

वार्षिक प्रतिवेदन ANNUAL REPORT 2020



भाकृअनुप-राष्ट्रीय मिथुन अनुसंधान केन्द्र

मेड्जीफेमा, नागालैन्ड-797 106, भारत

ICAR-NATIONAL RESEARCH CENTRE ON MITHUN

Medziphema, Nagaland- 797106, India

www.nrcmithun.icar.gov.in



LOCATION AND TRAVEL INFORMATION

MAIN STATION

ICAR-NRC on Mithun is a research organization, working under the aegis of Indian Council of Agricultural Research (Department of Agriculture Research and Education, Ministry of Agriculture and Farmers Welfare. Our Institute 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)

Silchar: 310 km (Road)

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

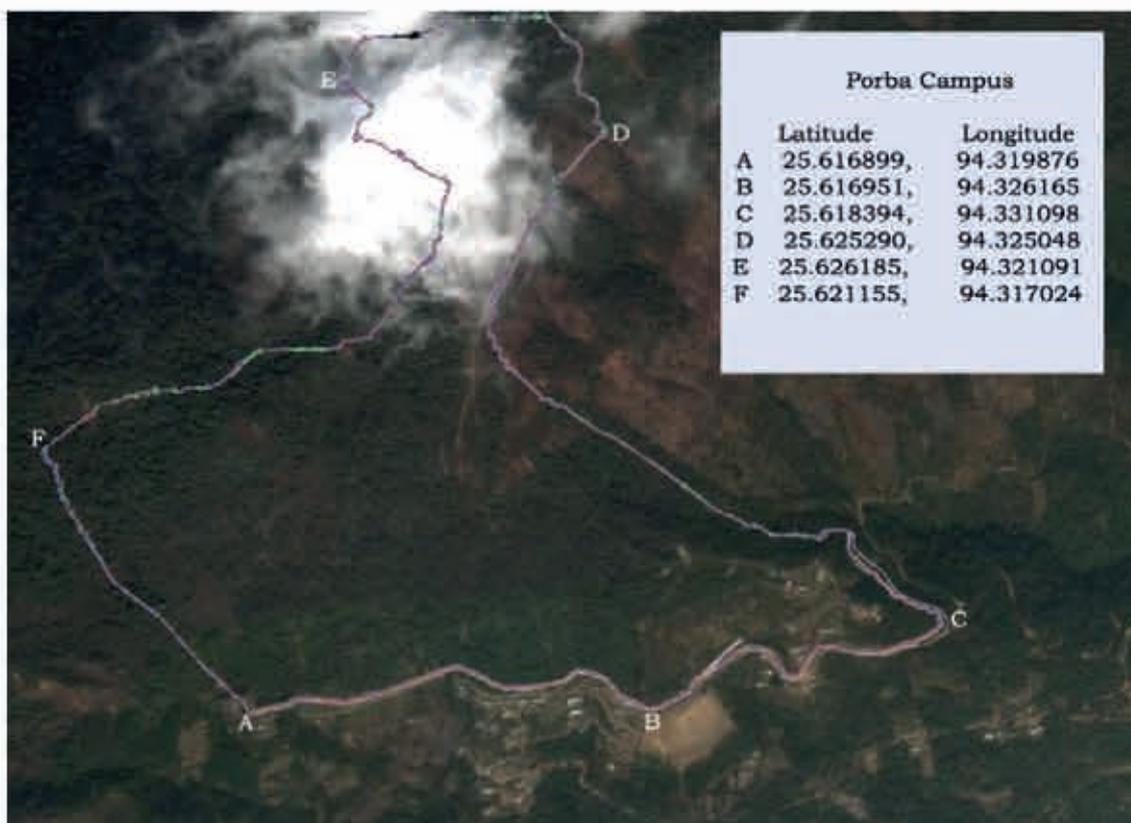
Delhi: 2198 km (Rail) and 1661 km (Air)

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.



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प्रस्तावना | PREFACE



ICAR-National Research Centre on Mithun, Nagaland has been working since 1988 for the continual improvement of the unique bovine species of North Eastern states, Mithun (*Bos frontalis*). The animal is not only the representative of the socio-economic, religious, and cultural life of the tribal people of North-Eastern states of Arunachal Pradesh, Nagaland, Manipur, and Mizoram but also has a great potential for meat, milk, hide and draft power. Mithun, being a unique and valuable bovine species of the North-Eastern states of India, could be an important component of the sustainable animal production system of the region. As far as the mithun meat is concerned, studies indicated that it has good nutritive value as shown by its high protein content, good amino acid profile, water-soluble vitamins, minerals and low-fat content. Apart from meat, mithun milk and hide are other dimensions that will give additional avenues for income generation. After successful implementation of the semi-intensive mithun model at the Institute Mithun Farm, Medziphema since last two decades, this model is further extended under field conditions. Institute provides the inputs required for the construction of such model by providing materials like CGI sheets for roofing and barbed wire for fencing.

To strive for excellence in the mandated areas of research, we have undertaken 9 IRC and one ICAR Network project. Animal Genetics and Breeding section recently sequenced the whole genome of mithun and published its finding in BMC Genomics. During the reporting period, Institute has generated valuable scientific information on mithun rumen microbiome, follicular dynamics of pubertal and pre-pubertal mithun heifers, the

growth rate of different categories of mithun, early weaning of mithun calves, preliminary studies on haemoprotzoan disease in mithun, immune response of FMDV vaccinated animal and incidence of major sub-clinical metabolic diseases in transition mithun cows.

It is our continuous endeavor to disseminate the technologies and package of practices developed in the Institute to the farmers' field. Under Tribal Sub-Plan (TSP), several programs including the establishment of the semi-intensive unit, mithun mela-cum- technology awareness program, farmers training and exposure visits were organized benefitting 2119 farmers. KVK-Phek, the only KVK under the Institute, carried out 73 training programs benefitting 1414 farmers. Apart from these activities, the KVK also undertook 163 extension activities benefitting 1829 farmers.

The Institute aims to improve the technical competency of the students, faculties and other extension personnel by imparting new skill and knowledge. During the initial period of the pandemic, our Institute has given hands-on training on real-time PCR and its uses in the detection of nucleic acids for the medical team of CIHSR led by Dr. Neto Yephthomi.

We have developed an active collaboration with Central Agriculture University, Imphal and its constituent colleges particularly College of Veterinary Sciences & Animal Husbandry, Jalukie, Nagaland; College of Veterinary Sciences & Animal Husbandry, Selesih, Mizoram and College of Horticulture and Forestry, Pasighat, Arunachal Pradesh has been a good help to our

efforts in mithun propagation and conservation. Support and collaboration received from Assam Rifles, Directorates of Veterinary Services & AH of mithun rearing states, ATMA, ATARI-Zone II and III, NABARD, College of Veterinary Science AAU, Kahanapara and other ICAR Institutes of the region is noteworthy.

The Institute is highly indebted to the various visiting dignitaries and academicians for their encouragement, candid suggestions and valuable inputs. The members of 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. Jena, DDG (Animal Science and Fisheries) and Dr. B. N. Tripathi, DDG (Animal Science). The help and advice rendered by Dr. Vineet Bhasin, PS, Animal Science Division, ICAR are well-acknowledged with gratitude.

Last but not least, let me acknowledge the support and untiring efforts of all the staff of the Institutes who are putting in all hours of pain and sweat to achieve our target to conserve, improve and propagate this magnificent species, Mithun.

“Jai Hind!”



(M. H. Khan)
Director (Acting)

कार्यकारी सारांश | EXECUTIVE SUMMARY

इस अनुभाग में पिछले वर्ष संस्थान में पूर्ण किये गए अनुसंधान कार्यों का सार प्रस्तुत है:

पशु पोषण

- राइस बीन के साथ उगाये गए मकई चारे (जे-1006) की उत्पादकता अकेले उगाये गए मकई चारे से अधिक दर्ज की गयी।
- औसत दैनिक वृद्धि और चारा रूपांतरण अनुपात में कोई महत्वपूर्ण अंतर नहीं देखा गया, जब बछड़ों को 3 महीने के लिए 80% क्रूड प्रोटीन और 100-150% ऊर्जा युक्त राशन खिलाया गया।

पशु शरीर-क्रिया एवं पुनरुत्पादन

- प्यूबर्टल और प्री-प्यूबर्टल मिथुन में टू-वेव फॉलिकुलोजेनेसिस चक्र सामान्य रूप से देखा गया। मद की समाप्ति के 10.33±0.92 घंटे (7-16 घंटे की सीमा) बाद मिथुन में अंडोत्सर्ग दर्ज किया गया। मिथुन में औसत मद चक्र की अवधि 20.40±0.40 दिन (19 से 21 दिन) पाई गई।
- मिथुन में मद का पता लगाने का सबसे कुशल और विश्वसनीय तरीका टीजर सांड का उपयोग है।

पशुधन उत्पादन एवं प्रबंधन

- नर और मादा मिथुन में मासिक वजन का बढ़ना 13 महीनों तक समान होता है। हालांकि, 14 महीने के बाद से 3 साल तक, नर मिथुन ने मादा समकक्ष की तुलना में मासिक वजन वृद्धि में प्रभुत्व का प्रदर्शन किया।
- मिथुन बछड़ों के जन्म भार पर मौसम का कोई महत्वपूर्ण प्रभाव नहीं पड़ता है।
- 5 साल की आयु के बाद, नर मिथुन में शरीर का वजन स्थिर हो जाता है।
- पारंपरिक (6 महीने) और शीघ्र (4 महीने) वीनिंग वाले समूहों के बछड़ों के मासिक वजन में कोई महत्वपूर्ण अंतर नहीं देखा गया।

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

Animal Nutrition

- The productivity of fodder maize (J-1006) intercropped with rice bean was significantly higher than sole fodder maize.
- No significant differences were observed in average daily gain and feed conversion ratio, when the calves were fed with rations containing 80% crude protein and 100-150% energy for 3 months.

Animal Physiology and Reproduction

- The two-wave folliculogenesis cycle was common in pubertal and pre-pubertal mithun. The ovulation in mithun occurred at 10.33±0.92 h after the end of estrus with a range of 7-16 h. The average estrous cycle length in mithun was found to be 20.40±0.40 days (19 to 21 days).
- The most efficient and reliable method of estrus detection in mithun is by the use of teaser bull.

Livestock Production and Management

- The monthly body weight gain in male and female is more or less the same up to 13 months. However, from 14 months onwards up to 3 years, male exhibited dominance in monthly body weight gain than its female counterpart.
- Season has no significant effect on the birth weight of mithun calves.
- After 5 years, the body weight gain in male mithun becomes stagnant.
- No significant differences were observed in monthly body weight of calves of conventional (6 months) and early (4 months) weaning groups.

पशु स्वास्थ्य

- तंबाकू के एथेनॉलिक अर्क (5%), उसके बाद सोपनट, ने जलीय जोंक के विरुद्ध सबसे अधिक इन विट्रो प्रभावकारिता प्रदर्शित की।
- एफएमडीवी के विरुद्ध एंटीबॉडी स्तर टीकाकरण के 7 से 14 दिनों के बाद चरम पर होता है और 2 से 3 महीने तक बना रहता है, फिर धीरे-धीरे कम हो जाता है। सुरक्षात्मक एंटीबॉडी स्तर केवल 4-5 महीने तक बना रहता है। एफएमडीवी के विरुद्ध एंटीबॉडी स्तर 2 वर्ष से कम आयु के मिथुनों में तुलनात्मक रूप से कम होता है।
- गैर-एस्ट्रिफाइड फैटी एसिड (एन.ई.एफ.ए) के लिए 0.26 एमएमओएल/ली और बीटा-हाइड्रॉक्सीब्यूट्रिक एसिड (बी.एच.बी.ए) के लिए 1.09 एमएमओएल/एल के कट-ऑफ पॉइंट का उपयोग मिथुन में नकारात्मक ऊर्जा संतुलन और सबक्लिनिकल किटोसिस के निदान के लिए किया जा सकता है।

प्रसार

- नागालैंड में 80.15% और अरुणाचल प्रदेश में 98.89% से अधिक किसान अपनी आजीविका सुरक्षा सुनिश्चित करने के लिए मिथुन को पालते हैं।
- नागालैंड और अरुणाचल प्रदेश के किसानों की कुल वार्षिक आय में मिथुन की खेती का योगदान क्रमशः 35% और 28% है।

Animal Health

- Ethanolic extract of tobacco (5%) exhibited the highest *in vitro* efficacy against aquatic leech followed by soapnut.
- Antibody titre against FMDV peaks at 7 to 14 days after vaccination and is maintained till 2 to 3 months, then gradually decreases. The protective antibody level is maintained up to 4-5 months only. The level of antibody against FMDV is comparatively low in mithuns aged <2 years.
- A cut-off point of 0.26 mmol/L for non-esterified fatty acids (NEFA) and 1.09 mmol/L for beta-hydroxybutyric acid (BHBA) can be used for the diagnosis of negative energy balance & subclinical ketosis in mithun.

Extension

- More than 80.15% of the mithun farmers in Nagaland and 98.89% in Arunachal Pradesh rear mithun to ensure their livelihood security.
- Mithun farming contributes about 35% and 28% to the total annual income of the farmers in Nagaland and Arunachal Pradesh, respectively.

INTRODUCTION

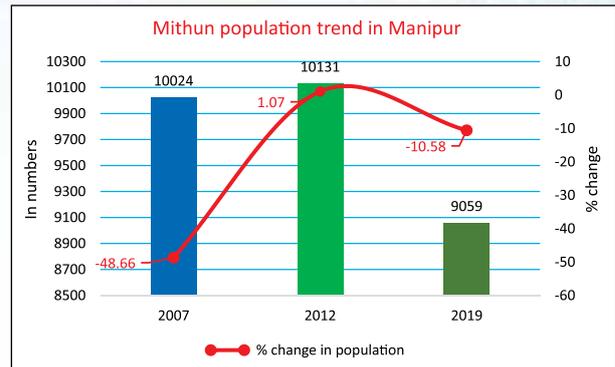
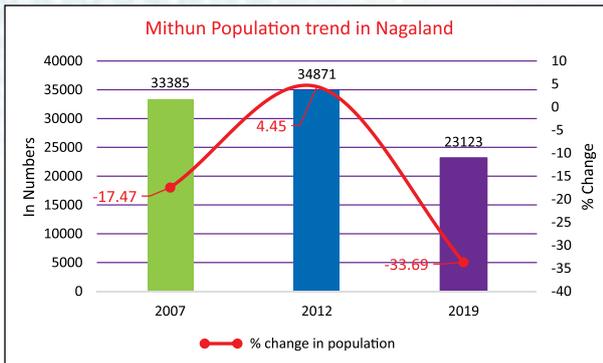
The Institute: At a Glance

ICAR-National Research Centre on Mithun, located at Medziphema, Nagaland, is the only Institute in the world fully dedicated to research in a rare bovine species mithun (*Bos frontalis*) or gayal. It is the state animal of Arunachal Pradesh and Nagaland and plays a central role in improving livelihoods of indigenous tribes of NEH region. The Institute is solely focused on the continual improvement and conservation of mithun, a species regarded as vulnerable to extinction. Priceless scientific data essentially required to address the issues pertaining to mithun health, nutrition and reproduction have been generated by the Institute during the past three decades. Recent researches revealed that mithun is phylogenetically distinct from other *Bos* species and originated independently of Zebu cattle and gaur. Moreover, the Institute has developed various packages of practices and technologies with immense potential to improve and safeguard mithun husbandry. At present, the Institute is making relentless efforts to popularize an alternative system of mithun rearing i.e. semi-intensive system in order to improve survivability of mithun and conserve its free-ranging population. The Institute also succeeded to get 1 patent, 3 designs and 1 copyright. Some of the salient achievements of the Institute are:

- Developed, demonstrated and established 16 semi-intensive mithun rearing units in farmers' field.
- Whole-genome of Indian mithun sequenced.
- Chromosomal profiling, phenotypic and genetic characterization of different mithun populations.
- Mitochondrial genome of mithuns from different locations sequenced.
- Complete profiling of mithun meat and milk.
- Rumen microbiome meta-analysis.
- Developed technique for age determination of mithun using dentine pattern.
- Developed area-specific mineral mixture for mithun.
- Developed mineral block and mineral block dispenser.
- Identification, chemical analysis, and nutritional evaluation of more than 260 tree leaves/ shrubs for incorporation in ration of mithun.
- Developed low-cost complete feed block.
- Standardized protocols for collection, freezing of semen and AI in mithun.
- Developed a mobile app "Mithun Mitra" and linked about 125 mithun societies with mobile app.
- Birth of first ET mithun calf 'BHARAT' in May 2012.
- Developed a mithun health calendar.
- Standardized techniques for preparation of value-added products from mithun milk (paneer, lassi, dahi, rasgolla), meat (meat block, patties, nugget, meat powder) and hide (leather jacket, ladies bag, shoe, wallet, portfolio bag).

Geographical Spread and Population Trend of Mithun

Mithun is exclusively found in the hilly forests of NEH region at an altitude of 300-3000 mMSL. Besides northeastern states of India, it inhabits China, Bangladesh, Thailand, Bhutan, Myanmar and Malaysia. According to 20th Livestock Census (2019), the mithun population has shown an overall increase of 30.6%. The maximum population increase was recorded in Arunachal Pradesh followed by Mizoram. However, Nagaland and Manipur recorded a decline of 33.6% and 10.5%, respectively, in their mithun population. A survey conducted by ICAR-NRC on Mithun & State Veterinary Department, Nagaland has identified various factors for the declining mithun population in Nagaland. Immediate measures need to be taken to check further decline of mithun population.



The driving factors leading to the decline in mithun population are as follows:

1. Decrease in forest area due to deforestation
2. Shrinkage of the pastoral area
3. Lack of insurance and bankable schemes for mithun
4. Frequent predator attacks on mithun calves
5. Lack of awareness and misconception about vaccination
6. Inter-border crossing for better grazing areas increases the spread of diseases like FMD, HS, BQ etc.
7. Inter-border crossing for better grazing areas increases the spread of diseases like FMD, HS, BQ etc.
8. No regular income from mithun
9. Migration of farmers from rural to urban areas

In the following sections, a brief description of the research work and extension activities carried out by the Institute, staff positions, funding status, ongoing projects and other relevant information, during 2020, are presented.

VISION, MISSION, MANDATE

संद्श्य / 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

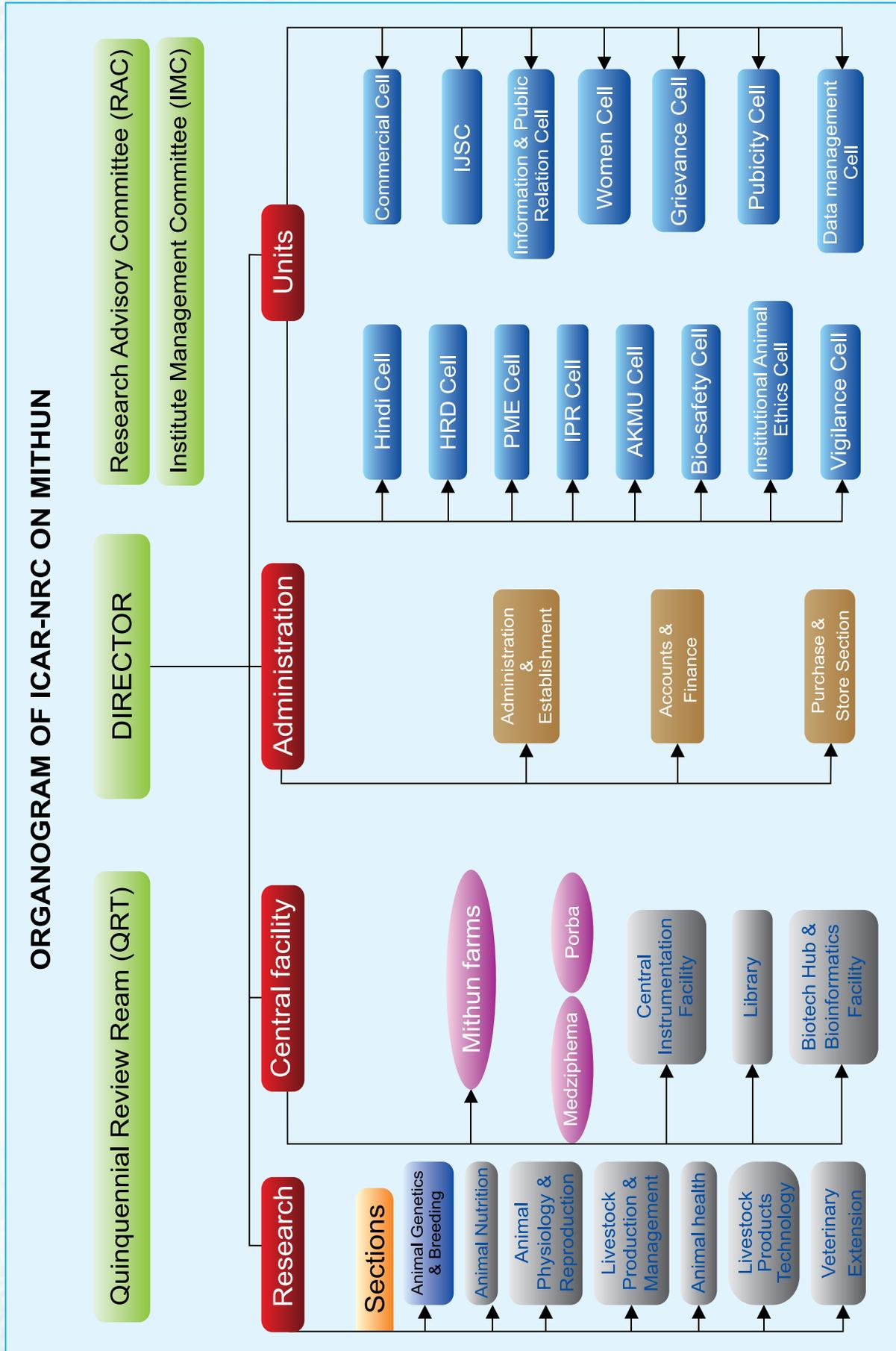
प्रजनन एवं स्वास्थ्य हेतु वैज्ञानिक प्रबंधन एवं निरूपण, आहार पद्धति तथा जैव प्रौद्योगिकी का प्रयोग एवं मिथुन पालकों के हित हेतु आर्थिक रूप से व्यवहार्य एवं संधारणीय प्रौद्योगिकी का विकास।

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.

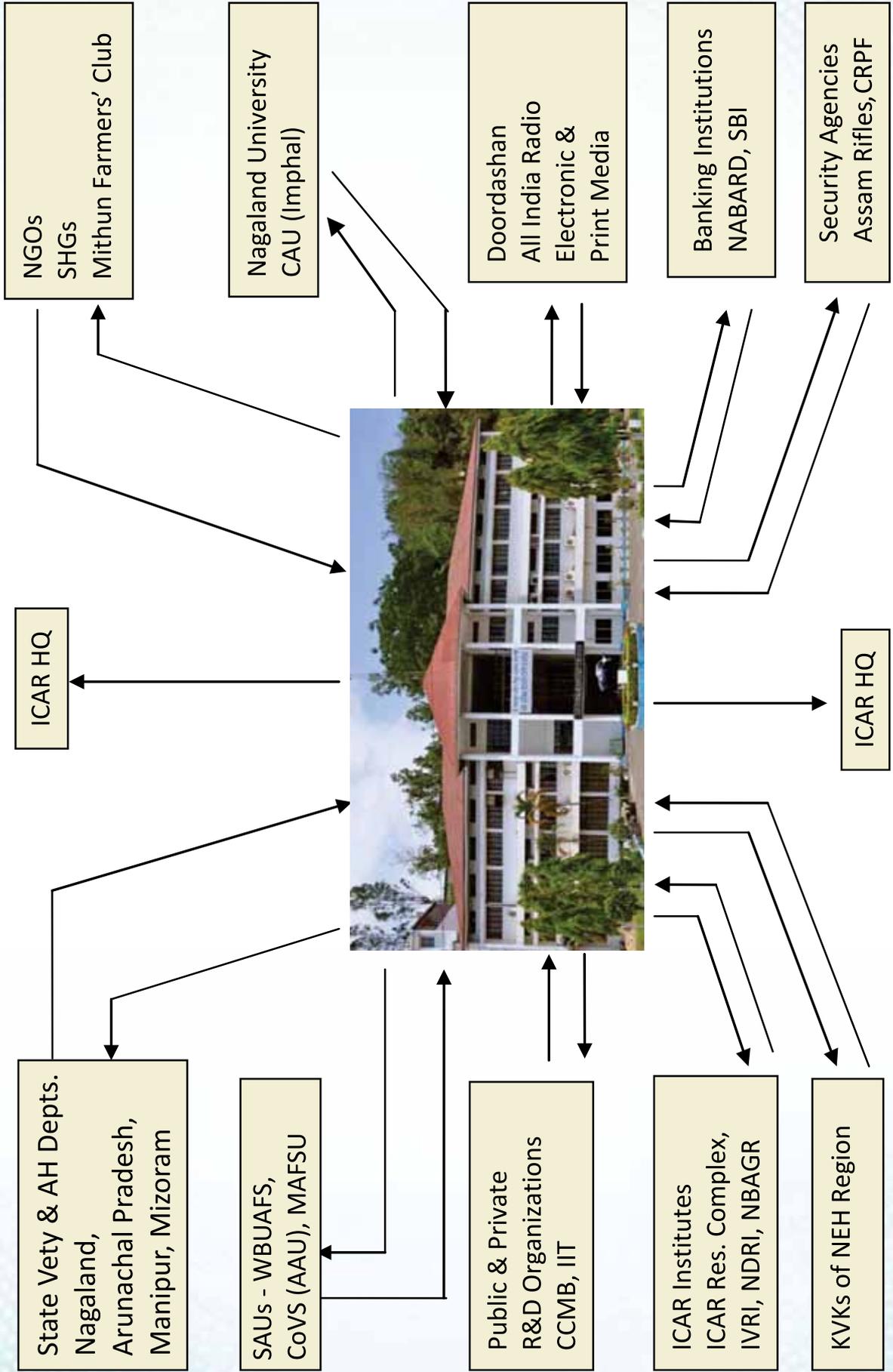
अधिदेश / MANDATE

- देश में उपलब्ध मिथुन के जननद्रव्य की पहचान, मूल्यांकन एवम गुणवर्णन करना।
- Identification, evaluation and characterization of mithun germplasm available 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





LINKAGES AND COLLABORATION



ORGANIZATINAL SETUP

STAFF POSITION AS ON 31.12.2020

S. No	Category	Sanctioned Strength	In Position	Vacant
(A)	Scientific			
	RMP	1	0	1
	Principal Scientist	2	1	1
	Senior Scientist	3	1	2
	Scientist	13	8	5
	Total	19	10	09
(B)	Technical			
	STO (T-6)	3	2	1
	Technician (T1)	2	2	0
	Total	05	04	01
(C)	Administrative			
	AO	1	0	1
	AAO	2	2	0
	AF&AO	1	1	0
	Assistant	4	1	3
	PA	1	0	1
	Stenographer Gr. III	1	1	0
	UDC	1	1	0
	LDC	4	3	1
	Total	15	09	06
	SSS	7	5	2
	Total	22	14	08
	Grand Total (A)+(B)+(C)	46	28	18

IN-CHARGE AND MEMBERS OF DIFFERENT CELL

Head of Office	Miss Aloli Rengma Sh. Th. Dipal Meitei Dr. Kobu Khate
AAO (Purchase & Stores)	Miss Aloli Rengma Sh. Th. Dipal Meitei Dr. Kobu Khate
AAO (Establishment)	Sh. Th. Dipal Meitei Miss Aloli Rengma Dr. Kobu Khate
DDO Cell	Sh. Th. Dipal Meitei Miss Aloli Rengma Dr. J.K. Chamuah



Cashier	Ms Arenla Ozukum Mrs Achuno Solo
AF & AO	Sh. Utpal Ghosh Dr. Kezhavitou Vupru
Estate I (Security and all other not included in Estate II & III)	Dr. Kezhavitou Vupru Dr. Kobu Khate
Estate II (Pump House)	Dr. Kobu Khate Dr. Kezhavitou Vupru
Estate III (Office, Campus Lawn & Garden maintenance)	Miss Aloi Rengma Sh. S Verma
Farm	Dr. Kobu Khate Dr. S.S. Hanah Dr. Laishram Sunitibala Devi
Guest House	Dr. Kobu Khate Sh. Th. Dipal Meitei
Caretaker Guest House	Sh. S Verma
Library section including CERA	Dr. Vivek Joshi Dr. Vikram R
AKMU Cell	Dr. J.K. Chamuah Dr. H. Lalzampaia
Bio-Safety Cell	Dr. H. Lalzampaia Dr. J.K. Chamuah
Data Cell	Dr. J.K. Chamuah Dr. Vikram R
Hindi Cell	Dr. Vivek Joshi Dr. Vikram R
PME Cell	Dr. S.S. Hanah Dr. Laishram Sunitibala Devi Dr. Vivek Joshi
RTI Cell	Dr. Kobu Khate Miss Aloi Rengma
Sport Cell	Dr. H. Lalzampaia Dr. S.S. Hanah
TSP activities	Sh Kamni Paia Biam Dr. S.S. Hanah Dr. Kobu Khate
Vehicle Cell I (All office vehicles including Generators)	Sh. Th. Dipal Meitei Dr. Kezhavitou Vupru
Vehicle Cell II (Tractors)	Dr. Kobu Khate Dr. Kezhavitou Vupru
HRD Nodal Officer	Dr. S.S. Hanah Dr. H. Lalzampaia
Seminar & Meeting Hall	Dr. Vikram R Sh Kamni Paia Biam
Swachh Bharat Mission	Dr. Kobu Khate
CIF Cell	Dr. H. Lalzampaia

Institute Management Committee (IMC)

Position	Name and designation
Chairman (Director, ICAR-NRC on Mithun)	Dr. M. H. Khan
Member (Representative of the State Govt. in which the Institute is located to be nominated by President, ICAR)	Dr. Budhi Lama, Director, Dept. of Veterinary & Animal Husbandry, Govt. of Nagaland, Kohima
Member (A representative of any other state govt. concerned with the research in the Institute nominated by President, ICAR)	Dr. N. D. Minto, Director, Directorate of Veterinary & Animal Husbandry, Itanagar, Nirjuli
Member (A representative of the Agricultural University under the jurisdiction nominated by the President, ICAR)	Dr. Lalnunluangi Hmar, Dean, College of Veterinary Sciences & Animal Husbandry, Central Agricultural University, Selesih
Member (Four scientists of Council's Institutes to be nominated by the DG)	Dr. Subodh Kumar, Principal Scientist, AGB Division, Indian Veterinary Research Institute, Izatnagar, U. P. Dr. D. T. Pal, Principal Scientist (Animal Nutrition) National Institute of Animal Nutrition and Physiology, Adugodi, Bangalore 560030, Karnataka. Dr. Arnab Sen, Principal Scientist & Head, ICAR, Research Complex for NEH Region, Barapani, Meghalaya. Dr. K. P. Ramesha, Principal Scientist & Head, Southern Regional Station, NDRI, Bengaluru.
Member (Two non-official person representative of Agricultural Rural interest nominated by the President, ICAR)	Dr. M. Chandemo Lotha, Dimapur. Sh. Akok Walling, Mokokchung, Nagaland.
Member (The Financial Advisor of the Council or DARE or the Account Officer of the same or another Institute)	Sh. Prabhat Kumar Nayak, AF&AO, ICAR-NRC on Pig, Guwahati, Assam.
Member Secretary (Assistant Administrative Officer)	Ms. Aloli Rengma, AAO, ICAR-NRC on Mithun, Medziphema, Nagaland.
Member ADG (AP & B), ICAR, Krishi Bhavan, New Delhi	Dr. Amrish Kumar Tyagi, ADG (ANP), ICAR, Krishi Bhavan, New Delhi

12th Research Advisory Committee (RAC)

Position	Name and Designation
Chairman (An eminent scientist from outside the ICAR system nominated by the DG, ICAR)	Dr. Surender Lal Goswami, Chairman, RAC, ZC 590, 1 st Floor CSD City, Sector-45, Karnal-132001.
Members (4-5 external experts: ex-retired scientist of ICAR representing the major areas of the research development program nominated by the DG, ICAR)	Dr. Amrish Kumar Tyagi, ADG (ANP), ICAR, Krishi Bhavan, New Delhi Dr. N. Kondaiah, Former Director, ICAR-NRC on Meat, Hyderabad. Dr. R. N. Goswami, Former Dean, College of Veterinary Sciences, AAU, Khanapara. Dr. Probodh Borah, Coordinator, BIF & Head, Dept. of Animal Biotechnology, C.V.Sc., Khanapara, Guwahati. Dr. J. R. Rao, Former Principal Scientist & Head, Hyderabad.
Member (Director of the Institute)	Dr. M. H. Khan, Director (Acting), ICAR-NRC on Mithun, Medziphema, Nagaland
Member (Two non-official persons representative Agricultural rural interest to be nominated by the President, ICAR)	Dr. M. Chandemo Lotha, Dimapur Sh. Akok Walling, Mokokchung.
Member Secretary	Dr. Nazrul Haque, Principal Scientist, ICAR-NRC on Mithun, Medziphema, Nagaland.

Institute Research Committee (IRC)

Position	Name and Designation
Chairman	Dr. M. H. Khan, Director (Acting), 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.
ADG Nominee	Dr. Amrish Kumar Tyagi, ADG (ANP), Krishi Bhavan, New Delhi
ICAR Nominee	Dr. Rajan Gupta, Principal Scientist, ICAR, Krishi Bhavan, New Delhi

Institutional Animal Ethics Committee (IAEC)

Reg. No: 267/GO/RBi/l/2000/CPCSEA

Designation in IAEC	Name of the IAEC Members
Chairman	Dr. Nazrul Haque, Principal Scientist, ICAR-NRC on Mithun, Nagaland
Main Nominee	Dr. Gunjan Das, Associate Professor, College of Vety. Sciences and AH, CAU, Jalukie, Peren District, Nagaland
Link Nominee	Dr. Amrit Sagar Dehingia, Ushapur, Moranhat, PO Moranhat, Sibsagar district, Assam
Scientist from outside of the Institute	Dr. P. Chattopadhyay, Scientist, DRDO, Tezpur, Assam
Socially aware Nominee	Mr. Lourembam Biswajeet Meitei, Thoubal, Manipur
Scientists In-charge of Animal House Facility	Dr. Kobu Khate, CTO, ICAR-NRC on Mithun, Nagaland
Veterinarian	Dr. M. H. Khan, Principal Scientist, ICAR-NRC on Mithun, Nagaland
Biological Scientists	Dr. J. K. Chamuah, Scientist, ICAR-NRC on Mithun, Nagaland
Member Secretary	Dr. Vivek Joshi, Scientist, ICAR-NRC on Mithun, Nagaland

FINANCIAL STATEMENT

(Allocation vis-à-vis Expenditure as on 01.04.2020 to 31.03.2021)

(Amount in lakhs)

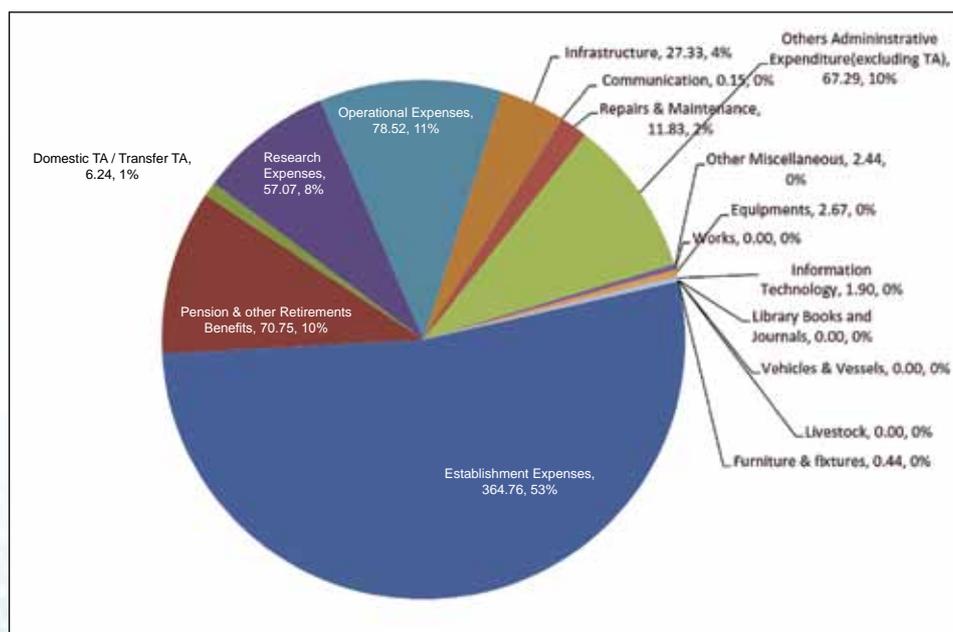
S. No	Head	Allocation	Expenditure
A	GRANT IN AID-CAPITAL		
1	Works	9.93	9.93
	Equipments	8.73	8.73
2	Information Technology	4.69	2.56
3	Library Books and Journals	0.54	0.54
	Vehicles & Vessels	0.00	0.00
4	Livestock	2.50	2.50
	Furniture & fixtures	5.60	5.44
Total- Grant in Aid Capital		31.99	29.71
B	Establishment Expenses (Salaries)		
1	Establishment Charges	393.93	393.93
2	Wages	40.02	40.02
Total - Establishment Expenses (Salaries)		433.95	433.95
C	Grant in Aid General		
1	Pension & Other Retirement Benefits	72.27	72.27
2	Traveling Allowance	6.56	6.56
3	Research Expenses & Operational Expenses		
i	A. Research Expenses	89.17	89.17
ii	B. Operational Expenses	142.68	138.54
Total- Research Expenses & Operational Expenses		231.85	227.71
4	Administrative Expenses :		
i	Infrastructure	37.07	37.07
ii	Communication	0.15	0.15
iii	Repair & Maintenance		
	i. Equipments, Vehicles & Others	2.32	2.32
	ii. Office Building	30.82	30.82
	iii. Residential Building	12.78	12.78
iv	Minor Works	1.08	1.08
v	Others (excluding TA)	97.84	97.84
Total- Administrative expenses		182.06	182.064
5	Miscellaneous Expenses		
i	HRD	0.00	0.00
ii	Publicity & Exhibitions	3.02	3.02
iii	Guest House – Maintenance	0.40	0.40
iv	Others Misc	0.11	0.11

S. No	Head	Allocation	Expenditure
	Total - Miscellaneous Expenses	3.53	3.53
	Total-Grants in Aid General	496.27	492.14
	Grand total (Capital + Establishment + General)	962.21	955.80
	Loans and Advances	0.00	0.00

Completed and Ongoing works

List of civil works initiated/completed during 2020

S. No	Name of the work	Sanctioned amount (Rs)	Ongoing/Completed
1	Construction of Experimental Shed at Medziphema Mithun Farm	25,98,800/-	Completed
2	Construction of Borewell One each at ICAR-NRC Mithun Residential Campus and Mithun Farm	34,88,595/-	Ongoing
3	Construction of Bull Shed at Medziphema Mithun Farm	34,52,400/-	Completed
4	Construction of Boundary Fencing at Medziphema Mithun Farm	1,73,70,980/-	Completed
5	Construction of Abattoir/ Slaughterhouse at Medziphema Mithun Farm	1,27,39,000/-	Ongoing
6	Construction of Instrument Lab cum Museum CIF	1,19,54,000/-	Completed
7	Construction of Black Topped Road of 2 KM, Porba	1,16,18,000/-	Ongoing
8	Construction of Semen Collection & Processing Lab with Bull Exerciser	28,95,000/-	Ongoing
9	C/o Type-II residential Qtrs (4 Nos.) at NRCM, Porba Centre	2,77,66,900/-	Ongoing
10	Land Development of Place Selected for Children Park at NRCM Medziphema	4,59,800/-	Ongoing



RESEARCH ACHIEVEMENTS

Animal Nutrition

Maize production in NEH region for sustainable livestock production

The experiment was conducted to compare growth parameters of Quality protein maize (QPM) variety HQPM 1 sweet corn variety Sugar 75. The sowing date of the same was 27.05.2020. The date of harvesting was 03.09.2020. The spacing between the plants was 25 x 60 cm for both the varieties. The plant height at maturity was 182.3±3.02 and 155.1±1.53 cm, number of leaves was 10.4±0.75 and 7.8±0.20, cobs per plant 2.4±0.24 and 1.4±0.24, cob length 17.6±0.27 and 20.0±0.45 cm, cob girth 15.6±0.41 and 17.6±0.38 cm in QPM and Sweet corn, respectively which was significantly ($P < 0.001$) different from each other. It was concluded that overall biomass production from QPM was higher than sweet corn.

Determination of energy and protein Requirements for mithun

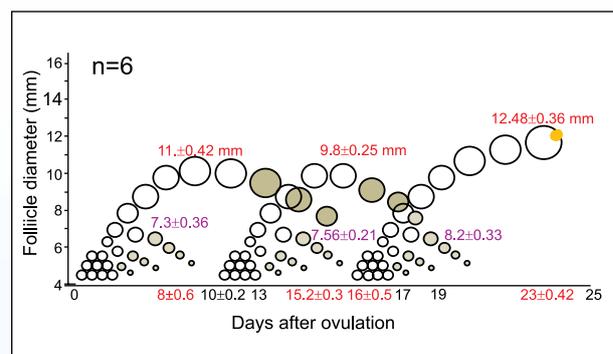
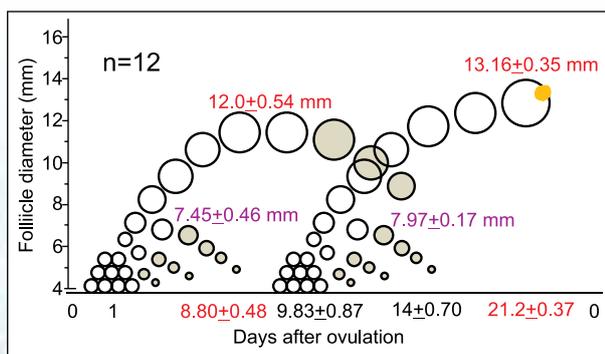
No significant difference was observed in average daily gain and feed conversion ratio, when the calves (N=9) weighing 98.8±7.50 kg were fed with rations containing crude protein 80%, and energy 100 -150% of its requirement as per NRC standard for 3 months. The average daily gain and feed conversion ratio ranged between 310.8 to 383.7 g/day (average 336.0±35.75 g/day) and 6.49 to 9.24 kg (average 8.15±0.86), respectively.

Animal Physiology and Reproduction

Follicular dynamics study in pubertal and pre-pubertal mithun

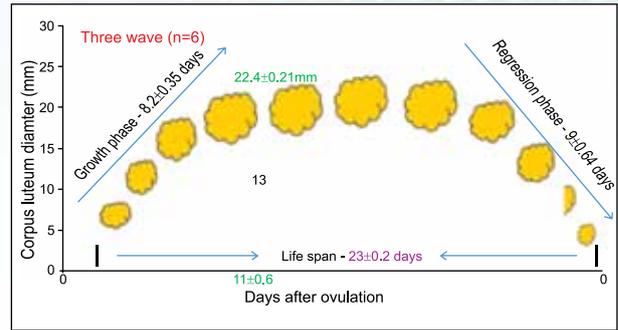
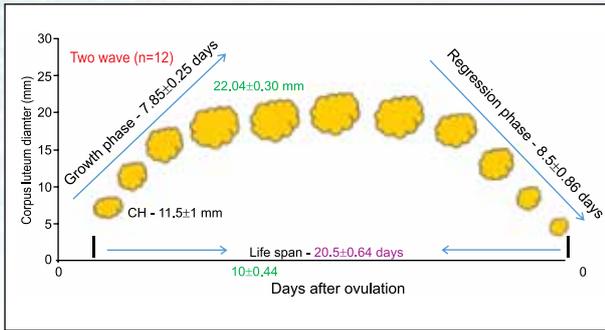
Follicular dynamics were studied in cyclic pluriparous mithun animals of age 5-6 years maintained under semi-intensive conditions (n=6; 18 Estrous cycles). The animals were synchronized using two PGF2α hormone injections (11-day interval). The estrous behavior was evaluated after 48 h of PGF2α injection. The day of ovulation was determined by the real-time B mode transrectal ultrasonography using a 7.5 MHz probe. The day when the dominant follicle disappeared and it was replaced by corpus haemorrhagicum was determined to be the day of ovulation (Day 0) for this experiment. Blood samples were collected daily using heparinized vacutainer tubes, samples were centrifuged (2000 g for 10 min) and plasma obtained was stored at -20 °C for hormonal estimation. The pre-pubertal mithun animals of age 12-14 months (n=6) were selected to study the follicular dynamics for 3 waves. The day of onset of the wave was day 0 for this experiment and plasma collected was stored at -20 °C for hormonal estimation.

In this study, the duration of estrus in mithun was found to be 61.8±3.51 h (Range - 48 h to 96 h) and estrous cycle length was of 20.40±0.40 days (Range - 19 to 21 days). The two-wave folliculogenesis cycles were prominent with an ovulatory dominant



Dynamics of ovarian follicular development during two and three-wave estrous cycles in mithun.

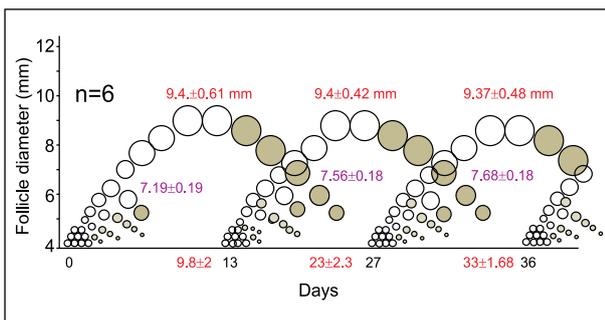
Dominant and subordinate follicles are indicated as open (viable) or shaded (atretic) circles.



Corpus luteum development during two and three three-wave estrous cycles in mithun.

follicle of 13.16 ± 0.35 mm and the corpus luteum maximum diameter of 22.4 ± 0.21 mm. The Antral follicle count >3 mm (AFC) was 11 ± 1.3 number of follicles (Range; 7-15) and 10 ± 0.84 (Range; 6-12) in first and second wave, respectively. The ovulation in Mithun occurred at 10.33 ± 0.92 h after the end of estrus with a range of 7-16 h. Therefore, the ideal time for artificial insemination (AI) should be 16-24 h after the onset of estrus in mithun.

The follicular dynamics in pre-pubertal showed a wave-like growth of follicles. The maximum diameter of the dominant follicle (3 waves) was 9.4 ± 0.61 , 9.4 ± 0.42 and 9.37 ± 0.48 mm in the first, second, and third waves, respectively. The maximum diameter of the subordinate follicle (3 waves) was 7.19 ± 0.19 , 7.56 ± 0.18 and 7.68 ± 0.18 mm in the first, second and third waves, respectively.



Dynamics of ovarian follicular development in pre-pubertal mithun. Dominant and subordinate follicles are indicated as open (viable) or shaded (atretic) circles.

Estrus detection by teaser mithun bull and artificial insemination (AI) in mithun

A teaser bull is a term describing a bull whose reproductive system has been surgically altered to render him sterile. The bull is sterilized by either vasectomy or caudal epididymectomy. Estrus

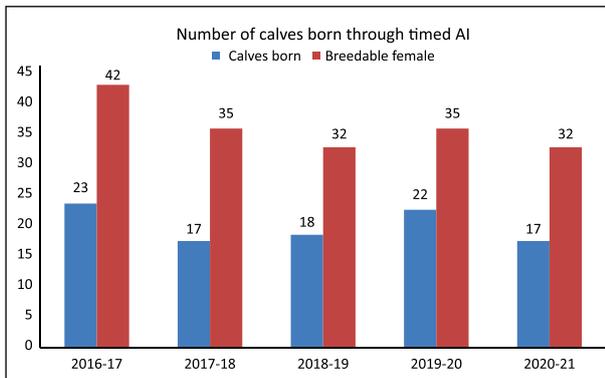
detection is often the primary problem in mithun as the prominent visual or behavioral signs are absent, however, it is an important part of the artificial insemination program. The failure in the estrus detection can result in serious economic losses to the farm. The purpose of such bulls is to aid in the detection of cows in estrus to facilitate when to artificially inseminate. Although several heat detection methods are available, some farms still prefer the use of teaser bulls. Teaser bulls often identify the cows showing transient signs of heat and their presence within as herd provides psychosexual stimulation. Even with the utilization of currently available estrus synchronization programs and timed AI, estrus detection is important as a tool to evaluate the efficacy of the protocol, to troubleshoot problems in real-time, and identify outliers that can be bred outside the prescribed 'AI window'. The most efficient estrus detector is the teaser bull, therefore, utilization of a teaser bull is the most reliable method of estrus detection in the utilization of an AI program. Artificial insemination was performed in both estrus synchronized and estrus detected naturally (non-synchronized) using the frozen-thawed mithun semen and 17 calves were born.





Estrus detection using the teaser bull at Institute mithun farm. A. Teaser bull sniffing the perineal region of female; B. Erection and attempting to mount the estrus female.

Graph 1. Number of animal estrus synchronized and teaser bull detected



Calves born through timed AI in mithun



Livestock Production and Management

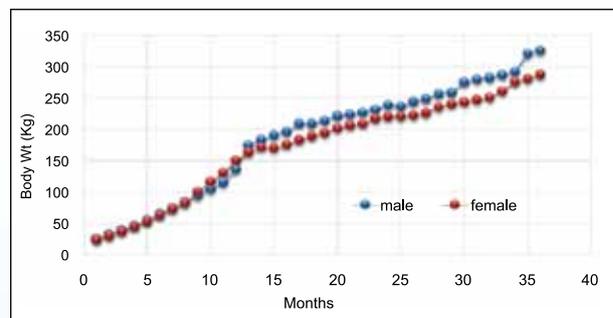
Growth performance of mithun

Mithun (*Bos frontalis*) which is also known as 'Cattle of Mountain' is an important bovine species having great potential in meat production. Genetic improvement for growth is one of the important trust areas. A project has been taken up to study the growth potential of mithun. Available retrospective data: 2010 - 2017 (seasons of calving, birth weight and parity of dam) and monthly live bodyweight of farm animals were recorded and analyzed. It is observed that maximum calving take place in the winter season (119 calves) and season has no significant effect on the birth weight of calves, however, calves born in winter and summer season found to be heavier than autumn and rainy. Similarly, seasons have no significant effect of birth weight on different sex but the trend was observed that male calves are heavier than female calves.

Effect of seasons on birth weight and sex of calves (kg)

Winter (n=119)	20.30±0.33
Spring(n=66)	19.45±0.44
Summer (n=72)	20.19±0.40
Autumn (n=48)	20.03±0.33
Male (n=139)	20.30±0.32
Female (n=156)	19.67±0.33

Monthly live bodyweight records reveal that up to 13 months of age the monthly weight gain in male and female is more or less the same, however, from 14 months onward up to 3 years male dominate in monthly body weight gain than its female counterpart.

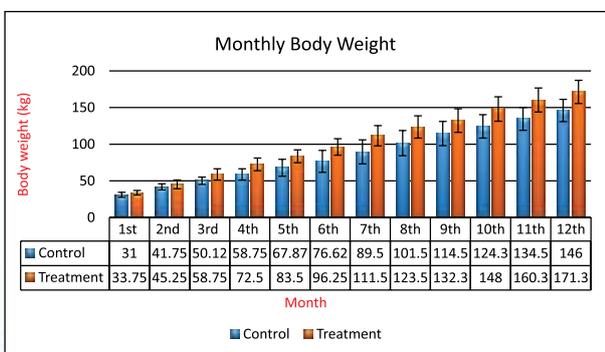


Growth potential of male mithun indicates that after 60 months (5 years) the body weight gain in male mithun is stagnant. Hence, male mithun other than the breeding bull should be culled from the farm.



Effect of early weaning on growth performance of mithun calves

A study was conducted to determine the growth performance of early-weaned calves as compared to conventional weaning practice. For the control group (conventional weaning practice), calves were allowed to suckle their dam for 30 minutes twice a day and weaned at 6 months of age. For the treatment group (early weaning practice), complete milking was done from the dam of the particular calves and were fed milk through a bottle with the provision of calf starter and weaned at 4 months of age. The monthly body weight of calves up to 12 months showed no significant difference between control and treatment groups. This indicates that the provision of calf starter along with milk to calf has a beneficial effect on its growth performance.

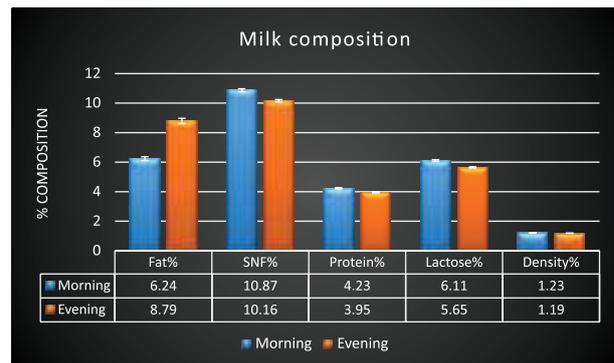


Monthly body weight of mithun calf up to one year of age

Mithun milk profile

A total of 10 semi-intensively reared mithun cows were included to study the nutritional value of mithun milk. Oleic acid and lysine were significantly

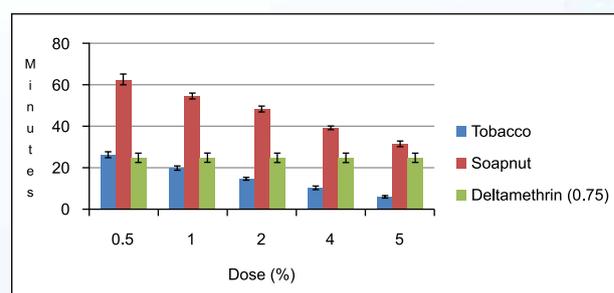
higher as compared to the cattle milk. Likewise, fat soluble vitamins viz. vitamin A, D, E and minerals such as calcium, phosphorus and magnesium were found to be higher in mithun milk when compared with cattle milk. Furthermore, the mean values of SNF, protein, lactose and density were significantly higher during morning milking except fat percent which was significantly higher during evening milking.



Animal Health

Efficacy of ethanolic extract of selected herbs against aquatic leech

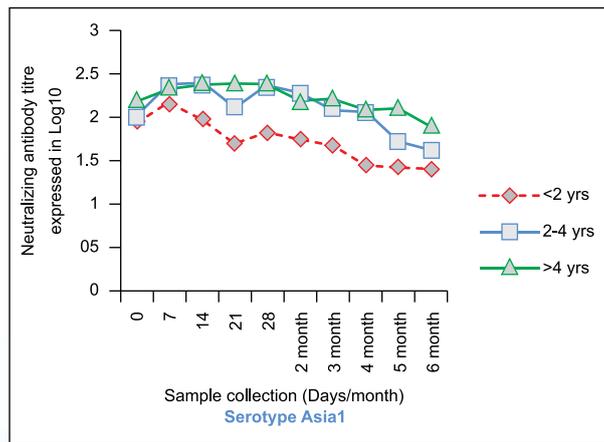
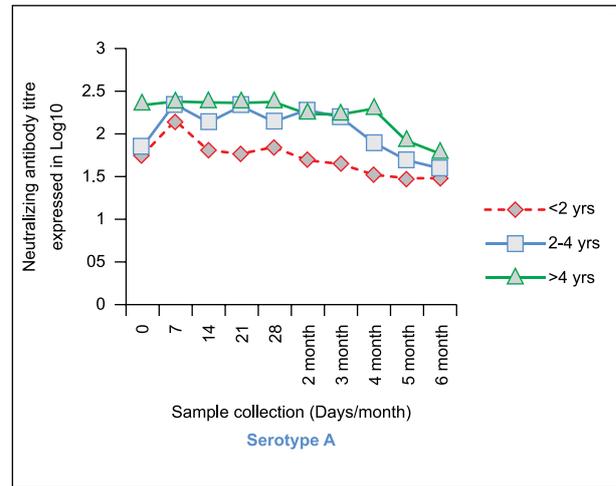
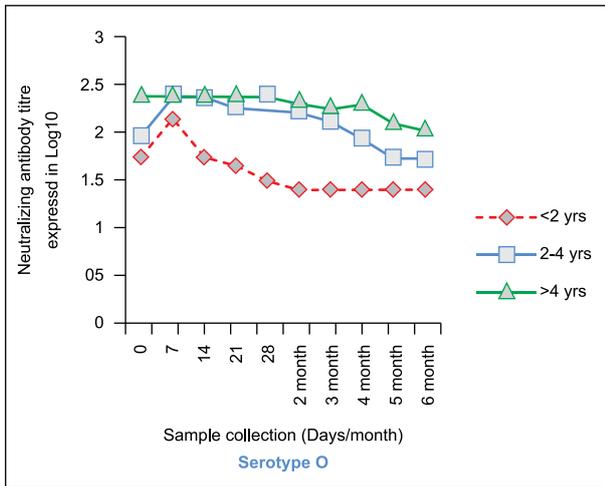
In vitro trials were undertaken to find out the efficacy of the ethanolic extract of some medicinal plants against the aquatic leech infestation. The ethanolic extracts of Tulsi (*Ocimum sanctum*), Garlic (*Allium sativum*), Ginger (*Zingiber officinale*), Neem (*Azadirachta indica*), Tobacco (*Nicotiana glauca*), and Soapnut (*Sapindus species*) were employed at different concentrations (0.5 %, 1.0 %, 2.0 %, 4.0 %, 5 %) while deltamethrin (0.75 %) served as control drug. At 5 % concentration, ethanolic extract of tobacco (6.0 ± 0.40 min) exhibited the highest efficacy against aquatic leech followed by soapnut (31.5 ± 1.32 min) in terms of average killing time, while the killing time in the control group was 24.75 ± 2.17 min. Other plant extracts were found to be ineffective.



Immune response profile of FMDV vaccinated farm mithun

Maternal antibody was estimated in mithun calves and it was found that out of 6 calves, 2 were born unprotected against FMDV serotypes. Duration of maternal antibody lasted about 2 months (50%). By 3 months, only one animal is protected against all the serotypes, all other animals showed antibody titre lower than 1.5 Log₁₀. The studies on the duration of protective antibody titre in FMDV vaccinated mithun showed same trend of antibody production irrespective of the age group. Antibody titer peaks at 7 to 14 days after vaccination and is maintained till 2 to 3 months then gradually decreased. In general, the protective antibody level

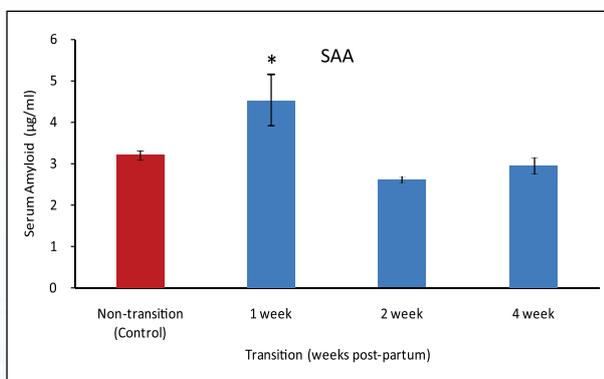
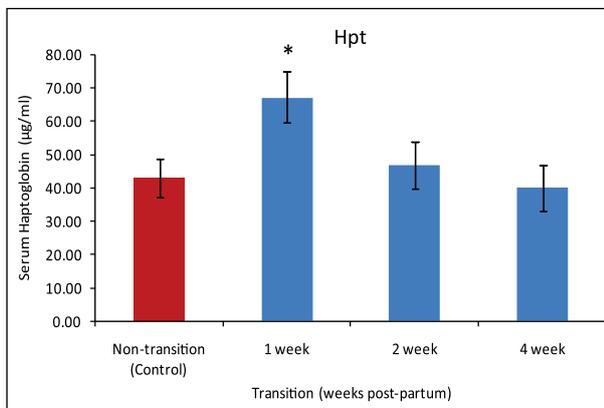
is maintained up to 4 to 5 months only. Further, it was found that the level of antibody production is comparatively lower in animals less than 2 years old as compared to the older group. The level of IFN γ was estimated from the whole blood using the commercially available kit. IFN γ production peaks at 7th day after vaccination and gradually decreased. Animals of >4yrs of age showed a significantly higher level of IFN γ at 7th and 14th days. Overall, IFN γ production is lowest in calves of <2 yrs of age. By 60 days post-vaccination, the level of IFN γ is still comparatively higher in animals of >4 yrs of age (5.5 ng/ml) as compared to the younger groups (2 ng/ml). Compared to cattle calves, IFN γ production is comparatively higher in mithun calves.



Antibody production profile against FMDV in farmed mithun

Epidemiology of subclinical metabolic diseases in mithun

A cut-off point of 0.26 mmol/L for non-esterified fatty acids & 1.09 mmol/L for beta-hydroxybutyric acid can be used for diagnosis of negative energy balance & subclinical ketosis (SCK) in mithun. The overall prevalence of SCK in mithun cows was 18%. A significant ($P < 0.05$) increase in liver SGOT activity and significant ($P < 0.05$) decline in serum triglycerides & total cholesterol was recorded in mithun cows with SCK. In transitioning mithun, SCK may be closely associated with inflammation as suggested by increased circulating levels of haptoglobin (Hpt) and serum amyloid A (SAA). An optimal cut-off value of serum calcium for diagnosis of subclinical hypocalcaemia (SHC) in mithun cows was 2.07 mmol/L and the prevalence of SHC was 21%. There was no prevalence of sub-acute ruminal acidosis as mean pH values of rumen fluid (6.53 ± 0.11), blood (7.49 ± 0.04) and urine (8.01 ± 0.06) were lying within the normal ranges at 1, 2, 4, 6 weeks post-partum.



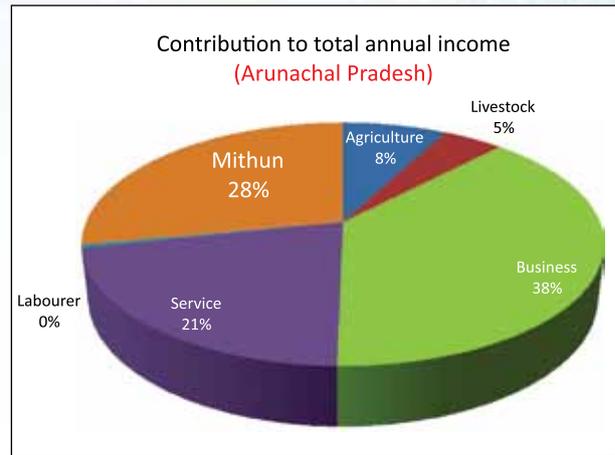
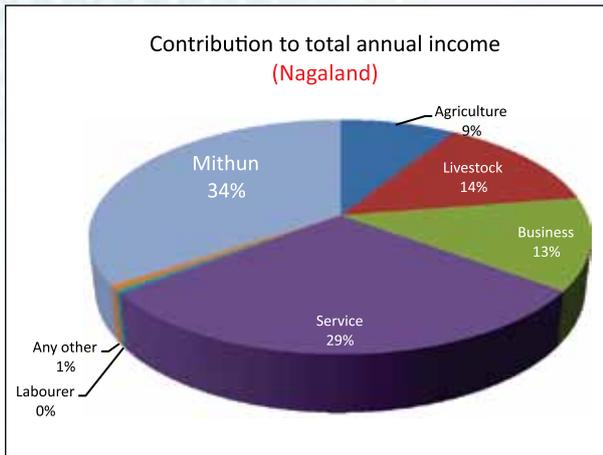
Effect of subclinical ketosis on circulating acute phase proteins

For diuresis, unlike other bovine species, mithun is refractory to the perineal massage method and per rectal stimulation of the urinary bladder. Furosemide forced diuresis, a non-invasive method to collect sterile urine, was standardized and validated in mithun. Low-dose furosemide (0.5 mg/kg, slow IV) was found to be effective in induction of mithun diuresis and the average time to first voiding after furosemide forced diuresis was 7.67 ± 1.20 minutes.

Extension

Socio-economic evaluation of mithun rearing

The research study was systematic documentation of the role of mithun in the livelihood security of the mithun farmers and the socio-economic value of mithun from the point of view of the mithun farmers based on the contingent valuation scenario. The study conducted in three districts each of Nagaland and Arunachal Pradesh (AP) revealed that more than 80.15 percent of the mithun farmers in Nagaland ($n=126$) and 98.89 percent in AP ($n=180$) rear mithun to ensure their livelihood security. Due to its inherent socio-cultural and economic dynamism plays a multidimensional role in the mithun rearing society. Mithun farming contributes 35 percent and 28 percent to the total annual income of the farmers in Nagaland and AP, respectively. Income from mithun farming is significantly correlated to the total annual income of the mithun farmers ($r=0.463$ for Nagaland and $r=0.22$ at $P \leq 0.01$ for AP). High inputs price for fencing the jungles and predator attack on young calves are the major constraints in mithun rearing. In Nagaland and AP, the socio-economic and cultural value of mithun has significantly declined from the point of view of the farmers and is reared primarily for sale, only 1.64 percent difference between the perceived value of existing mithun owned and perceived value under contingent scenario and 7.13% difference was observed in Arunachal Pradesh (i.e. Government bans movement/sale of mithun as a result of which you lose control over the trade of the animal and its role in culture as bridal payment, festival offerings, etc.) was observed.



TRANSFER OF TECHNOLOGY

EXTENSION ACTIVITIES

Under Tribal Sub-Plan (TSP), a total of 07 programs were organized in all the four mithun rearing states viz. Arunachal Pradesh, Manipur, Mizoram and Nagaland. The various programs organized includes mithun *mela* cum technology injection program, establishment of semi-intensive mithun rearing units, animal health cum vaccination camp, exposure visits, training, workshops and piglet distribution for doubling farmers' income. A total of 2077 farmers were benefitted.

Mithun Mela cum Technology Injection Programme

ICAR-NRC on Mithun has made inroads in creating awareness among the farmers about the need to conserve and preserve mithuns

by organizing Mithun melas and Technology Awareness programmes. During the melas, the technologies developed by the Institute were showcased and several competitions were organized to judge the best mithun bulls, cows and heifers and to create awareness about the conservation of good germplasm by preventing the slaughter of elite mithuns. A total of four mithun melas were organized benefiting 1671 farmers.

1. Mithun Mela at Leng village, Serchhip, Mizoram

On 5th March 2020, a mithun mela was organized at Leng village Serchhip district, Mizoram. The mela was organized by ICAR-NRC on Mithun in collaboration with Dept. of Animal Husbandry and Veterinary, Govt. of Mizoram.

S. No.	Programmes	Date	Village/District/State	Total Beneficiaries
1	Mithun <i>mela</i> cum Technology Injection Programme	05.03.2020	Leng, Serchhip, Mizoram	657
		04.03.2020	Konsakhul, Kangpokpi, Manipur	98
		19.02.2020	Tening, Peren, Nagaland	552
		14.02.2020	Mawai, Kamjong, Manipur	364
2	Establishment of semi-intensive mithun rearing units	05.03.2020	Haipi, Kangpokpi, Manipur	150
3	Animal Health cum Vaccination camp	05.03.2020	Leng, Serchhip, Mizoram	36
		19.02.2020	Tening, Peren, Nagaland	48
		14.02.2020	Mawai, Kamjong, Manipur	35
4	Exposure visits	24.01.2020	Jalukie, Peren, Nagaland	15
5	Training on scientific Pig and Poultry Husbandry	14 th to 16 th October 2020	Dimapur, Nagaland	28
6	Workshops			
	Review meeting workshop of the semi-intensive mithun rearing units established under TSP	6 th to 7 th February 2020	Mithun Farmers from Arunachal Pradesh, Manipur and Nagaland	60
	Virtual interface workshop on promotion and branding of mithun	22.06.2020	KVKs of ATARI Zone VI and VII	42
7	Piglet distribution for doubling farmers income	5.02.2020	Dimapur, Phek and Kohima, Nagaland	34

Chief Guest of the *mela*, Dr. Hmarkunga, Director, AH & Vety. Department Mizoram highlighted the importance of mithun rearing in the state like Mizoram where there is very limited agricultural land. Mithun rearing can serve as an alternative source of livelihood generation for the farmers of the state. A total of 35 mithuns were vaccinated against HS and BQ. A mithun competition to adjudge the best mithun based on different categories was also organized. A Farmers-Scientist interaction was also conducted wherein officials of the state department and scientists from ICAR addressed the problems faced by the mithun farmers. In addition, the mithun farmers were also handed over with salt, mineral mixture, anthelmintic and other medicines for the health and welfare of the mithuns. Prizes to the winners from various categories were also distributed. The program was attended by more than 657 farmers from 11 villages of the Serchhip district.



2. Mithun Mela at Konsakhul village, Kangpokpi, Manipur

A one-day Technology Injection Programme was organized at Konsakhul village, Kangpokpi district on 4th March 2020 in collaboration with Krishi Vigyan Kendra, Senapati district of Manipur. During the program mineral mixtures and

medicines were distributed to farmers for the health and welfare of the mithuns. A total of 98 farmers from the Konsakhul and Haipi village of Kangpokpi district participated in the program.

3. Mithun Mela at Tening village, Peren, Nagaland

On 19th February 2020, a one-day “Mithun Mela-cum-Technology-Injection Programme” was organized at Tening Village of Peren district. Animal Health cum Vaccination Camp was organized for the Mithun farmers of Tening and Nzau Village. A total of 48 mithuns were vaccinated against FMD. Medicines were distributed for the health and welfare of the mithuns. A Farmers-scientist Interaction was also organized to address the problems faced by the mithun farmers. A mithun competition was held wherein farmers are awarded for bringing the best mithun under different categories. Shri. Rhosietho Ngouri, ADC, Tening graced the occasion as Special Guest and Prof. Capt. G. D. J. Rao, Dean, College of Veterinary Science and Animal Husbandry as Guest of Honour. The Mela was attended by 552 farmers from Tening, New Nzau, Nzau, Nsong, Ngualand, and Bamsiakalo Villages.



Establishment of semi-intensive mithun rearing units

Mithun is traditionally being reared under a free-range forest ecosystem wherein the animals are let loose in the community forest without providing shelter and any supplementary feeding except occasional salt. Animals are looked after by one or two herdsmen. Since the animals are exposed to harsh weather conditions and wild carnivores; a lot of mortality has been reported in mithun due to diseases and particularly due to attacks from wild carnivores to the newborn calves. During winters, due to the scarcity of trees leaves and grasses in the forest, trespassing of mithun into agricultural land is reported which is the main cause of conflict between mithun owners and agriculture farmers. Some of the villagers have even stopped rearing of mithun due to this conflict. Moreover, decreasing forest coverage is also a concern for the conservation and propagation of mithun in the region. Considering these drawbacks, the Institute has developed an alternative package of practices of mithun rearing under a semi-intensive rearing system and has disseminated the technology to various villages.

4. Mithun mela at Mawai village, Kamjong, Manipur

The mela was organized in collaboration with ICAR-KVK Ukhrul at Mawai village of Kamjong district Manipur on the 14th February 2020. The objective was to create awareness of the scientific mithun rearing system and to enhance the productivity of mithun by using the technologies developed by the Institute. The program was graced by Dr. Narendra Prakash, Former Director ICAR-RCNEH region Barapani as Chief Guest. Veterinary medicines were also distributed to the farmers. A farmer-scientist interaction and mithun competition were also organized. A total of 364 farmers from 7 villages attended the *mela* and 35 mithun were vaccinated against, FMD, BQ and HS.



Haipi, Kangpokpi, Manipur

On the 5th March 2020, a semi-intensive unit was established at Haipi village, Kangpokpi district





Mawai village, Manipur

of Manipur. Inputs like barbed wire for fencing approximately five kilometers of the forest area, CGI sheet for the construction of low-cost mithun shed, gumboots and raincoats for the mithun herdsman were distributed to the Haipi Mithun Society.

the mithun *melas* conducted in Mizoram, Manipur and Nagaland. The mithuns were vaccinated against Foot and Mouth Disease (FMD), Haemorrhagic Septicemia (HS) and Black Quarter (BQ). A total of 119 mithun were vaccinated during the camps.

Animal Health cum Vaccination camp

Mithun are reared under a free-range ecosystem, as a result, most mithun are never vaccinated making them susceptible to transboundary diseases. Three vaccination camps were conducted during

Exposure visits

On the 24th January 2020, 15 farmers from Jalukie, Peren District Nagaland visited the Institute to witness the semi-intensive mithun rearing units at the Institute farm. The exposure visit was a joint collaboration with KVK-Peren District. During the visit, a farmer-scientist interaction was also organized and hands-on training on restraining mithun was demonstrated.



Leng village, Mizoram



Tening village, Nagaland

Training on scientific Pig and Poultry Husbandry

A three days hands-on training on “Scientific Pig and Poultry Husbandry” was organized from the 14-16th October 2020. The training was organized in collaboration with ICAR-Regional Complex for North Eastern Hill Region, Nagaland Centre. As part of the training, an exposure visit to the Institute



mithun farm was also organized for the participants to educate and familiarize them with semi-intensive mithun farming. A total of 28 beneficiaries who had received piglet and poultry under the TSP scheme for doubling farmer's income from Medziphema village, Medziphema town, Jharnapani, Kukidulong and New Socunoma villages of Dimapur district, Nagaland participated in the training.

Workshops Organized

1. REVIEW MEETING WORKSHOP OF THE SEMI-INTENSIVE MITHUN REARING UNITS ESTABLISHED UNDER TSP

On the 6-7th February 2020, a meeting was conducted to review all the semi-intensive mithun rearing units established under TSP. The representative mithun farmers of all the beneficiary villages across the mithun rearing state of the North Eastern Hilly region were invited. Altogether a total of 60 farmers from 20 villages of three North-Eastern states viz. Arunachal Pradesh, Manipur, and Nagaland attended the program. During the meeting, each village representative has given feedback on the difficulties of free-range system and



the benefits of adopting a semi-intensive rearing system.

Excerpts from the beneficiaries of the of Semi-Intensive mithun rearing model

- It helped in better monitoring and supervisions of the mithun
 - Increased adult body weight and size
 - An increase in the mithun population was recorded in areas where mithun bull was provided by the Institute viz Punglwa and Gidemi village in Nagaland
 - Resting sheds for the mithun with provisions for water and a common salt licking block has helped the farmers in reaching out to a larger number of mithuns at a common area without having to venture deep into the jungles
 - Better sheds/huts for the herdsman to rest and monitor the mithun
 - Demarcation of the mithun rearing areas from the agriculture fields
 - Decrease in mithun-human conflict, because of fencing and ear tags issued for the mithuns
 - Easier handling and restraining of the mithun during vaccination with the help of the travis provided
 - In Yangkhullen village of Manipur, the fencing inputs distributed has brought a decrease in the number of mithun mortality rate due to falling off the steep hills. The society reported no mortality for the year 2019-20
2. VIRTUAL INTERFACE WORKSHOP ON PROMOTION AND BRANDING OF MITHUN



On 22nd June 2020 a one-day virtual interface workshop on “Promoting and Branding Mithun” was organized in collaboration with the Krishi Vigyan Kendras (KVKs) of the Agricultural Technology Application Research Institute (ATARI) of Zone VI and VII. The workshop was organized to promote scientific mithun husbandry as an entrepreneurial activity to economically uplift the tribal population through the integration of scientific mithun husbandry and its diversified use in terms of value addition of mithun meat, milk, draught-power and hide through the intervention from KVKs. A brief presentation was made by the Scientists of the Institute highlighting the various technologies and packages of practices of the Institute namely Semi-Intensive System of Rearing Mithun, Mineral Blocks, Areas Specific Mineral Mixture (µthimin), portable Mineral Block Dispenser, Fixed Time AI (FTAI), milking in mithun and its value addition. Dr. Bidyut C. Deka, Director, ICAR-ATARI Zone VII, and Dr. Anil. K. Tripathi, Director, ICAR-ATARI Zone VI, Dr. Bhupendra Nath Tripathi, Deputy Director General (Animal Science), ICAR, Dr. Ashok Kumar Singh, Deputy Director General (Agricultural Extension), ICAR and several experts of national repute namely, Prof. N. S. R. Sastry, Former Head, Animal Production and Management, HAU, Hissar, Prof. Subhrasnu Pan, Former Head, APM, WBUVFS, Dr. R. K. Singh, Director and Vice-Chancellor, ICAR-IVRI, Izatnagar, Dr. Amrish K. Tyagi, ADG (AN&P), Dr. Vineet Bhasin, PS (AG&B), Dr. S. Vaithyanathan, Director, ICAR-



NRC on Meat, Dr. Raghvendar Singh, Director, ICAR-CSWRI, 26 KVKs from Arunachal Pradesh, Manipur, Mizoram and Nagaland, Directors of ICAR Institutes, scientific faculty, and staffs of ICAR-NRC on Mithun, Nagaland actively participated online in the workshop.

Piglet distribution for doubling farmers' income

As a part of the Institute initiative to support the farmers in improving their livelihood and doubling their income, 30 piglets were distributed to farmers from three districts of Nagaland on the 5th February 2020. Piglets were distributed to 34 beneficiaries from Seithekema, Nutun Bosti and Chumukedima villages from Dimapur district, Phisachodii village from Phek District and one Self Help Group (Lieviisenomia Union) of Khonoma village from Kohima District.



2. CREATED AWARENESSES ABOUT DIFFERENT SCHEMES AND ACTIVITIES OF Government of India:
 - Compulsory guidelines and activities allowed during the LOCKDOWN 2.0 issued by the Government of India have been widely circulated.
 - Downloading and use of the *Arogya Setu App* by providing already generated links to this app via WhatsApp.
 - Use of the Kisan Rath Mobile App for the facilitation of inter-state and inter-district movement of perishable crops
 - Kisan Call Centre numbers 18001804200 and 14488.
3. Communicated to the respective Commissioner and Secretary as well as the Directors of the Department of Veterinary and Animal Husbandry of Arunachal Pradesh, Mizoram, Manipur, and Nagaland requesting their

intervention for issuing suitable instructions to the mithun rearing districts/village authorities to allow the mithun farmers for fencing work and other activities

ACHIEVEMENTS OF KRISHI VIGYAN KENDRA, PHEK

Krishi Vigyan Kendra, Phek was established in Porba village by the Indian Council of Agricultural Research (ICAR) under the aegis of ICAR-NRC on Mithun, Medziphema, Nagaland in 2003 to boost the farmers of Phek district with latest technological knowledge in order to increase the production and to achieve sustainability. Krishi Vigyan Kendra Phek imparts trainings, conducts On Farm Trials, Frontline demonstrations on proven technologies in order to disseminate at grass root level and also organizes various extension activities. The activities carried out during January 2020 till December 2020 is given below.

Training and extension activities

Training programmes				
Number of Courses			Number of Participants	
Clientele	Targets	Achievement	Targets	Achievement
Farmers	33	52	855	952
Rural youth	12	16	405	331
Extension Functionaries	5	5	65	131
Total	50	73	1325	1414

Extension Activities			
Number of Activities		Number of Participants	
Targets	Achievement	Targets	Achievement
159	250	1190	3614

Vocational training programmes

Date	Training title	Participants		
		Male	Female	Total
19 to 22 Feb. 2020	Scientific rearing and management of poultry	-	11	11
21 to 25 Feb. 2020	Post harvest management and value added product in soybean	4	9	13
28 Sept to 1 Oct 2020	Composting technologies	5	17	22
18 to 21 Nov 2020	Post harvest processing of important fruits and vegetables	4	6	10
19 to 22 Dec. 2020	Crop intensification	4	9	13
TOTAL		17	52	69

Sponsored training and Exposure programs

Date (From- To)	Duration (days)	Title of training	No. of Participants			Sponsoring Agency
			M	F	T	
16-03-2020 to 21-03-2020	6	Organic production of fruits and vegetables	20	8	28	MANAGE, Hyderabad
01-12-2020 to 04-12-2020	4	In artificial insemination in pigs	18	2	20	NABARD

On-Farm trials (OFT) and Frontline demonstrations (FLD) conducted during 2020

Discipline	On-Farm Trials			Frontline Demonstrations		
	Crop / Enterprise	No. of technology	No of trials	Crop / Enterprise	No. of technology	No of demonstration
Agronomy	Paddy	1	4	Maize	1	10
	Maize + Beans cropping system	1	4	Field pea	1	10
				Potato	1	10
Horticulture	Pakchoi	1	3	French bean var. Arka Arjun	1	10
	Dolichos bean	1	5	Onion var. AFDR	1	10
Soil Science	Turmeric	1	4	Broccoli	1	10
	Cabbage	1	4	Low cost water harvesting	1	5
				Low cost vermicomposting	1	10
Animal Science	Poultry	1	10	Piggery	1	5
Total		7	34		9	80

Under NICRA project at Thipuzumi, K. Basa, Kikruma and Phusachodu village, 17 training cum demonstration on agriculture and allied activities was conducted with a total of 239 participants

'Mera Gaon Mera Gaurav' a farmer-oriented program initiated by GOI under which three training programs on soil fertility management, the importance of cropping system, rabi crop production, conservation agriculture, soil moisture conservation and package and practices of field pea was conducted in Phusachodu, Chesezu, Rihuba, Yoruba and Porba with a total of 56 participants.

Under Paramparagat Krishi Vikas Yojana, 4 nos. of training on organic farming and kiwi cultivation was conducted at Porba village benefiting 98 farmers. Under NARI program, posha abhiyan was conducted and seeds were distributed to 65 participants and 3 numbers of training were

conducted benefiting 60 farm women of different villages.

Ninety one numbers of mobile advisory services through ICT tools were sent benefiting 2124 farmers on agriculture and allied sectors.

AGRONOMY

Under Agronomy division, two on-farm trials were conducted on a modified system of rice intensification for higher productivity and maize + beans based intercropping covering 8 farmers and the trials were taken in June and March respectively. Under FLD program, three demonstrations were conducted on the popularization of QPM var. HQPM1, popularization of Potato var. Kufri Girdhari and field pea var. Aman covering 30 farmers and demonstration were conducted in March and November respectively.



OFT on modified system of rice intensification for higher productivity



OFT on maize + beans intercropping system



FLD on popularization of potato var. Kufri Girdhari



FLD on popularization of QPM var. HQPM1



FLD on field pea var. Aman

HORTICULTURE

Under the Horticulture division, two on-farm trials on the performance of Pakchoi and Dolichos bean Var. Arka Jay was conducted benefitting 8 farmers in March and September respectively. Under FLD program two demonstrations on the

popularization of French bean variety Arka Arjun and nutritional garden were demonstrated at farmer's field during August and June benefitting 30 farmers.



OFT on performance of Pakchoi



OFT on Performance of Dolichos bean var. Arka Jay



FLD on popularization of french bean var. Arka Arjun



Demonstration on nutritional gardening

SOIL SCIENCE

Under the Soil Science division, two on-farm trials were conducted to assess the organic management in turmeric var-Megha Turmeric-1 and cabbage-Rare ball benefitting 8 farmers in May and August, respectively. Three numbers of demonstrations were conducted under FLD program

viz. promotion of vermicompost application in broccoli Var Green Magic, popularization of low-cost vermicomposting technology and low-cost water harvesting. The demonstrations covered 25 farmers and were conducted during August, September and November.



OFT on organic management in turmeric var. Megha Turmeric-1 at Yoruba village



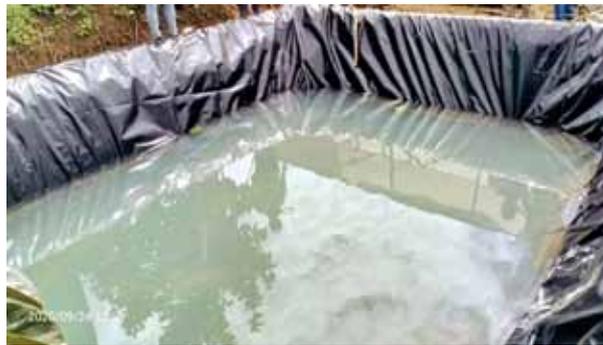
OFT on organic management in cabbage var. Rare ball



FLD on vermicompost application in broccoli var. Green magic



FLD on low cost HDPE vermicomposting



FLD on low cost water harvesting

ANIMAL SCIENCE

Under the Animal Science division, on-farm trials on the performance of CARI Uttam Quail and front line demonstration on popularization of AI technology in pig following synchronization were conducted.



OFT on performance of CARI uttam quail



FLD on popularization of AI technology in pig following synchronization

KVK Phleg is also engaged in analysis of soil and water sample of farmers from different villages and the distribution of soil health cards.

Soil and Water Sample Analysis/Soil Health Cards (SHCs)

S. No.	Samples tested/ Analysed	Sample (No.)	Farmer beneficiaries	Village covered
1	Soil sample	200	250	3
2	Water sample	2	2	2

EXTENSION ACTIVITIES AND CELEBRATION OF IMPORTANT DAYS

S. No.	Extension Activities	Programs Conducted	Beneficiaries
1	Diagnostic visit	63	153
2	Scientists' visit to farmers' field	72	206
3	Advisory services/ telephone talk	49	1355
4	Celebration of Important days	12	875
5	Newspaper Article/coverage	17	-
6	Exposure tour	1	20
7	Field day	46	58
8	Method demonstration	23	332
9	Film show	2	37
10	Soil Health Camp	1	25
11	Animal Health camp	3	172
12	Farmers Scientist Interaction/Kisan Mela	11	224
13	Lecture delivered	2	35
14	Web Casting programmes	2	37
15	World Soil Day	1	59
16	Awareness on Farm Bill Act 2020	7	159
17	Webinar organized on Farm Bill Act 2020	1	20
	Total	313	3767



Training cum demonstration on vermicomposting for Assam Rifle Personnel at Phek



International Women's Day 2020 at Pftusero



Skill training on organic production of fruits and vegetable at Porba village



Distribution of vegetable seeds for nutritional garden under NARI



Distribution of planting materials during World Environment Day



Sensitization programme for bankers under NABARD Phek



Virtual XVth SAC Meeting conducted in KVK Phek



Celebration of *Poshan Maah*



Celebration of World Soil Day



Launching on KSHAMTA programme



Celebration of *Swachhata Pakhwada*



Conducted Webinar on Farm Bill Act 2020

ONGOING RESEARCH PROJECTS

Project Title	PI	Date of Start	Date of Completion
AICRP/Network project			
All India co-ordinated research project on FMD.	Dr. H. Lalzampaia	July 2014	June 2021
Collaborative programme on Maize production in NEH region for sustainable livestock production (ICAR Network project)	Dr. Nazrul Haque	Dec. 2018	Nov. 2022
Externally funded project			
National mission on sustainable Himalayan ecosystem (NMSHE)	Dr. Nazrul Haque	May 2015	March 2020
Institute project			
Genetic improvement of growth performance of mithun (<i>Bos frontalis</i>)	Dr. S.S. Hanah	May 2017	April 2020
Ovarian follicular dynamics and hormonal profile in pre-pubertal and pubertal mithun	Dr. Vikram R.	June 2019	December 2020
Socio-economic evaluation of mithun rearing	K. P. Biam	June 2019	May 2020
Clinico-epidemiological study of major subclinical metabolic diseases of transition mithun	Dr. Vivek Joshi	June 2019	August 2020
Developing weaning strategies in mithun (<i>Bos frontalis</i>)	Dr. L. Sunitibala Devi	June 2019	March 2021
Immune response profile of FMD vaccinated farm mithun	Dr. H. Lalzampaia	June 2019	March 2021
Determination of energy and protein requirement in mithun	Dr. Nazrul Haque	Sept. 2020	August 2022
Seasonal variation in carrying capacity of forest for rearing mithun in Nagaland	Dr. Sapunii S Hanah	Sept. 2020	Dec. 2022
Vitrification of mithun semen and sperm ultra-structural changes post-thawing	Dr. M. H. Khan	Sept. 2020	June 2022
Molecular screening of tick vector and host mithun (<i>Bos frontalis</i>) for haemoparasites in the states of Nagaland and Arunachal Pradesh	Dr. J. K. Chamuah	Sept. 2020	March 2023
Development of mithun body condition scoring system (MBCSS) and its validation by ultrasonography	Dr. Vivek Joshi	Sept. 2020	August 2021
Assessment of draughtability of mithun	Dr. L. Sunitibala Devi	Jan. 2021	Dec. 2022
Assessment and documentation of the existing mithun rearing practices under free-range system on North-Eastern India	Kamni Paia Biam	Jan. 2021	Dec. 2022
Inter-Institutional Project			
Testing and validation of pregnancy diagnosis kit, pregD in mithun (Inter-institutional project with ICAR-CIRB)	ICAR-NRC on Mithun PI –Dr. Vikram. R ICAR-CIRB PI –Dr. Ashok K. Balhara	Sept. 2020	August 2021

AWARDS AND RECOGNITION

- M. H. Khan was conferred the 'Achiever Award 2020' by the *Society for Advancement of Human and Nature (SADHNA)*.
- Vivek Joshi was conferred the 'Young Achiever Award 2020' by the *Institute of Scholars, Bangalore*.
- Vivek Joshi was awarded the 'Certificate of Appreciation' from the *International Journal of Livestock Research* (ISSN 2277-1964) in recognition of an outstanding contribution to the quality of the journal in the year 2019-20.
- Vivek Joshi was inducted into the Editorial Board of '*The Indian Journal of Veterinary Sciences and Biotechnology*' (ISSN: 23940247) (NAAS=5.58).

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Chapters in Technical Bulletins/ Popular Articles

- Chamuah, J. K., Amenti and Lalchamliani (2020). Occurrence of acaricidal resistance on ticks and their detection measures. *International Journal of Bio-resource and Stress Management*. 11(3):240-245
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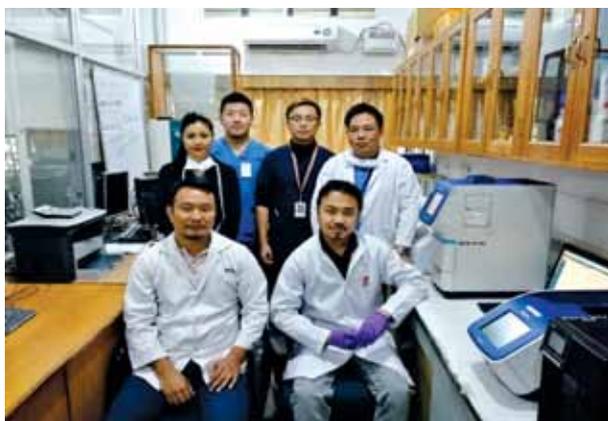
OTHER SPECIAL DUTY

- Vivek Joshi was nominated as the 'External Examiner' for Veterinary Medicine for the academic session 2019-20 for IV Year Professional UG Examination of College of Veterinary Sciences & Animal Husbandry, Central Agricultural University, Jalukie, Peren, Nagaland.
- Vikram R. contributed as resource person in the 5 day exposure-cum-training programme on Artificial insemination in pigs held at ICAR-Research Complex for North East Hill Region, Medziphema sponsored by NABARD, Dimapur, Nagaland on 4th December 2020

TRAINING AND CAPACITY BUILDING

Hands-on Training on Real-Time PCR for CIHSR, Dimapur

On 17-18th April 2020, ICAR-NRC on Mithun conducted hands-on training on real-time PCR and its uses in the detection of nucleic acids for the medical team of Christian Institute of Health Sciences and Research (CIHSR) led by Dr. Neto Yephthomi. Dr. H. Lalzampaia, a Scientist of the Institute explained and demonstrated the setting up of reaction and running of the machine. The participants were encouraged to handle the samples (mock samples non-infectious) by themselves. The importance of good laboratory practices (GLP), analysis of the result and troubleshooting of different types of problems in the data were highlighted. The trainees were also taught about sample handling, isolation of RNA, cDNA synthesis as well as quality checking of nucleic acids.



Workshop on Intellectual Property Rights

ITMU section organized one day workshop on Intellectual Property Rights on 16th January 2020. The resource person, Ms. Amrita Majumdar, Patent Attorney, Kolkata gave an elaborated lecture on Intellectual Property Rights in India, with emphasis on copyright, design and patent. A total of 44 participants including staff of ICAR-NRC on Mithun, College of Veterinary Science and Animal Husbandry, Jalukie and SASRD, Nagaland University participated in the program.



Webinar on Perspective of Agroforestry for Improved Mithun Husbandry

On 5th June 2020, the Institute organized a webinar on 'Perspective of Agroforestry for Improved Mithun Husbandry' to celebrate World Environment Day. The expert speakers and specialists were invited from across the country to create awareness on the implications of agroforestry

for improved mithun husbandry in Northeast India. Dr. S. K. Chaudhari, DDG (NRM), ICAR, chaired the webinar while Dr. Habibar Rahman, ILRI regional representative, South Asia, Dr. Shiv Kumar Dhyani, Senior Agroforestry Specialist, South Asia, Dr. Virendra Pal Singh, Representative for South Asia at CIAT, CGIAR, Dr. N. S. R. Sastry,



Dr. Subhrasnu Pan, Dr. K. P. Mohapatra, Dr. M. Kishan Kumar and Dr. Vijay M. Ilorkar were among the major speakers and panelists. The scientists of the Institute and all the KVKs from the mithun rearing states participated online in the program.

Workshop on Prospect of Mithun Farming in the Hilly District of West Bengal

On 3rd March 2020, one-day awareness workshop on 'Prospect of Mithun Farming in the Hilly District of West Bengal' was jointly organized by the Institute and West Bengal Comprehensive Area Development Corporation, Kolkata at Circuit House, Darjeeling.



Participation in Conference/Training/ Workshop

S. No.	Name of Conference/Training/Workshop and Webinar	Name of the staffs
(A) Scientist		
1	Attended National Conference on “Paradigm Shift in Livestock Management to Obtain High-Quality Animal Products for Enhancing Farm Economy and Entrepreneurship” organized by ISAPM, PGIVER, RAJUVAS, Jaipur from 4-6 th February 2020	Dr. L. Sunitibala Devi
2	38 th Annual Convention of ISVM and National Symposium on ‘Advancement in Veterinary Medicine in Mitigating Challenges to Animal Health’, 5 th -7 th February 2020, Veterinary College, Hebbal, Bengaluru	Dr. Vivek Joshi
3	Attended an online meeting on the Indian Network of Fisheries and Animal Antimicrobial Resistance (INFAAR) in the SFC for the 13 th plan period (2020-21 to 2024-25). Conducted by INFAAR on 27 th April 2020.	Dr. H. Lalzampua
4	Attended a webinar on Perspective of Agro-forestry for improved mithun husbandry organized at ICAR-NRC on Mithun on the 5 th June 2020	All the scientist of the Institute
5	Attended the virtual interface workshop on promoting and branding Mithun in collaboration with KVK’s of ATARI zone VI and VII organized at ICAR-NRC on Mithun on the 22 nd June 2020	All the scientist of the Institute
6	Attended the International Webinar Series on Emerging Trends in Extension and Social Sciences Research organized by Multi-Technology Testing & Vocational Centre, College of Fisheries, CAU (Imphal), ICAR-NAARM, Hyderabad and ICAR-CTCRI, Kerala from the 10-16 th June 2020	Kamni Paia Biam
7	Attended Online training on “Intellectual Property Rights” organized by IDP-NAHEP, College of Veterinary Sciences & Animal Husbandry, CAU, Selesih, Aizawl, Mizoram from 1-7 th July 2020	Dr. L. Sunitibala Devi
8	Attended International Workshop (1-day) on ‘Holistic Approach towards Diagnosis and Management of Canine Cardiac Disorders’ organized by NDVSU, Jabalpur, MP on 01/06/2020.	Dr. Vivek Joshi
9	Attended the Sensitization workshop on "Standardized Scheme Process in ICAR-ER", conducted by ICAR Headquarters on 24 th July 2020.	Dr. J.K. Chamuah
10	Attended National Workshop on ‘Improvement of Livestock Productivity and Food Security through Milk and Milk Products’ organized by NDVSU, Jabalpur, MP on 20 th July 2020.	Dr. Vivek Joshi
11	Attended the Digital Discourse Series on Gender and Pandemic: Challenges and Opportunities organized by ICAR-ARATI, Bengaluru and Farmer FIRST Programme of ICAR-CPCRI, Kayamkulam, ICAR-NIANP, Bengaluru, ICAR-IIHR, Bengaluru and ICAR-CIFT, Kochi from the 10-12 th August 2020	Kamni Paia Biam
12	Attended a lecture on NABL Accreditation of ICAR laboratories, conducted by IP & TN Unit, ICAR Hqrs, New Delhi, on 13 th August 2020.	Dr. J.K. Chamuah
13	Attended a webinar on “Post Pandemic challenges and opportunities in Animal Health” organized by College of Veterinary & Animal Sciences, Meerut, UP on 14 th August, 2020	Dr. Vikram R
14	Attended the webinar on Formation and Effective Functioning of Farmers Producers Organization organized by ICAR-RC for Eastern Region, Patna on the 18 th August 2020	Kamni Paia Biam
15	Attended AMR Masterclass Webiner on “Emerging Resistance in Gram Negative Bacilli: Detection Identification and Treatment-Experience from a Tertiary Care Hospital in East India” conducted by HISI Kolkata Chapter & BD India on 19 August 2020	Dr. H. Lalzampua
16	Attended online training on “Innovative Practices in Extension Research and Evaluation” conducted by ICAR-NAARM during 8-28 th September, 2020	Kamni Paia Biam



S. No.	Name of Conference/Training/Workshop and Webinar	Name of the staffs
17	Attended an online Workshop on Scientific Writing and Research Ethics for Medical and Clinical Science Community, conducted by DBT/Wellcome Trust India Alliance on 19 th September, 2020.	Dr. H. Lalzampua
18	Attended “Intellectual Property Rights in Agricultural Research and Education in India” jointly organized by National Agricultural Higher Education Project (NAHEP) and ICAR-Intellectual Property and Technology Management (IPTM). Unit, Pusa, New Delhi from 12-28 th September, 2020	Dr. H. Lalzampua Dr. L. Sunitibala Devi
19	Attended DST online sponsored training programme on “Emotional Intelligence at Workplace” from 21-25 th September 2020	Dr. Sapunii S Hanah
20	Attended 28 th Annual Review Meeting of AICRP on FMD for 2019-20 through video conferencing, conducted by DFMD on 6-7 th November 2020.	Dr. H. Lalzampua
21	Attended International Webinar on “Climate Smart Livestock and Poultry Production through Nutritional Intervention” Organized by Institute of Animal Nutrition, Directorate of Centre for Animal Production studies, Tamil Nadu Veterinary and Animal Science University on 23-24 th November. 2020	Dr. Sapunii S Hanah Dr. L. Sunitibala Devi
22	Attended National webinar on “Water Footprints and Conservation in Livestock Farming” organized by the Department of Livestock Production Management, Madras Veterinary College, TANUVAS, Chennai on 26 th November 2020	Dr. L. Sunitibala Devi
23	Attended National Workshop on “Intellectual Property Management in Agriculture”, conducted by ICAR-IIAB, Ranchi on 28 th November, 2020.	Dr. H. Lalzampua
(B) Subject Matter Specialist		
24	Attended Online Programme on “Gender in Agriculture (on MOOC)” conducted by MANAGE, Hyderabad. From July 27 th to 5 th August, 2020.	Dr. Hannah K. Asangla
25	Attended online training programme on “Climate Resilient Development in Agriculture” conducted by National Institute of Agricultural Extension Management (MANAGE), Rajendranagar Hyderabad. from 7 th -11 th December,2020	Dr. T. Esther Longkumer
(C) Technical		
26	Attended DST online sponsored training programme on “Capacity Building Programme for Technical Person” conducted by Indian Institute of Public Administration (IIPA), Indraprastha Estate New Delhi, from 11-22 nd January 2021.	Dr. Kobu Khate
(D) Administration		
27	Attended “Good Governance for Effective Implementation of Development Programme” conducted by V. V. Giri, National Labour Institute Noida during 26 th -28 th August 2020.	Mr. Dipal Meitei Ms. Aloli Rengma Mr. Utpal Ghosh
28	Attended “Online Training Programme for Administrative and Finance Officers of ICAR” conducted by National Academy of Agricultural Research Management (NAARM), Rajendranagar Hyderabad from 23 rd -27 th November 2020	Mr. Dipal Meitei

DISTINGUISHED VISITORS

- Shri Bimbadhar Pradhan, Additional Secretary & Financial Advisor (DARE & ICAR) Krishi Bhavan, New Delhi on 13.01.2020.
- Dr. S. L. Goswami, Former Vice-Chancellor, BUAT, Ranchi visited on 27.02.2020.
- Sh. Temjen Imna Along, Honourable Minister, Higher Education & Technical and Tribal Affairs, Govt. of Nagaland on. 23.05.2020.
- Mr. H. Khehovi, Advisor Tourism, Art and Culture. Govt. of Nagaland on 24.07.2020.
- Mr. K. Yhome. Secretary, Finance., Govt. of Nagaland on 10.08.2020.



PERSONNEL

Institute STAFF

Cadre Name	Name	Designation
RMP	Dr. Meraj Haider Khan	Director (Acting)
Scientific	Dr. Nazrul Haque	Principal Scientist
	Dr. Jayanta Kumar Chamuah	Scientist
	Dr. Sapunii Stephen Hanah	Scientist
	Dr. (Mrs.) Lalchamliani	Scientist
	Dr. H. Lalzampaia	Scientist
	Dr. (Ms.) Laishram Sunitibala Devi	Scientist
	Dr. Vivek Joshi	Scientist
	Mr. Kamni Paia Biam	Scientist
	Dr. Vikram R.	Scientist
	Technical	Dr. Kezhavituo Vüprü
Dr. Kobu Khate		CTO (T-9)
Mr. Rokongulie Krose		Technical Assistant (T-3)
Mr. Vizekrol Kikhi		Senior Technician (Driver, T-2)
Administration	Ms. Aloli Rengma	AAO
	Mr. Utpal Ghosh	AF&AO
	Mr. Th. Dipal Meitei	AAO
	Ms. Achuno Solo	UDC
	Ms. Vikhobeinuo Kiso	Stenographer Gr.III
	Ms. Sentisangla Pongener	LDC
	Ms. Arenla Ozukum	LDC
	Mr. Shatrughan Verma	LDC
Supporting	Mr. Zakahi	SSS
	Mr. Vezato	SSS
	Mr. Povetso	SSS
	Mr. Thupuvoyi	SSS
	Mr. Vezhocho	SSS
KVK	Dr. D. Borkotoky	ACTO (Animal Science) (T-7-8)
	Ms. Hannah K. Assangla	ACTO (Agronomy) (T-7-8)
	Ms. T. Esther Longkumer	CTO (Soil Science) (T-9)
	Mr. Rinku Bharali	CTO (Horticulture) (T-9)
	Mr. Nukusa T. Vadeo	Technical Officer (Computer Science) (T-5)
	Mr. Keniseto Chucha	Farm Manager (Technical Assistant, T-4)
	Mr. K. M. Chusi	Assistant
Ms. R. Imsennaro Longchar	Jr. Steno cum Computer Operator	

Cadre Name	Name	Designation
	Mr. Bodan Ch. Kachari	Technical Asstt. (Driver cum Mechanic, T-3)
	Mr. Vevo	SSS
	Mr. Shetsonyi Puro	SSS

DIRECTOR (ACTING) CHARGE

S. No.	Name	Designation	Date of Joining
1	Dr. Meraj Haider Khan	Director (Acting)	22.10.2020

PROMOTION- TECHNICAL

S. No.	Name	Designation	Actual date of Promotion w.e.f.
1	Ms. T. Esther Longkumer, KVK Phek	ACTO (T-7-8) to CTO (T-9)	1.8.2018
2	Mr. Rinku Bharali, KVK Phek	ACTO (T-7-8) to CTO (T-9)	17.8.2018
3	Dr Debojyoti Borkotoky, KVK Phek	STO (T-6) to ACTO (T-7-8)	1.11.2015

TRANSFER

S. No.	Name	Designation	Discipline	Transferred to	Date of Transfer
1	Dr Abhijit Mitra	Director	-	ICAR-CIRC Meerut	26.9.2020
2	Dr. Rajni Choudhury	Scientist	AGB	ICAR-CSWRI Avikanagar	30.7.2020

DEPUTATION

S. No.	Name	Designation	Transferred to	Date of deputation
1	Sh Surjit Kumar	Assistant	IARI-IARI, Jharkhand	17.8.2020

MAIN STATION



Animal Genetics and Breeding Section

This section is engaged in the research activities on identification, evaluation, characterization, and conservation mithun germplasm. The salient achievements include whole-genome sequencing of mithun, complete cytogenetic analysis including karyotyping and different chromosomal bandings (C-banding and R-Banding) characterization of economically important genes such as kappa casein, leptin, etc., microsatellite-based characterization of different mithun population and muscle transcriptome analysis.



Animal Nutrition

Identification, nutritional evaluation, and preservation of locally available feeds and fodders, determination of nutrient requirements, feed efficiency, and studies on the rumen microbes of mithun are the central areas of research. Barring few, most of the forages that were analyzed for their nutrient content, can serve as a good source of protein and energy for mithun and contained phenolic compounds within the limit. Nutrient management by evaluation of various feed ingredients, using the suitable technique for



its preservation with minimization of nutrient losses are also given due importance. Preservation of feeds and fodders in the form of feed blocks is a unique technique through which desirable feeds in balanced form could be offered to animals as per their requirements. Attempts have been made for developing suitable binders for feed blocks using locally available feed ingredients instead of inorganic binders. Assessing the macro as well as the micro-mineral contents of soil, feeds & fodders, and the serum of mithun, an area-specific mineral mixture entitled with the trademark 'mthimin' has been developed. Methods have been developed for the preparation of mineral blocks and serving it to the animals in forest conditions using mineral dispenser fabricated by this Institute. The gut microbiome of mithun reared under semi-intensive and free-range systems has been compared.

Animal Physiology and Reproduction section

This section mainly focused on improving reproduction efficiency in mithun through basic physiological approaches and unraveling fundamental mechanisms of reproductive processes to provide solutions for improved mithun production. They have standardized the procedure of semen collection by artificial vagina and electro-ejaculator followed by the production of frozen semen. Estrus synchronization and Artificial Insemination (AI) protocol has been optimized by the section and is being used successfully under the farm as well as in field conditions. Since, August 2016, AI has been introduced in the Mithun Farm, Medziphema and 97 calves have been born. The follicular dynamics & endocrine profiling has been



studied along with the determination of time of ovulation for enhancing reproductive efficiency in mithun. Presently, research on the development of pen side pregnancy kit and the process of vitrification of mithun semen is under process.

Livestock Production and Management

The section is having two Scientists, they maintained and generate information on the economic traits of mithun, such as birth weight and subsequent growth performance, milking record, age at first heat, age at first calving etc. under a semi-intensive rearing system. Presently there are two ongoing projects on the draught ability of mithun and carrying capacity of the forest for rearing of mithun.



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, researching the frontier areas of meat science and to develop value-added products from mithun milk and meat is 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 hide 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.



Animal Health

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 is 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 the field level survey in mithun inhabiting states. This section also prioritized developing safe, environment-friendly alternative therapeutics for animal health care by screening the rich floral biodiversity of NEH. The section is engaged in providing health care services to the Institute mithun farms at Medziphema and Porba as well as advanced diagnostic services to the Department of Veterinary & AH, Govt. of Nagaland. Currently, studies on phytochemical screening of plants with anti-leech potential, immune response profile of FMD vaccinated mithun, and major subclinical metabolic diseases of transition mithun is underway.

Extension Section

The Extension section is involved in the transfer of technologies developed by the Institute, in the field of mithun health, production, and management through various extension activities with the help of scientists and experts of different sections of the Institute. One of the most important activities of the section is conducting research on multidimensional socio-economic and cultural issues related to mithun husbandry. The section also performs field extension activities mainly to generate inputs for research. It keeps an active liaison with the mithun farmers to have a collaborative extension programme for the transfer of technologies for the development of mithun in the country through feedback provided by the farmers. The section has also developed a Mithun Mitra Mobile App for its stakeholders. The app serves as a single-window

delivery system for information on mithun and has a registration interface, wherein the mithun farmers can register their mithun rearing societies with the Institute.

Institutional Level Biotech Hubs

The Institutional Level Biotech Hub was established during 2011-12 under the special scheme for the North Eastern Region of India by the Department of Biotechnology, Government of India. Since its inception, the Hub has conducted 15 hands-on training, eight outreach programs and delivered the eight invited lectures in Undergraduate (UG) and Post-graduate (PG) institutions in the area of molecular biology and biotechnology. In addition, short-term courses on molecular technique and PCR-related researches were conducted for students in and around the Institute.



Bioinformatics Infrastructure Facility

The Bioinformatics Infrastructure Facility was established in the year 2012 under the special scheme for North East India by the Department of Biotechnology, Government of India. The Institute bioinformatics center 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.

acid Extractor, Bioanalyzer, Ultrasonicator, CO₂ incubator, Computer Assisted Semen Analyzer (CASA), refrigerated centrifuge and deep freezers (-40°C and -80°C). Currently, the laboratory is utilized for performing research work on Foot and Mouth disease which includes a demonstration of FMDV antibody titre using Solid-phase competitive ELISA, isolation of PBMCs from the animals, whole blood culture and quantification of Interferon-γ using ELISA. The facility is extended for use to all the research scholars of NEH and Department of Veterinary & AH, Govt. of Nagaland. In addition, to join hands against fighting for the Covid-19 pandemic, the laboratory was utilized to train Medical personnel from CIHSR, Dimapur to familiarize the basic principles and handling of Real-Time PCR.

Central Biotech Infrastructure Facility

The facility was created in 2012 with a special grant from the Department of Biotechnology, Government of India housed modern instruments for researching the area of molecular biology, microbiology and biotechnology. The laboratory is equipped with advanced instruments like Real Time-PCR, Gradient PCR, Nanodrop, Biological safety cabinet (Class II), Ultracentrifuge, Nucleic

Mithun Farm, Medziphema

The mithun in the Institute's farm are reared under a semi-intensive system. Three hectares of farmland is under fodder cultivation where congo signal, hybrid napier, maize and local fodder trees



Adult		Young (1-2 years)		Calf (< 1 year)		Total	
Male	Female	Male	Female	Male	Female	Male	Female
31	46	9	5	9	3	49	54
77		14		12		103	

are grown to meet the green fodder requirement of farmed mithun. The net quantity of green fodder harvested during the reported year was 220.16 tonnes. Regular vaccination is being practiced against FMD, HS and BQ as preventive measures. The total strength of farm is 103 mithun.

Library

“Nothing is pleasanter than exploring a library”

The Institute is maintaining a small academic library to meet the needs of working groups specific on Animal Husbandry, Agriculture and allied sectors. Storing relevant printed intellectual documents and simultaneously upgraded by the addition of new books as and when required. Daily Newspapers and magazines are procured and displayed for readers to provide the culture of reading along with information dissemination and holistic development. The facility is being availed by employees of the Institute, researchers, students from nearby institutions, and others directly or indirectly associated with the Institute. Researchers have online access through the Consortium of e-Resources in Agriculture (CeRA) for scientific journals.

S. No.	Particulars	Period 2020	Total
1	Books	55	2059
2	Journals		
	Indian	-	55
	International	-	07
3	Abstract CD		
	Agris CD	-	13
	Vet CD	-	23
	Beast CD	-	08
	Resource CD	-	01
	Medline	-	21
	Miscellaneous	-	17
4	Annual Report/ Research Highlights/ Technical Bulletin	2	2
5	Others publications / Compendium /Proceedings	5	2
6	Thesis	-	13
7	Annual Reports of other Institutes	21	521

ITMU

The Institute Technology Management Unit has been constituted in the Institute to promote



the 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 conducting training and capacity building activities for scientist and other research workers. The ITMU unit of NRC on Mithun has initiated the filing of Patents, Trademarks and Geographical Indication. This cell works in consultation with other scientific, technical and administrative staff for the smooth functioning of unit. Under the initiative of ITMU one-day workshop on “Intellectual Property Rights” was organized by ICAR-NRC on Mithun, Nagaland on 16th January 2020. The workshop was part of the capacity-building program to educate and awareness among scientific communities about intellectual property rights of research activities. In this year, Institute got one copyright on “Mithun Mitra Mobile App” which was granted on 17.08.2020. Besides, this Institute was applied five designs to the patents office, Kolkata during the year.

AKMU

This cell provides the IT-based facility to the Institute and is equipped with networking devices and 24 hours uninterrupted power backup system. Presently, the cell works for providing internet, printing and scanning facilities. It also maintains and updates the website of the Institute.

HRD

The role of this cell is to improve the performance and productivity of the staff and young generation through increased knowledge, competencies, skills and attitudes. Hence, from time to time, the cell makes necessary arrangements for different training programs for scientific as well as other staff members of the Institute and college students.

REGIONAL STATION

PORBA, PHEK DISTRICT

The regional research station of NRC on Mithun is located at Porba village of Phek district, Nagaland. It is 125 km away from ICAR-NRC on Mithun, Medziphema. The Scientists from the Headquarters used to visit the station from time to time to collect biological samples for research purposes, organizing health cum vaccination camps, other extension activities, and to ensure optimal functioning of the centre. The station has a mithun farm with a herd strength of 36 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, Sakrba, Losami, and Thevopisu where regular animal health cum vaccination camp are being organized and disease diagnostic service are routinely provided. The Krishi Vigyan Kendra (KVK-Phek) of the Institute is housed in this campus.



MISCELLANY

INSTITUTIONAL ACTIVITIES

Republic Day Celebration

The 71st Republic Day was celebrated in the Institute on 26th January 2020. Dr. Abhijit Mitra, Director, ICAR-NRC on Mithun unfurled the tricolor in the morning with the singing of the National Anthem. The children and family members of the staff also took an active part in the celebration in colorful attire.

RAC Meeting

The Institute conducted its 13th RAC Meeting on 27th February 2020. Dr. S. L. Goswami, Chairman of the RAC presided over the meeting. All the RAC



members and scientists of the Institute attended the meeting

International Women's Day Celebration

Under the initiative of ICAR-NRC on Mithun, International Women's Day was celebrated on 9th March 2020, where all the lady staff attended the program and discussed various issues related to women's welfare at the workplace under the leadership of Dr. S. Toppo.



IRC meeting

IRC meeting was held on 7th and 9th August 2020 under the Chairmanship of Dr. Abhijit Mitra, Director, in the presence of Dr. Vineet Bhasin, Principal Scientist (AG&B), Animal Science



Division, ICAR, New Delhi as an external expert. Section-wise achievements of all the research projects were presented.

Farmers' Exposure Visit

On 24th January 2020, a group of farmers from Jalukie, Peren district visited mithun farm and Institute's campus along with the staff of KVK, Jalukie. The farmers interacted with the scientists of the Institute and got to know about the various management practices followed in the farm. The technologies developed by the Institute were also demonstrated.



Visit of School Students

Shalom Public School, Chumukedima

The students of class 1 of Shalom Public School, Chumukedima visited ICAR-NRC on



Mithun on 30th January and 10th February 2020 and were exposed to the different research laboratories and technologies developed by the Institute. They interacted with the scientists of the Institute and also visited mithun farm.

Hope Academy School, Dimapur

On 12th February 2020, a total of 95 students from class 6 accompanied by six teachers had an opportunity to interact with the scientists of the Institute and witness the semi-intensive mithun rearing at the Institute's farm.



Foundation Day Celebration

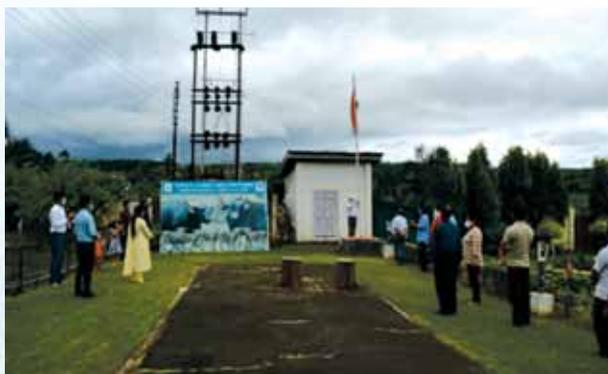
On 2nd June 2020, the Institute celebrated its 32nd Foundation Day via video conferencing. Dr. Trilochan Mohapatra, DG, ICAR graced the function as the Chief Guest from New Delhi. He inaugurated the new website of the Institute and state-wide painting and drawing competition for school children of Nagaland. The Foundation Day lecture was delivered by the Guest of Honour Dr. K.M. Bujarbaruah, Former VC, AAU, Jorhat. Dr. B.N. Tripathi, DDG (AS), ICAR, the Directors of several Animal Science Institutes of ICAR including Dr. R.K. Singh, Director, ICAR-IVRI, Dr. Ragvendra Bhatta, Director, ICAR-NIANP, Dr.



V.P. Singh, ICAR-NISHAD, scientists, KVK staff members and farmers from all the mithun rearing states participated online in the program.

Independence Day Celebration

On 15th August 2020, to celebrate 74th Independence Day, the honorable Director of the Institute unfurled the tricolor with the singing of the national anthem in the presence of all the scientific and administrative staff of the Institute.



IAEC Meetings 2020

Two annual IAEC meetings of the Institute were held on 22.08.2020 and 07.10.2020 via video conferencing. All the new projects submitted to IAEC for approval were presented by the PIs and reviewed in the presence of external CPCSEA nominees and internal IAEC members. The meeting was attended by Dr. Nazrul Haque, Dr. Gunjan Das, Dr. P. Chattopadhyay, Mr. L. Biswajeet Meitei, Dr. M. H. Khan, Dr. J. K. Chamuah, Dr. Kobu Khate and organized & coordinated by Dr. Vivek Joshi.



हिंदी सप्ताह समारोह 2020

भा.कृ.अनु.प.–राष्ट्रीय मिथुन अनुसंधान केन्द्र में 14 से 20 सितंबर 2020 के दौरान हिंदी प्रकोष्ठ प्रभारी डॉ. विवेक जोशी द्वारा हिंदी सप्ताह समारोह का आयोजन एवं संचालन किया गया। 14 सितंबर को हिंदी सप्ताह का शुभारंभ संस्थान के निदेशक द्वारा दीप प्रज्वालित करके किया गया। इस अवसर पर संस्थान के समस्त अधिकारी एवं कर्मचारी उपस्थिति थे। हिंदी सप्ताह के दौरान 07 प्रतियोगिताओं का आयोजन किया गया जिसमें तात्कलिक भाषाण, टिप्पणी एवं प्रारूप लेखन, हिन्दी अनुवाद, स्मरण शक्ति, परिसर के बालक-बालिकाओं के लिए निबंध लेखन शामिल थे। संस्थान के सभी अधिकारियों, कर्मचारियों एवं परिसर के बालक-बालिकाओं ने उत्साहपूर्वक हिस्सा लिया। 20 सितंबर 2020 को हिन्दी सप्ताह का समापन समारोह एवं पुरस्कार वितरण समारोह आयोजित किया गया। इस अवसर पर संस्थान के निदेशक, हिन्दी प्रकोष्ठ प्रभारी, अधिकारियों व कर्मचारियों की उपस्थिति में विभिन्न प्रतियोगिताओं के विजेताओं को पुरस्कार प्रदान किया



गया। संस्थान में हिन्दी प्रोत्साहन के लिए किये गये कार्यक्रम की सराहना की गई।

all the staff members in the presence of the Director of the Institute while the quiz competition was organized and coordinated by Dr. Vivek Joshi.

Webinar on Formulation of Mithun Insurance Policy

On 18th September 2020, the Institute conducted a webinar on 'Formulation of Mithun Insurance Policy' in collaboration with National Insurance Co. Ltd (NIC). The webinar was attended by the scientists and technical officers of the Institute, officials of NIC from head office and regional & branch offices in northeastern states, representatives of NABARD and officials of the Department of Veterinary & Animal Husbandry of all the mithun rearing states viz. Arunachal Pradesh, Manipur, Mizoram and Nagaland.



150th Birth Anniversary Celebration of Mahatma Gandhi

On 1st October 2020, the Institute organized a *swachhta* pledge-taking program and a written quiz competition on 'Gandhiji's Autobiography and Indian Freedom Struggle'. The pledge was taken by



Mahila Kisan Diwas Celebration

Mahila Kisan Diwas was celebrated at ICAR-NRC on Mithun on 15th October 2020 to recognize the contribution of women in agriculture. An interactive session on the role of women in pig and poultry farming in Nagaland was organized. The lectures on the prospects and potential of poultry and piggery as an entrepreneurial activity in Nagaland were delivered by the scientists of the Institute. A total of 23 women farmers from Medziphema, Jharnapani, Kukidulong, and Socunoma villages of Dimapur district participated in the programme.



Vigilance Awareness Week Celebration

A weeklong celebration of the Vigilance Awareness Week 2020 was conducted by the Vigilance Cell of the Institute from 27th October to 2nd November 2020. Several competitions viz. essay writing, painting and quiz competition for the staff of the Institute was organized.



National Unity Day Celebration

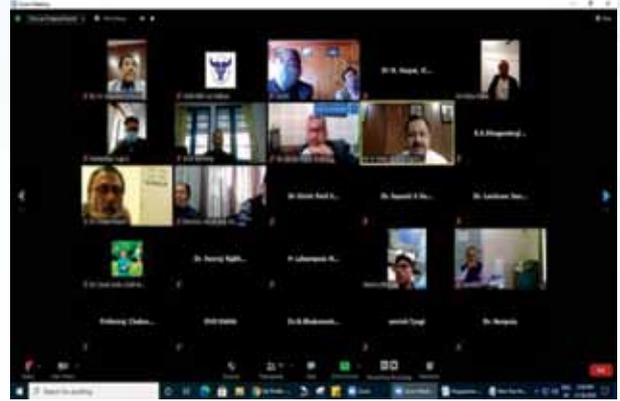
The Institute celebrated National Unity Day on 31st October 2020 to commemorate the birth anniversary of Sardar Vallabhbhai Patel who undoubtedly unified the country.



71st Constitutional Day Celebration

On 26th November 2020, the Institute celebrated 71st Constitutional Day along with the rest of the nation through a live telecast program.





Stakeholders' Meeting

On 26th November 2020, the Institute organized a virtual stakeholders' meeting on 'issues of declining mithun population and strategies for organic mithun production'. The meeting was virtually attended by ADG (AN&P), ICAR, scientists from ICAR headquarters, officials from Veterinary & Animal Husbandry Department, Government of Nagaland and Manipur, Nodal Officer, NLDB, Arunachal Pradesh, scientists from ICAR-NRC on Meat, Hyderabad, ICAR-KVK officials and stakeholders from different mithun rearing states.



GLIMPSES OF OUR PREVIOUS ANNUAL REPORTS



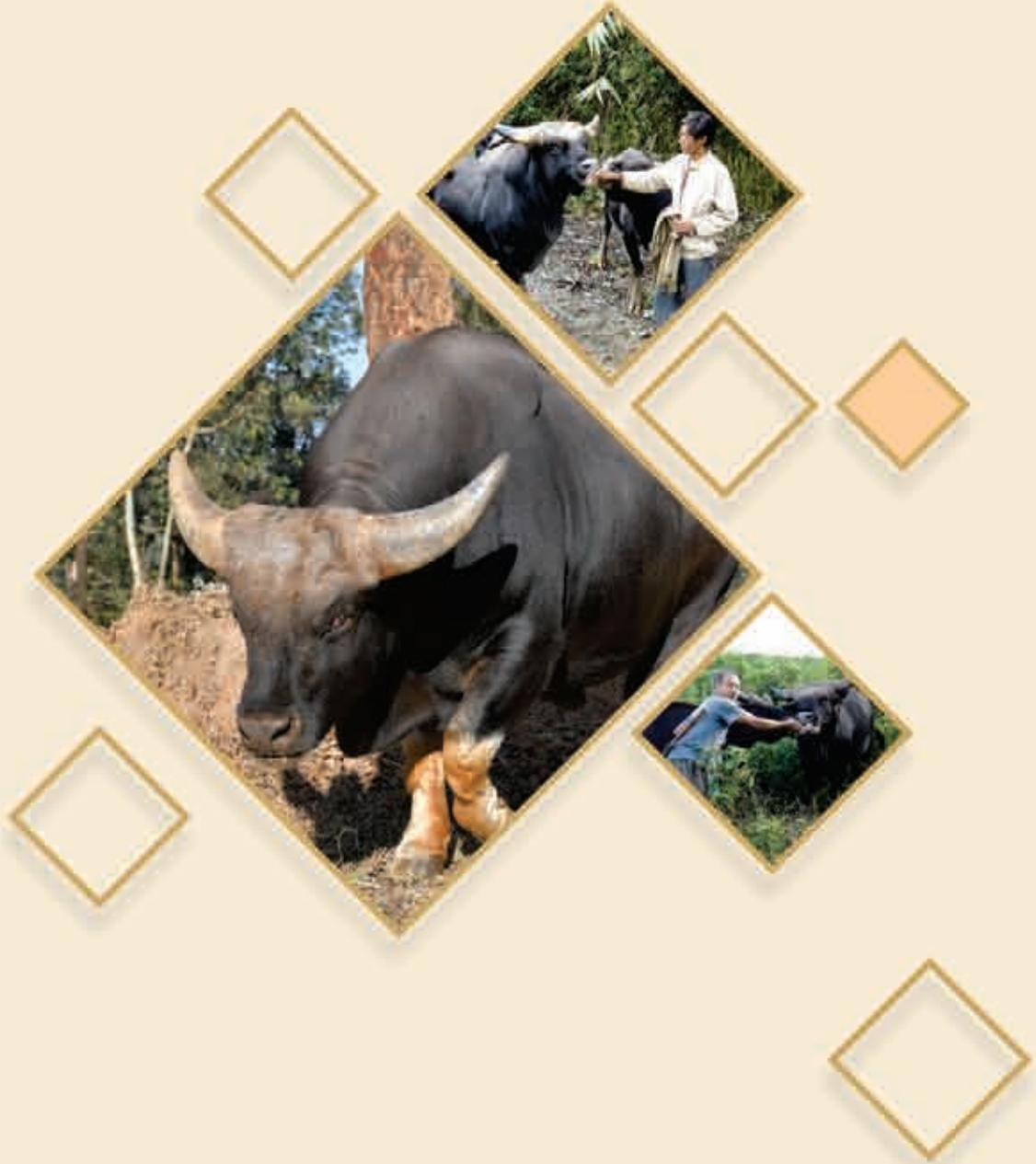
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This annual report contains unprocessed or partially processed data/scientific information which would form the basis of research articles in due course. Hence, the data/information contained in this report, should not be used without written permission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



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किसानों का हमसफर
भारतीय कृषि अनुसंधान परिषद

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