रा, डॉ. सरोज टोप्पो हिन्दी प्रकोष्ठ प्रभारी एवं प्रशासनिक अधिकारियों एवं कर्मचारियों आदि की उपस्थिति में विभिन्न प्रतियोगिताओं के विजेताओं को पुस्कार प्रदान किया गया । संस्थान में हिन्दी प्रोत्साहन के लिए किये गये कार्यक्रम की सराहना की गई ।

LIBRARY

Libraries are the part of an intellectual culture where intentionally created information are collected, organized and saved for the future in any storage device or formats. It is the space and portal to the entire world's knowledge shared by people of all age group to practice lifelong learning. The digitization has made its accessibility easier and wide to many libraries in public domain with no boundary to time and space.

The Institute is maintaining a small academic library having total 1989 number of books in the field of Animal Genetics, Physiology, Production, Nutrition, Health, Biotechnology and others. In general storing relevant printed intellectual documents to provide the culture of reading and information dissemination for holistic development to the employees, researchers and others associated with the Institute like farmers, students. With the advent of digital library concept of Consortium of e-Resources in Agriculture (CeRA) researchers have online access to the full text of CeRA therefore; Institute has discontinued the subscription of scientific journals from 2017-18 onwards.

S.N.	Particulars	2017-18	Total Numbers
1	Books	10	1989
2	Journals Indian International	 34 4	 952 217
3	Abstract CD Agris CD Vet CD Beast CD Resources CD	 - - - -	 13 29 08 01
	Medline Miscellaneous	- -	20 24
4	Thesis	01	10
5	Priced books (for sale)	-	1552
6	Institute Annual Report	750	454
7	Annual Report received from other institute	62	453
8	Research Highlights/ compendium/ Technical Bulletin	750	473
9	Other publication and proceedings	250	35
10	Types of folder/ leaflets	-	354
11	News letters received from other institute	140	932

ITMU

The Institute Technology Management Unit has been constituted in the Institute with the aim to promote development of infrastructural facilities for registration of intellectual property by facilitating the improvement of legal, institutional and administrative framework assists and facilitates owners of intellectual property and to conduct training and capacity building activities for scientist and other research workers. The ITMU unit of NRC on Mithun has initiated filing of Patents, Trade mark and Geographical Indication. This cell works in consultation with other scientific, technical and administrative staff for smooth functioning of the unit.

ARIS Cell

This cell provides the IT based facility to the

Institute. It is equipped with networking devices and 24 hours uninterrupted power backup system. Presently the cell is responsible for distributing internet connectivity to all the sections and officers, individual computer systems with colour and black and white printing and scanning facilities. This section is also maintaining the website of the Institute.

REGIONAL STATION

PORBA, PHEK DISTRICT

The regional research station of NRC on mithun is located at Porba village of Phek district, Nagalnd. It is 125 km away from ICAR-NRC on Mithun, Medzihema. The station has one Assistant Chief Technical Officer cum Station In-charge, one Veterinary Field Assistant and other supporting staff. The scientists from the Head quarters visit the station from time to time to collect biological samples for research purposes, organizing health cum vaccination camps and other extension activities. The station has mithun farm with herd strength of 58 and one laboratory equipped with primary samples processing facility. The station has adopted more than 10 villages namely Porba, Gidemi, Pholami, Upper Khomi and Middle Khomi, Mesulomi, Enhulumi, Sakraba, Losami, Thevopisu where regular animal health cum vaccination camp are being organized and disease diagnostic service are routinely provided. This campus is also having Krishi Vigyan Kendra (KVK-Phek) of the Institute is also housed in this campus.

MISCELLANY

Celebration of International Yoga Day

The International Yoga Day was celebrated on 21st June, 2017 by organizing a Yoga camp in the campus starting from 9.00 AM. All the employees of the Institute and their family members participated in the camp.

Staff of NRC Mithun participating in Yoga

Research Advisory Committee (RAC) Meeting

The 10th RAC Meeting of the Institute was held on May 2, 2017. Dr. Abhijit Mitra, Director presented a brief account of the Institute during the last one year. Dr. Dharmeswar Das, Chairman, RAC appreciated the efforts made by the Scientist of Institute and emphasized the need of prioritization of the research areas. He further urged to take up the research projects to delineate the uniqueness of mithun. The committee members visited the Mithun Farm at Medziphema and took an account of the farm activities. The meeting was also attended by other RAC members including Dr. R. S. Gandhi,

RAC Meeting in progress

RAC Chairman and Members visiting Mithun Farm

ADG (AP & B), ICAR, New Delhi; Dr. Kusumakar Sharma, former ADG (HRD); Dr. K. K. Baruah, Former-Director, NRC on Yak; Dr. A. Chakravarty, Director Research, C. V. Sc, Khanapara; Shri Jaangsillung Gonmei and Shri Lachit Kachari, The farmer representative.

IRC Meeting

The IRC meeting was held on 16th May, 2017 in the Institute and started with a welcome address by the Director, ICAR-NRC on Mithun. Dr. Vineet Bhasin, Principal Scientist, ICAR Headquarters, in his opening remarks suggested that the Scientists should follow the recommendations of the RAC in letter and spirit and should take up the projects keeping in view of the mandate of the Institute for the betterment of the mithun, which is the pride of the nation in general and North East India, in particular. The Director of the Institute stressed that all the present and future projects should to be completed as per the approved technical program within a given time frame.

29th Foundation Day of ICAR-NRC on Mithun

The Institute celebrated its 29th Foundation Day on 2nd June 2017. In the inaugural session, Shri Yatachu Fithu, Minister of School Education & SCERT, Govt. of Nagaland, who was the Chief Guest of the Foundation Day Meeting, lauded the Centre for its efforts. He stressed that the NRCM not to focus on giving incentives but to be a Centre of providing information and helping farmers to grow on their own. Dr. Chandan Rajkhowa, former Director of the Institute and Guest of Honor of the Foundation Day Meeting, said that mithun has tremendous potential to transform the lives of tribal population in the NE region. He expressed satisfaction at the progress made by the Institute in past years and gave credit to the staff who works with sincerity and zeal.

Visit of School Students

A group of elementary students from Community Education Centre School, Dimapur visited the Institute and Mithun Farm to know about mithun rearing practices on 17th June 2017.

Celebrating the Independence Day

The Independence Day was celebrated in the Institute Campus on 15th August 2017. Dr. Abhijit Mitra, Director, unfurled the tricolor in the morning with the singing of National anthem. The Director encouraged all the staffs to work with a purpose and remain ever vigilant for safeguarding the reputation of the Institute in particular and nation in general. The children and family members also took an active part in the celebration.

Visit of Quinquennial Review Team (QRT) for the period of 2012-17

The First meeting of the QRT was held from September 5 to 7, 2017. During the visit to the Institute, the team had detailed discussions with the Scientists on the outcomes of their research programmes and activities. The team also visited the Mithun Farm at Medziphema.

The QRT Meeting and visit to the Institute Mithun Farm

The QRT also visited all the sections including the technical, supporting and administrative units and had active interaction with the scientists, technical, administrative and supporting staff. The team also had a look at the research publications, books, brochures, extension literature, etc. The QRT also discussed the operational constraints faced by the staff. The team was also appraised on the ATR of the previous QRT.

Two field visits to Medziphema and Molvom villages were arranged during the first meeting where the team had extensive interaction with the farming community. The visit to Medziphema village was particularly significant as it marked the inauguration of an operational unit of mithun under semi-intensive rearing system by the Chairman of the QRT.

The Second meeting of the QRT took place from January 14-19, 2018. The team visited the Porba Campus and had a good insight into the facilities of the outstation including the mithun farm and KVK field and outreach activities. The QRT also visited Khonoma Village and had an extensive interaction with the stakeholders i.e. mithun rearers and rural communities to assess the needs and constraints of the stakeholders in mithun rearing as a viable enterprise for livelihood security.

The QRT also had an interactive meeting with the officers and representatives of the Department of Veterinary & Animal Husbandry from all the four states of the North-Eastern states, Nagaland Livestock Development Board (NLDB), North-East Institute of Development Agency (NEIDA), National Bank for Agriculture and Rural Development (NABARD), School of Agricultural Sciences and Rural Development (SASRD), Nagaland University; College of Veterinary Science & Animal Husbandry, CAU, Jalukie, Joint Director, ICAR Research Complex for NEHR, Nagaland Centre, Medziphema, Nagaland Agricultural Department, etc.

The QRT also had discussions with the public/ farmer representatives, non-governmental members of IMC and the ADG (AP&B), the representatives of administrative and technical staff (IJAC).

Vigilance Awareness Week

The Institute observed Vigilance Awareness Week from 30th October to 4th November 2017. The theme of the Vigilance Awareness Week for this year was **"My Vision-Corruption Free India"**. The programme began on 30.10.2017 at 11:00 hrs. Dr. Abhijit Mitra, Director the importance of Vigilance Week and administered a pledge to the staff. Various competitions were organized like essay writing, drawing competition, and slogan writing for the staff and students. The valedictory programme was held on 3rd November 2017 from 3:00 to 4:00 pm in the conference hall of the Institute. Dr. Meraj Haider Khan, Vigilance Officer, appraised the house about the activities conducted during vigilance week. Shri Ajen Lama, Administrative Officer and Dr. Nazrul

Haque, Principal Scientist expressed their views on preventing corruption. Dr. Abhijit Mitra, Director, emphasized the need to create awareness about anti-corruption and also motivated the school children to practice honesty in their daily life. The winners of various events were awarded with gifts and certificates. The vote of thanks was delivered by Dr. M. H. Khan, Vigilance Officer.

Constitution day

All the Staffs of ICAR-NRC on Mithun assembled in the Meeting Hall for taking pledge on the occasion of Constitution Day on 27th November 2017.

Republic Day Celebration

The 71st Republic day was celebrated in the Institute Campus on 26th January 2018. Dr. Abhijit Mitra, Director, unfurled the National Flag in the morning with the singing of National anthem. Staff members along with the family members were also attended the programme.

NOTE

NOTE

GLIMPSES OF OUR PREVIOUS ANNUAL REPORTS

Disclaimer

This annual report contains unprocessed or partially processed data/scientific information which would form the basis of research articles in due course. Hence, the data/information contained in this report, should not be used without written permission of this Institute, other than for quoting in any scientific reference.

भाकृअनुप–राष्ट्रीय मिथुन अनुसंधान केन्द्र

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