

# वार्षिक प्रतिवेदन ANNUAL REPORT

## 2023



भाकृअनुप-राष्ट्रीय मिथुन अनुसंधान केन्द्र

मेड्जीफेमा, नागालैन्ड-797106, भारत

ICAR-NATIONAL RESEARCH CENTRE ON MITHUN

Medziphema, Nagaland- 797106, India

<https://nrcmithun.icar.gov.in/>

 NRC on Mithun  NRCMithun  NRC Mithun

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# Message from Director



Girish Patil, S.

I am pleased to present the annual report for the year 2023, highlighting the significant achievements and milestones of ICAR-National Research Centre on Mithun (ICAR-NRC on Mithun). This report encapsulates our unwavering commitment to excellence, innovation, and sustainability in Mithun research and conservation. The year 2023 has been particularly remarkable for ICAR-NRC on Mithun, with several noteworthy accomplishments that have significantly contributed to the advancement of Mithun farming and conservation efforts. Among the many achievements, five stand out prominently:

**Recognition of Mithun as a Food Animal:** The inclusion of Mithun as a food animal under the Food Safety and Standards Authority of India (FSSAI) regulations and its incorporation into the Domestic Animal Diversity Information System (DAD-IS) of the Food and Agricultural Organization (FAO) represent a significant milestone. This recognition underscores the importance of Mithun in the culinary landscape and opens new avenues for its utilization and conservation.

**Intellectual Property:** The grant of four patents on Mithun leather processing-related technologies, along with two copyrights and one design registration, showcases our commitment to innovation and intellectual property rights protection. These achievements are a testament to our dedication to developing cutting-edge technologies for the benefit of Mithun farmers and stakeholders.

**Technology Transfer and Commercialization:** The signing of four technology transfer MoUs and the successful transfer of technologies for mineral dispenser, ectoparasite expeller cum drug applicator, and value-added products from Mithun meat demonstrate our efforts to translate research into practical solutions. These initiatives facilitate the adoption of innovative practices and enhance the economic viability of Mithun farming.

**Establishment of m-ANITRA:** The development and deployment of m-ANITRA, a block-chain application for Mithun herd registration, traceability, and online marketing, represent a significant advancement in digital agriculture. This initiative leverages cutting-edge technology to improve transparency, efficiency, and accountability in the Mithun value chain.

**Pregnancy Diagnosis Kit:** The development and release of a urine-based pregnancy diagnosis kit for Mithun mark a significant breakthrough in reproductive management. This innovation provides Mithun farmers with a reliable and cost-effective tool for pregnancy detection, enabling better herd management and reproductive efficiency.

In addition to these achievements, the inauguration of two Mithun conservation units at Khonoma and Thovopisumi, Nagaland further underscores our commitment to the preservation of Mithun genetic diversity and heritage. These conservation efforts are essential for ensuring the long-term sustainability and resilience of Mithun populations.

I extend my sincere thanks and gratitude to Dr. Himanshu Pathak, Secretary, DARE & Director General, ICAR, and Deputy Director Generals (Animal Sciences), Dr. B.N. Tripathi, Dr. J. K. Jena and Dr. Raghavendra Bhatta for their unwavering support and guidance. I also acknowledge the invaluable contributions of Assistant Director Generals Dr Amrish Kumar Tyagi, Dr. Ashok Kumar and Dr. G. K. Gaur. Thanks are also due to Principal Scientists Dr. Rajneesh Rana, Dr. Keshab Barman, Dr H. K. Narula and the entire staff of the Animal Science Division, ICAR, for their continuous support and collaboration. I would like to express my deepest appreciation to the scientists and staff of ICAR-NRC on Mithun for their dedication, hard work and tireless efforts in advancing our mission. Their commitment to excellence and passion for Mithun research and conservation are truly commendable.

Finally, I am grateful to the editorial board for their diligence and commitment in compiling this annual report. I am confident that this report will serve as a valuable reference for researchers, policymakers, and stakeholders engaged in scientific Mithun farming and product processing. I am honored to present the Annual Report for the year 2023 and look forward to continued progress and success in the years to come.



**Dr. Girish Patil, S.**

# Executive Summary

The Annual Report of 2023 for the ICAR - National Research Centre on Mithun (NRCM) embodies a comprehensive reflection of our relentless pursuit of excellence in Mithun research and development. Throughout the year, we have embarked on multifaceted initiatives spanning various domains, including genetics, nutrition, health management, reproductive physiology, and value chain enhancement. These endeavors aim to

not only advance scientific knowledge but also foster sustainable agricultural practices and improve livelihoods in the Northeastern Hilly region of India.

The Mithun, a unique indigenous bovine species, holds significant cultural, economic, and ecological importance in the Northeastern Hilly region of India. As a crucial component of traditional agro-pastoral systems, Mithun plays a pivotal role in the livelihoods of local communities while also contributing to the biodiversity and ecosystem services of the region. Recognizing its significance, the ICAR - National Research Centre on Mithun (NRCM) has been steadfast in its mission to unravel the complexities surrounding Mithun production and management, with a focus on genetic improvement, nutritional optimization, health management, reproductive physiology, and value chain enhancement.

## Genetics and Breeding

The Animal Genetics & Breeding section focuses on understanding the genetic makeup and breeding potential of Mithun populations in North East India. Through a decade-long analysis of body weight traits, we have unveiled significant insights into genetic parameters, correlations, and selection signatures. Key achievements include the meticulous collection and categorization of data from 110 Mithun animals spanning multiple generations and covering various developmental stages. Additionally, our research has led to the estimation of heritability, revealing substantial genetic influence on body weight traits, particularly at Month 12. Comparative analysis has highlighted unique genetic factors and strong interdependence between adjacent developmental stages, while the identification of candidate genes associated with meat production, adaptation to ecological habitats, and immune resilience using SNP array data has significant implications for informed breeding strategies aimed at enhancing desirable traits and resilience to environmental challenges in Mithun populations. While our findings represent a significant step forward, further research with larger sample sizes and advanced genomic techniques is necessary to refine our understanding and maximize genetic improvement strategies for Mithun populations.

## Nutrition and Feeding Management

The Animal Nutrition section has been dedicated to determining the energy and protein requirements for Mithun, crucial for optimizing growth and productivity. A study involving eighteen Mithun calves divided into three groups and fed at varying energy levels has provided valuable insights into growth curves, feed efficiency, and energy requirements across different stages of growth. Utilizing the Gompertz model, sigmoid growth curves were developed for male and female Mithun, offering insights into body weight and growth rate at different age groups. Furthermore, the study explored feed conversion ratios and optimal age for slaughtering animals, contributing to inform feeding and management practices.

## **Sustainable Production Practices**

Efforts towards promoting sustainable organic Mithun production have been highlighted in the Development of Package of Practices for Sustainable Organic Mithun Production section. Initiatives include the conversion of farm land to organic practices, registration with relevant authorities, and assessment of productivity per unit area of cultivated and naturally grown fodders. Key activities involve land preparation, cultivation of cowpea and rice bean, establishment of fodder nurseries for locally available tree fodder, and assessment of soil fertility. These efforts signify a holistic approach towards sustainable Mithun production, encompassing land management, fodder cultivation, and environmental stewardship.

## **Animal Health Management**

The Animal Health section encompasses various studies and initiatives aimed at understanding and addressing health challenges in Mithun and other livestock in the Northeastern Hilly region of India. From molecular screenings of tick vectors and host Mithun for haemoparasites to innovative interventions for promoting the meat sector, our endeavors aim to mitigate health risks and enhance livelihoods in the region. Noteworthy projects include the Molecular Screening of Tick Vectors and Host Mithun for Haemoparasites and the Development of Artificial Intelligence-based Diagnosis System for Helminth Parasitic Infections. These initiatives collectively contribute to advancing the understanding and management of health challenges in Mithun and allied bovines, with the goal of improving livelihoods and promoting sustainable agriculture in the Northeastern Hilly region of India.

## **Reproductive Physiology**

The Animal Physiology & Reproduction section has focused on two pivotal studies concerning pregnancy diagnosis and sperm cryotolerance in Mithun. The Testing and Validation of Pregnancy Diagnosis Kit, Preg-D in Mithun project aimed to evaluate the accuracy of the Preg-D pregnancy diagnosis kit in Mithun, leading to the development of a new kit named Preg-DM demonstrating improved accuracy, sensitivity, and specificity. Meanwhile, the Deciphering Sperm Functional and Proteomic Alterations in Mithun Bulls with Poor Sperm Cryotolerance study identified distinct protein signatures associated with cryotolerance levels, offering valuable insights into the molecular mechanisms underlying sperm function in Mithun. These studies contribute significantly to our understanding of reproductive physiology in Mithun and provide valuable tools for improving pregnancy diagnosis and sperm cryopreservation techniques.

## **Livestock Production and Management**

In the Livestock Production and Management section, efforts have been made to assess and document the existing Mithun rearing practices under free-range systems, design and establish digital platforms for Mithun registration, traceability, and market access, and utilize artificial intelligence for behavioral studies in Mithun. These initiatives aim to enhance Mithun rearing practices, promote technological interventions for livestock management, and leverage advanced techniques for behavioral studies, thereby contributing to improved productivity and welfare of Mithun populations.

## **Livestock Products Technology**

The Livestock Products Technology section has witnessed significant developments in enhancing the Mithun meat and milk value chain through technological advancements, market



recognition, collaborative partnerships, product development, commercialization, and revenue generation. Notable initiatives include the development of PCR technology for authentication and quality evaluation of Mithun meat and meat products, recognition of Mithun as a food animal by the Food Safety and Standards Authority of India (FSSAI), and signing of Memoranda of Agreement (MOAs) for technology transfer and production of value-added products. These efforts underscore our commitment to maximizing the economic potential of Mithun products and promoting their consumption.

## **Intellectual Profile of the Institute**

The Institute's Technology Management Unit (ITMU) has been established to promote the development of infrastructural facilities for intellectual property registration. It aims to enhance the legal, institutional, and administrative framework to assist intellectual property owners and conduct training and capacity-building activities for scientists and other research workers. The ITMU unit at the NRC on Mithun has taken the lead in initiating the filing of patents, trademarks, and geographical indications. This unit collaborates closely with other scientific, technical, and administrative staff to ensure the smooth functioning of the unit. Under the ITMU cells initiative, two workshops and one Industry Scientist meet were organized in 2023. These events were part of a capacity-building program with the objective of educating and raising awareness among scientific communities about intellectual property rights in research activities. The Institute secured six copyrights, seven designs, and five patents and seven trademarks. Furthermore, five technologies were successfully commercialized, and the Institute obtained ten certified technologies from the council. Also, the Institute received three copyrights, one design, and four patents.

## **Trainings by the Centre**

The ICAR-NRC on Mithun, Medziphema, in collaboration with various organizations, has been actively engaged in promoting scientific management practices in Mithun farming to enhance farmers' income. Initiatives such as biotechnological training, awareness programs, and exposure tours have been conducted to impart knowledge and skills to farmers and stakeholders. Efforts include establishing Mithun Conservation Units, organizing health camps, and advocating for sustainable farming practices. These endeavors aim to empower farmers, promote sustainable development, and ensure the prosperity of Mithun farming in the Northeast region.

In conclusion, the Annual Report of 2023 for the ICAR - National Research Centre on Mithun (NRCM) encapsulates a myriad of endeavors and accomplishments aimed at advancing scientific knowledge, fostering sustainable agricultural practices, and improving livelihoods in the Northeastern hilly region of India. Through our concerted efforts in genetics, nutrition, health management, reproductive physiology, and value chain enhancement, we strive to unlock the full potential of Mithun production and contribute to the well-being of local communities and the ecological sustainability of the region.



# INTRODUCTION



**PORTABLE MINERAL BLOCK DISPENSER WITH HEIGHT  
ADJUSTMENT FACILITY**



**ANNUAL REPORT – 2023**  
**ICAR – NRC on Mithun**

## Introduction

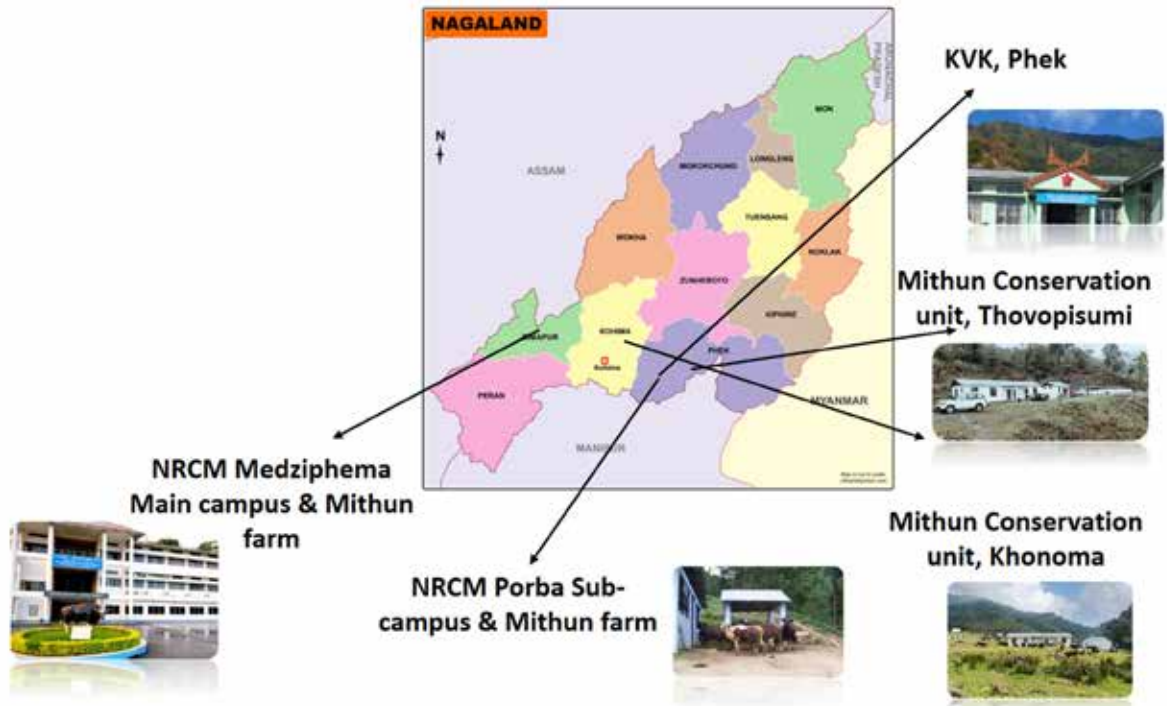
Established in 1988 under the auspices of the Indian Council of Agricultural Research (Department of Agriculture Research and Education, Ministry of Agriculture and Farmers' Welfare, Government of India), the ICAR-National Research Centre on Mithun (ICAR-NRC on Mithun) stands as a pioneering institution dedicated solely to the perpetual advancement and preservation of Mithun (*Bos frontalis*). Situated across two campuses, the main facility resides in Medziphema, Chumoukedima district, Nagaland, while the second campus lies in Porba village of Phek district, approximately 125 km from Medziphema. The latter is also home to the Krishi Vigyan Kendra (KVK-Phek) of the Institute. Unique in its focus, ICAR-NRC on Mithun leads the global charge in Mithun research and conservation efforts. It's Research and Development endeavors span across seven specialized sections: Animal Genetics & Breeding, Animal Physiology & Reproduction, Animal Nutrition, Animal Health, Livestock Production & Management, Livestock Production Technology, and Veterinary Extension. The institute boasts state-of-the-art infrastructure, including the Biotechnology Infrastructure Facility-cum-Central Instrumentation Facility, Molecular Genetics Laboratory, Semen Processing Laboratory, and Mithun Farm. Additionally, its library, equipped with online journal search capabilities, and the Agricultural Knowledge Management Unit (AKMU) cater to the academic and informational needs of the Institute's personnel and neighboring institutions alike. The Mithun Farm, situated approximately 8 km from the main campus atop a hill, accommodates 125-150 Mithuns under a semi-intensive rearing system. A second Mithun Farm operates within the Porba campus, furthering the Institute's commitment to research and conservation efforts. Furthermore, ICAR-NRC on Mithun actively collaborates with the All India Coordinated Research Project on Foot and Mouth Disease (AICRP on FMD), which is monitored by the Directorate of Foot and Mouth Disease (DFMD), Odisha. With an unwavering vision, mission, and a clear mandate, ICAR-National Research Centre on Mithun continues to lead the charge in the pursuit of excellence in Mithun research and conservation, reaffirming its status as a global leader in this unique field of study.

### Location

Located amidst the picturesque landscapes of Medziphema of Chumoukedima district of Nagaland, ICAR-NRC on Mithun stands as a beacon of research and conservation in the heart of the Northeastern region of India. The center is conveniently accessible, being approximately 20 km from Dimapur Airport, the nearest airport, and approximately 24.5 km from Dimapur Railway Station, the nearest railway station. The strategic location of the center ensures easy connectivity for visitors and researcher's alike, fostering collaboration and knowledge exchange in the field of Mithun husbandry and conservation.

### Faculty and Staff

The Institute is headed by the Director and currently 11 Scientists, 05 Technical and 18 administrative/finance/supporting staffs are in position.



## Staff Position

### Cadre strength of ICAR-NRC on Mithun, Medziphema, Nagaland as on 31.12.2023

S.No	Category	Sanctioned Strength	In Position	Vacant
(A)	<b>Scientific</b>			
	RMP	1	1	0
	Principal Scientist	2	1	1
	Senior Scientist	3	0	3
	Scientist	13	10	3
	<b>Total</b>	<b>19</b>	<b>12</b>	<b>7</b>
(B)	<b>Technical</b>			
	Cat III (T-6)	3	3	0
	Cat II (T-3)	1	0	1
	Cat I (T1)	3	2	1
	<b>Total</b>	<b>7</b>	<b>5</b>	<b>2</b>
(C)	<b>Administrative</b>			
	A.O.	1	0	1
	A.A.O.	2	2	0
	F&AO	1	0	1
	Assistant	4	0	4
	PS	1	0	1
	PA	1	1	0
	UDC	1	1	0
	LDC	2	2+1*	0
	<b>Total</b>	<b>13</b>	<b>6+1*</b>	<b>7</b>
	SSS	13	11	2
	<b>Total</b>	<b>13</b>	<b>11</b>	<b>2</b>
	<b>Grand Total (A)+(B)+(C)</b>	<b>52</b>	<b>34+1*</b>	<b>18</b>

\* In position but post not sanctioned in revised cadre review.



## Priority Setting and Management

The ICAR - National Research Centre on Mithun (NRC on Mithun) operates under the guidance of several advisory committees to ensure effective management and strategic direction. The Research Advisory Committee (RAC) plays a pivotal role in setting research priorities and guiding the Institute's research agenda. The Quinquennial Review Team (QRT) periodically evaluates the Institute's performance and provides recommendations for improvement. Additionally, internal committees such as the Institute Management Committee (IMC) and various other functional committees contribute to the decentralized management of the Institute. In addition to the RAC and QRT, NRC on Mithun has several other functional committees to ensure smooth operations and effective management. These include but are not limited to:

- Institute Animal Ethics Committee (IAEC)
- Institute Biosafety Committee (IBSC)
- Institute Technology Management Committee (ITMC)
- Technical Evaluation Committee (TEC)
- Purchase Advisory Committee (PAC)
- Official Language Implementation Cell (Hindi Cell)
- Women Cell
- Grievance Cell
- Priority Setting Monitoring and Evaluation Cell (PME Cell)
- Library Cell

### Vision

To preserve, conserve and propagate superior quality Mithun germplasm for a sustainable production system and subsequent utilization for better nutritional and socio-economic support to the farmers.

### Mission

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

### Mandate

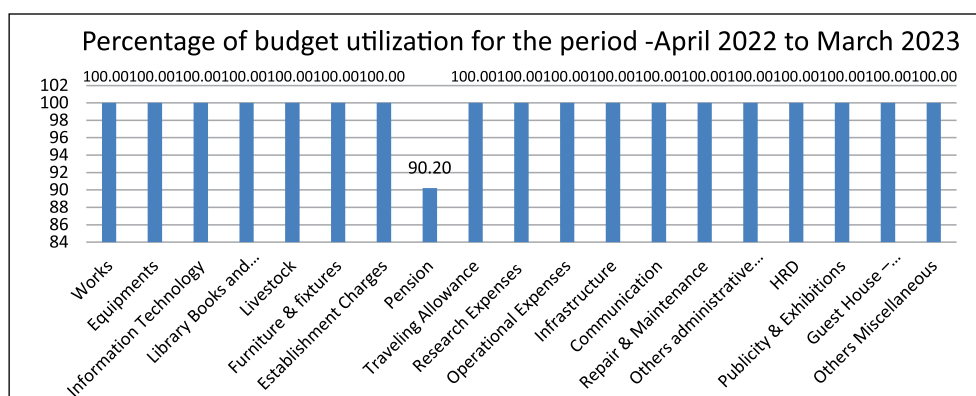
- Identification, evaluation, and characterization of Mithun germplasm available in the country
- Conservation and improvement of Mithun for meat and milk
- To act as a repository of information on Mithun

## Expenditure statement and revenue generation

Table 1: Revised Budget Estimate vis-à-vis Expenditure for FY 2022-23 (April 2022 to March 2023)

(Amount in lakhs)

S. No	Head	Revised Estimate 2022-23	Expenditure
<b>A</b>	<b>Grant in Aid Capital</b>		
1	Works ( Office Building & Minor Works)	45.30	45.30
2	Equipments	49.80	49.80
3	Information Technology	3.18	3.18
4	Library Books and Journals	0.20	0.20
5	Vehicles & Vessels	0.00	0.00
6	Livestock	2.50	2.50
7	Furniture & fixtures	3.93	3.93
<b>Total Grant in Aid Capital (A)</b>		<b>104.90</b>	<b>104.90</b>
<b>B</b>	<b>Establishment Charges</b>	<b>432.29</b>	<b>432.29</b>
<b>C</b>	<b>Pension &amp; other Retirement Benefits</b>	<b>20.5</b>	<b>18.49</b>
<b>D</b>	<b>Grant in Aid General</b>		
1	Traveling Allowance	11.85	11.85
2	Research Expenses	59.52	59.52
3	Operational Expenses	169.29	169.29
4	Infrastructure	39.67	39.67
5	Communication	0.08	0.08
6	Repair & Maintenance (Vehicle, Equipments, Office Building, Residential building & Minor Works)	64.54	64.54
7	Others administrative Expenditure (excluding TA)	130.64	130.64
8	HRD	4.60	4.60
9	Publicity & Exhibitions	9.15	9.15
10	Guest House - Maintenance	0.45	0.45
11	Others Miscellaneous	0.22	0.22
<b>Total Grant in Aid General (D)</b>		<b>490.00</b>	<b>490.00</b>
<b>Grand Total (A+B+C+D)</b>		<b>1047.69</b>	<b>1045.68</b>

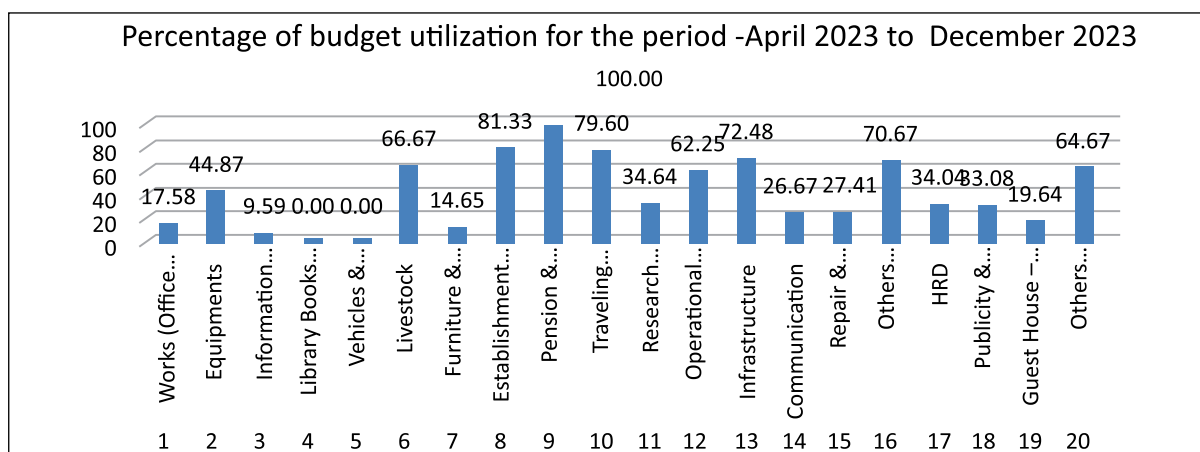




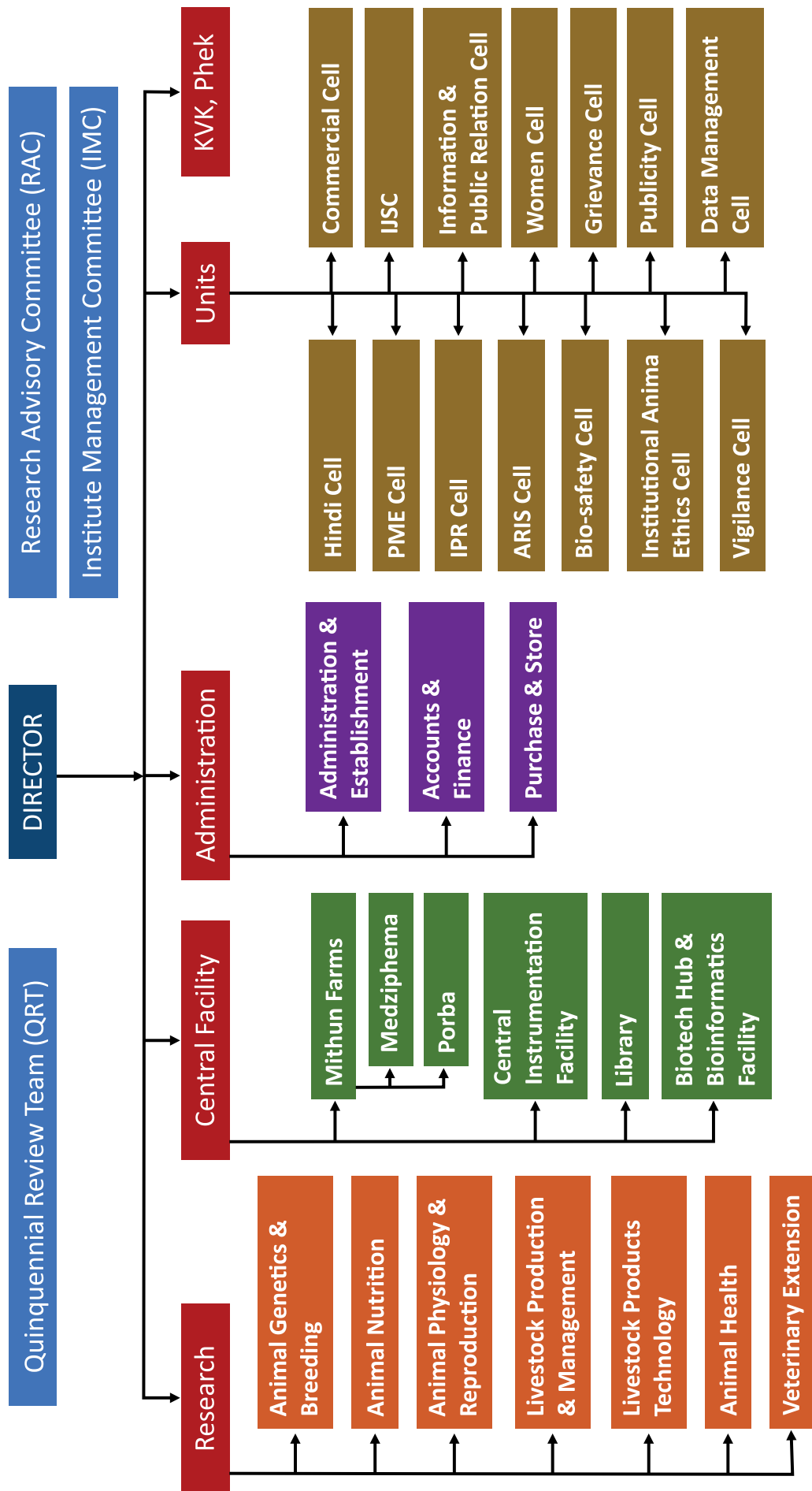
**Table 2: Revised Budget Estimate vis-à-vis Expenditure for FY 2023-24 (April 2023 to December 2023)**

(Amount in lakhs)

S.No	Head	Revised Budget Estimate 2023-24	Expenditure
<b>A</b>	<b>Grant in Aid Capital</b>		
1	Works ( Office Building & Minor Works)	64.89	11.41
2	Equipments	44.57	20.00
3	Information Technology	7.82	0.75
4	Library Books and Journals	0.30	0.00
5	Vehicles & Vessels	2.00	0.00
6	Livestock	7.50	5.00
7	Furniture & fixtures	7.92	1.16
<b>Total Grant in Aid Capital (A)</b>		<b>135.00</b>	<b>38.32</b>
<b>B</b>	<b>Establishment Charges</b>	<b>509.62</b>	<b>414.45</b>
<b>C</b>	<b>Pension &amp; other Retirement Benefits</b>	<b>22.54</b>	<b>22.54</b>
<b>D</b>	<b>Grant in Aid General</b>		
1	Traveling Allowance	15.00	11.94
2	Research Expenses	66.59	23.07
3	Operational Expenses	244.16	152.00
4	Infrastructure	41.13	29.81
5	Communication	0.30	0.08
6	Repair & Maintenance (Vehicle, Equipments, Office Building, Residential building & Minor Works)	116.97	32.06
7	Others administrative Expenditure (excluding TA)	140.50	99.29
8	HRD	8.05	2.74
9	Publicity & Exhibitions	18.74	6.20
10	Guest House - Maintenance	0.56	0.11
11	Others Miscellaneous	3.00	1.94
<b>Total Grant in Aid General (D)</b>		<b>655.00</b>	<b>359.24</b>
<b>Grand Total (A+B+C+D)</b>		<b>1322.16</b>	<b>834.55</b>



# Organizational Setup



# PHYSICAL PROGRESS



LARGE ANIMAL ECTOPARASITE EXPELLER CUM DRUG APPLICATOR



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## Physical Progress

### Fodder museum and demonstration plot

A fodder museum cum demonstration plot was developed which was inaugurated by Dr. B. N. Tripathi, DDG (AS) ICAR, Krishi Bhavan, New Delhi on 12<sup>th</sup> April 2023. Production of green forages during the reported year was very encouraging as the productivity per unit shows more than average yield of the reported data on the application of FYM. To showcase different fodder crops, demonstration plot for fodder was established at Mithun Farm, Medziphema, Nagaland. The major fodder varieties grown in the farm are:

- Hybrid Napier (*Cenchrus purpureus*)
- Congo signal (*Brachiaria ausizensis*)
- Guinea Grass (*Megathusus maximus*)
- Lucerne (*Medicago sativa*)
- Oats (*Avena sativa*)
- Khavu (*Ficus hookerii*)
- Thumero (*Careya arborea*)
- Tego (*Bahunia purpurea*)



### Amrit Vatika

Amrit vatika has also been developed in one hectare area in the Mithun Farm where a variety of fodder trees were planted. The total green biomass produced in 2023 was 2150 quintals.





Establishment of Mithun meat & milk sales counter



Completion of Institute compound wall



Establishment of officer's quarters at Porba sub-campus



Completed renovation and painting of the Mithun Farm at Porba Station



Repair and rejuvenation of the bore well at Medziphema Campus



Water filtration unit at Medziphema, Nagaland



Construction of the retention wall in Porba station to prevent landslide

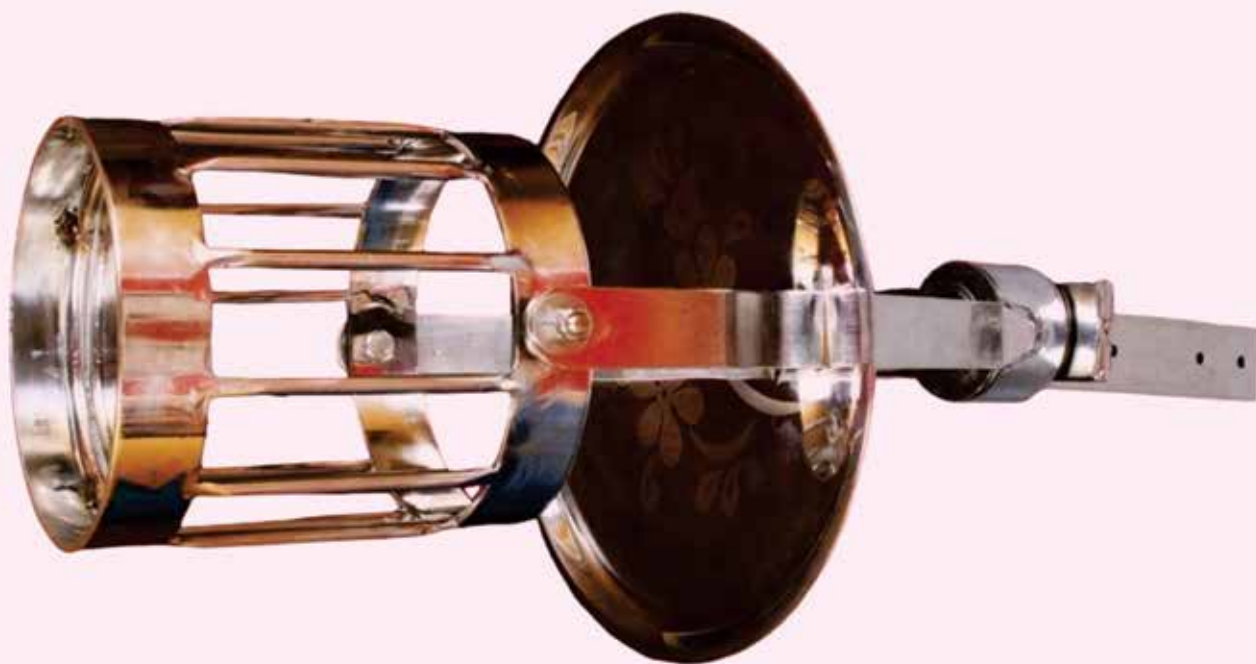


Museum established for scientific Mithun husbandry



Lab constructed for NABL accreditation

# RESEARCH PROJECTS



DESERVE MINERAL BLOCK DISPENSER FOR MITHUN, CATTLE AND BUFFALO



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ICAR - NRC on Mithun

## Research projects

### ANIMAL GENETICS & BREEDING SECTION

#### EXPLORING THE GENETIC ARCHITECTURE OF UNIQUE MITHUN POPULATIONS IN NORTH EAST INDIA

PI: Dr. Harshit Kumar

Co-PI: Dr. S S Hanah, Dr. Vikram R, Dr. Kobu Khate, Dr. Kezhavituo Vupru, Dr. Girish Patil, S.

#### Genetic Parameters and Correlations of Body Weight Traits in Mithun (*Bos frontalis*) using Animal Model

This research on Mithun body weight traits in Northeast India is a pioneering effort, utilizing data from the Mithun farm at our Institute over a decade. The study employed a univariate animal model to estimate genetic parameters, emphasizing heritability, and correlation. The amassed dataset encompasses information pertaining to 110 white socks Mithun animals, spanning multiple generations and covering a decade-long period from 2011 to 2022. These animals were born from 4 sires and 35 dams. The particulars, inclusive of animal codes and their parentage details (sire and dam records), were meticulously extracted from historical pedigree sheets meticulously maintained at the farm over a five-year span from 2017 to 2022. Additional data included essential details such as the date of birth, gender, and litter size. The recorded information specifically focused on the body weight of calves at eight distinct ages: 1 week (W1), 1 month (M1), 3 months (M3), 6 months (M6; weaning weight), 9 months (M9), 12 months (M12), 30 months (M30), and 45 months (M45; slaughter weight). The assessment of body weight was conducted using a calibrated digital balance (supplied by BR Life Sciences Pvt. Lmt., New Delhi, India – AEQUIP004 digital weighing balance – 1000 kg). Furthermore, the dataset underwent classification based on the season of birth (summer: March to May, rainy: June to September, winter: October to February), the period of birth spanning 12 years (2011-2022), and the gender of the animals (male and female). This meticulous categorization serves to enhance the granularity of the dataset and enables a comprehensive exploration of potential patterns and correlations.

**Heritability Estimates:** Heritability varied across developmental stages, ranging from 0.46564 to 0.49800. Month 12 exhibited the highest heritability (0.59207), indicating substantial genetic influence, while Month 9 also showed high heritability (0.54736).

**Comparative Analysis:** Comparison with prior research revealed unique genetic factors in Mithun body weight. The study reported higher heritability for early stages (W1 and M1) compared to previous estimates, suggesting a stronger genetic impact on early growth.

**Correlation Patterns:** Strong genetic and phenotypic interdependence between adjacent stages was observed. Notably, Month 9 exhibited lower genetic correlations with earlier stages, indicating nuanced genetic influence.

**Breeding Strategies:** The study suggests potential for genetic improvement through selective breeding, particularly targeting Month 12 and Month 9 body weights. The choice of selection should align with specific breeding goals and economic considerations.



In conclusion, this research contributes valuable insights into the genetic architecture of Mithun body weight traits, offering a foundation for informed breeding strategies in the region.

**Table 3: Variance components and heritability estimates for different body weight traits under study**

Time points of data recording	Additive genetic variance ( $\sigma^2a$ )	Residual variance ( $\sigma^2a$ )	Phenotypic variance ( $\sigma^2a$ )	Heritability estimates ( $h^2$ )
Week 1	6.52	7.16	13.69	0.46564 ± 0.0049882
Month 1	12.17	17.40	29.57	0.40146 ± 0.0055439
Month 3	51.10	111.83	162.93	0.30077 ± 0.0046351
Month 6	184.80	301.97	486.77	0.36719 ± 0.0051555
Month 9	444.98	359.35	804.33	0.54736 ± 0.004778
Month 12	573.61	389.10	962.71	0.59207 ± 0.0048375
Month 30	2607.80	2048.70	4656.50	0.55431 ± 0.0050992
Month 45	2778.50	2754.60	5533.10	0.49800 ± 0.0042941

$h^2 \pm MCE$ , MCE = monte carlo error

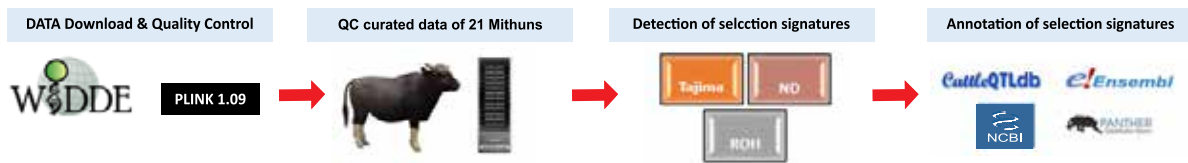
**Table 4: Genetic (upper diagonal) and phenotypic (lower diagonal) correlation estimates for different trait combinations**

Trait	Week 1	Month 1	Month 3	Month 6	Month 9	Month 12	Month 30	Month 45
Week 1	1	0.738	0.576	0.600	0.396	0.323	0.265	0.336
Month 1	0.726	1	0.0786	0.124	0.237	0.244	0.310	0.358
Month 3	0.606	0.822	1	0.079	0.231	0.242	0.311	0.339
Month 6	0.494	0.667	0.899	1	0.157	0.171	0.289	0.322
Month 9	0.437	0.524	0.633	0.752	1	0.031	0.299	0.300
Month 12	0.362	0.509	0.563	0.692	0.945	1	0.296	0.292
Month 30	0.351	0.305	0.331	0.505	0.555	0.573	1	0.217
Month 45	0.400	0.046	0.150	0.459	0.408	0.444	0.944	1

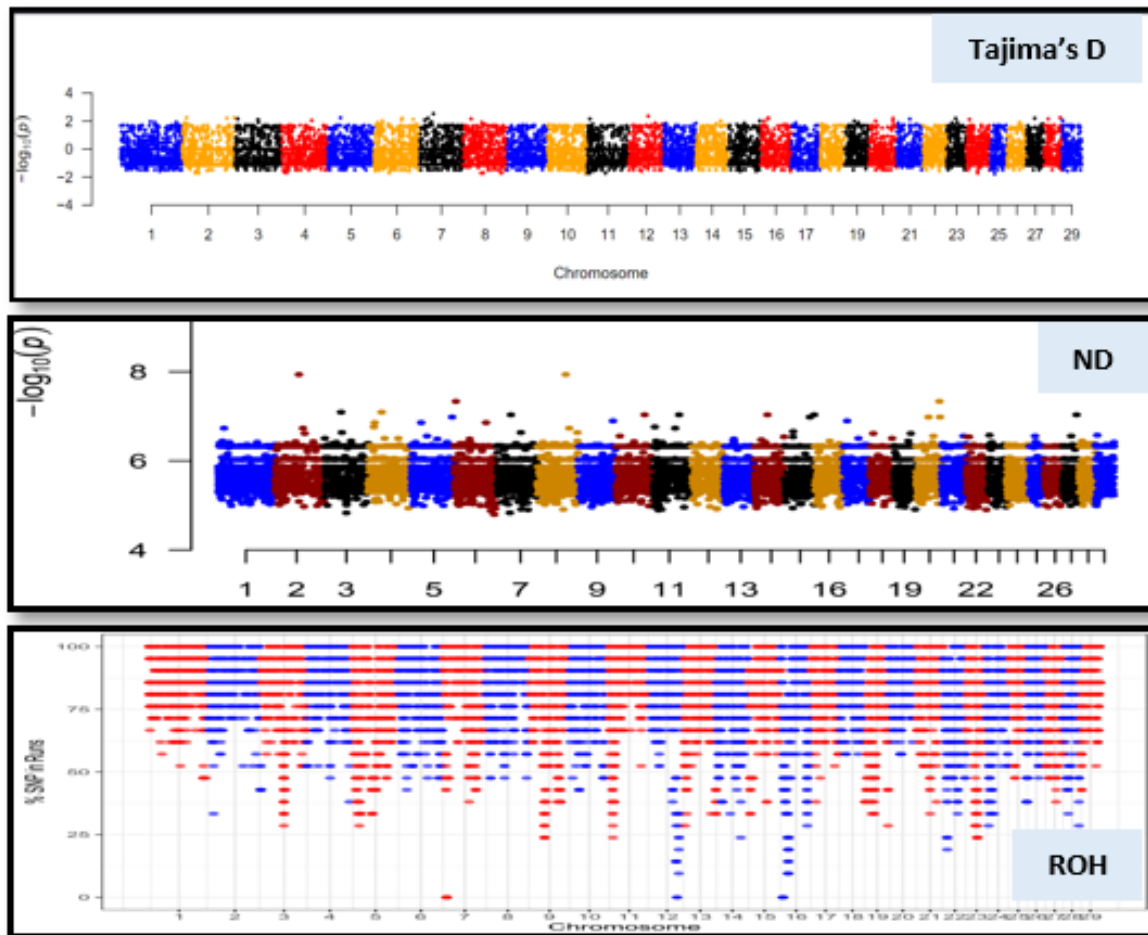
### Detection of selection signatures in Mithun (*Bos frontalis*) using 50K SNP array data

Domestication and artificial selection are the major driving forces responsible for the determinative and huge genetic variability in modern day bovinds. *Mithun (Bos frontalis)* has distinct genetic makeup and immune responses reflect its exceptional capacity to withstand local environmental challenges and pathogen pressures, setting it apart as a truly unique bovine species. These distinctive attributes have emerged from the unique genetic imprints etched within its genome, shaped by years of selective pressures and adaptation. For such candidate gene discovery important to its adaptation and evolution, Illumina Bovine 50k bead chip data was obtained WIDDE (Web - Interfaced next generation Database dedicated to genetic Diversity Exploration) (<http://widde.toulouse.inra.fr/widde/>). Data from 21 Mithuns were analyzed in the present study using intra-population summary statistics. Three complementary approaches, including Tajima's D, Runs of Homozygosity (ROH), and Nucleotide Diversity, were utilized to uncover selection signatures (methodology shown in Figure below). The subsequent Figure describes the Manhattan plot out of these three methods. In total, 248 (200), 397 (352), and 146 (138) genetic regions unveiled candidate genes as identified by the respective methods of Tajima's D, ROH, and Nucleotide Diversity. We found several candidate

genes related to meat production traits (*MEF2C*, *MYOD1*, and *RYR3*) and the adaptation of Mithun to suit its ecological habitat in forest (*EPHA5*, *GPR39*, and *SLC24A3*) and environmental constraints such as high altitude and cold temperatures (*NOS3*, *ADRB2*, and *PDPK1*). Investigation of immune-related gene selection in the Mithun genome reveals potential adaptations to local environmental challenges and pathogen pressures especially insects and ticks (*CCR1*, *IL6*, *IL22*, and *CD25*), shedding light on the genetic basis of immune resilience in this unique bovine species. Furthermore, selection signals are found to be part of different quantitative trait loci (QTLs) associated with important traits. However, further studies are warranted to refine the findings using a larger sample size, whole-genome sequencing, and/or high density genotyping.



Methodology for detecting selection signature in Mithun using SNP 50K array data



Description of the Manhattan plot out of these three methods

### Establishment of two Mithun conservation units at Khonoma, Kohima & Thevopisu, Phek

The Thevopisu unit was established for promoting semi-intensive Mithun farming with a budget of Rs 5526, 903/-. The completely tubular fenced facility has sheds for holding Mithun, farm office, laboratory space and feed storage unit.



Conservation and propagation unit of Mithun at Thevopisu, Phek district, Nagaland

The Khonoma unit was established for promoting semi intensive Mithun farming with a budget of Rs 48, 09,156/-. The completely tubular fenced facility has sheds for holding Mithun, farm office, laboratory space and feed storage unit.



Conservation and Propagation unit of Mithun at Khonoma, Kohima district

### Conservation and preservation of Arunachali Mithuns (Convex headed; *Tuppe*) & Manipuri Mithuns (Black socks; *Gwimie*) at ICAR – NRCM Mithun farm, Medziphema

The conservation and preservation of Arunachali Mithuns (known as Tuppe) and Manipuri Mithuns (referred to as Gwimie) at the ICAR – National Research Centre on Mithun (NRCM) farm in Medziphema represent crucial efforts in safeguarding the unique biodiversity of the Northeast region of India. These endeavors are essential not only for maintaining genetic diversity but also for understanding the ecological and cultural significance of these magnificent animals.



A female Arunachali Mithun being conserved at Mithun farm, Medziphema



A female Manipuri Black socks Mithun with calf at foot being conserved at Mithun farm, Medziphema

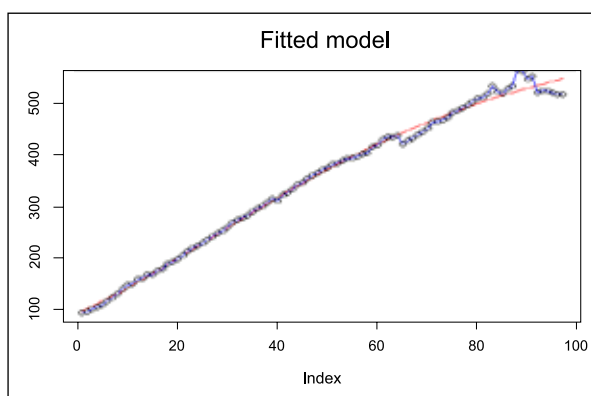
### ANIMAL NUTRITION SECTION

#### Determination Of Energy And Protein Requirements For Mithun

PI: Dr. Nazrul Haque

Co-PI: Dr. Sapunii Stephen Hanah, Dr. Kezhavitoo Vupru

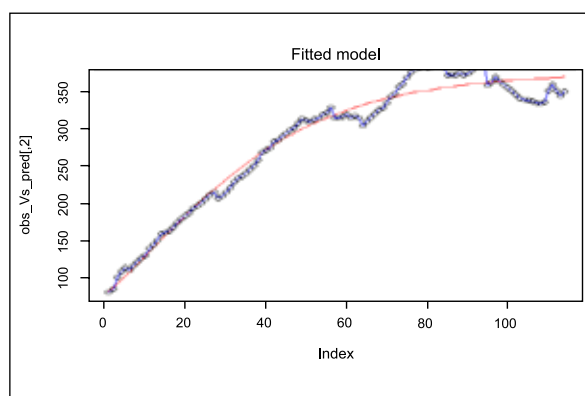
Eighteen Mithun calves of six months of age were divided into 3 groups of 6 animals in each and fed on 3 levels of energy either at 100, 125 or 150 % of ICAR recommendation in groups me, II and III, respectively determining the growth curve, feed efficiency and energy requirements of at different stages of growth. Daily feed intake and fortnightly bodyweight have been recorded. Overall, the sigmoid growth curves growth curves have been developed using Gompertz model for male and female Mithun recording the data for 100 fortnights as follows:



Growth curve for male  
Fortnight

Formula: Body wt. (kg) =  $k * \exp(\log(y_0/k) * \exp(-r * \text{Age}))$

Where,  $k = 5.108e+02$ ,  $y_0 = 4.190e+01$ ,  $r = 2.883e-02$ , age in fortnight

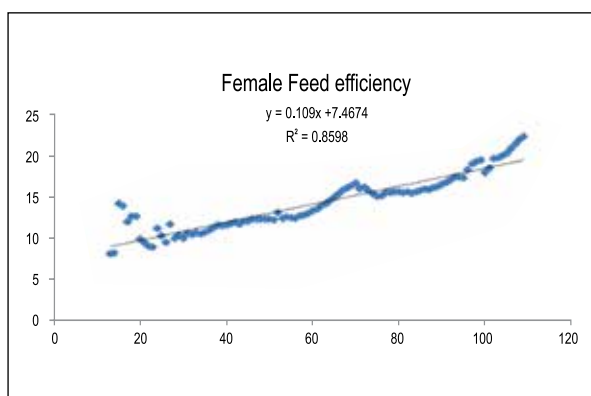


Age (Fortnight)  
Growth curve for female

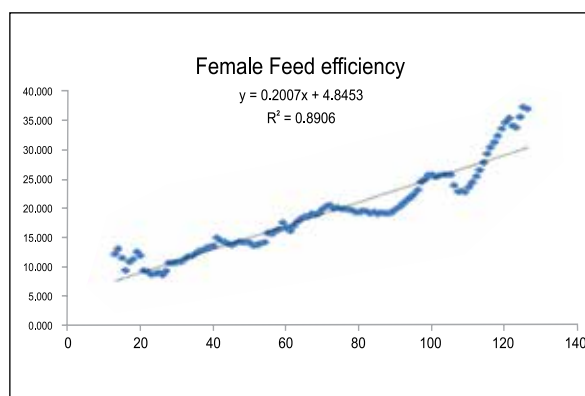
Formula: Body. (Kg) =  $k * \exp(\log(y_0/k) * \exp(-r * \text{Age}))$

Where,  $k = 6.483e+02$ ,  $y_0 = 4.550e+01$ ,  $r = 2.513e-02$ , age in fortnight

From these curves the body weight and growth rate of animals can be determined at different age groups.



Age (Fortnight)  
Feed consumed (kg) /kg gain



Age (Fortnight)  
Feed consumed (kg) /kg gain

Using these growth curves, feed conversion ratio and cost of feeds optimal age for slaughtering of animals can be determined.

## DEVELOPMENT OF PACKAGE OF PRACTICES FOR SUSTAINABLE ORGANIC MITHUN PRODUCTION

PI: Dr. Nazrul Haque

Co-PI: Dr. Ragulraj, Dr. T. Esther Longkumer, Dr. Hannah K. Asangla, Dr. Girish Patil, S

With an objective convert the farm land with an area of 200 acre, located at Porba, Phek district and assessment of productivity per unit area of cultivated as well as naturally grown fodders, the farm has been registered with Agricultural and Processed Food Products Export Development Authority (APEDA) through Sikkim State Organic Certification Agency (SSOCA). As part of the programme, a scope certificate has been received for conversion of the farm specially the feeds and fodders grown in the farm. Initially an area of 2 hectare inedible vegetation has been cleaned and land prepared sown cow pea and rice bean. Napier and broom grass has been planted and a nursery has been developed for of locally available tree fodder i.e. Khabu (*Ficus hookerii*), Wild cherry (*Prunus cerasoides*) and Wild apple (*Malus sylvestris*). The nitrogen, phosphorus and potassium content of soil before sowing cow pea and rice bean has been assessed and determined to be  $163.1 \pm 12.55$ ,  $33.4 \pm 4.30$  and  $342.7 \pm 59.7$  kg per hectare. Sub-fencing has been started in that area for assessing the productivity of naturally grown fodders and carrying capacity of that area in terms Mithun rearing.



Inedible vegetation before cleaning the land



Cleaned area



Area cultivated with rice bean and cowpea



Fodder nursery developed for *Malus sylvestris* (wild apple), *Ficus hookerii* and *Prunus cerasoides* (wild cherry)



Scope Certificate

Certificate No. **ORG/SC/0000/000000**

ICAR-NRC on Mithun  
Porba, Pflatsern, Phok, Nagaland-797107



Accreditation No under NPOP  
NPOP/NAR/0021

This is to certify that the product(s) and area(s) of the mentioned organisation inspected by Sikkim State Organic Certification Agency (SSOCA) are in accordance with requirements of

**India's National Programme for Organic Production Standards**

(Considered equivalent to Council regulation (EC)No. 834/2007(Category A & F) and Swiss Organic Farming Ordinance for unprocessed plant products originating in India)

For the following process, **Production** this Certificate is issued. This certificate is valid from **24/03/2023** until **23/03/2024**

This certificate is valid for those product(s) and area(s) that are specified in the annex **ORG/SC/0000/000000 A.**

The validity of this certificate solely depends on the continued compliance with the required standards and is subject to annual surveillance inspections.

Authorised By:  
Binita Chhetri  
Quality Manager  
Issued Date: 24/03/2023



1121 34567890



Organic certification for Porba farm



## ANIMAL HEALTH SECTION

MOLECULAR SCREENING OF TICK VECTORS AND THE HOST MITHUN (*Bos frontalis*) FOR HAEMOPARASITES IN THE STATES OF NAGALAND AND ARUNACHAL PRADESH

PI: Dr. J.K. Chamuah

Co-PI: Dr's H. Lalzampaia, Kobu Khate

**First Report of Ikeda genotype of *Theileria orientalis* in Mithun (*Bos frontalis*) from North eastern hilly region of India**

Oriental theileriosis caused by *Theileria orientalis*, previously considered as a benign disease, is posing a significant threat to the livestock industry across the globe. To elucidate the prevalence of *Theileria orientalis* in ticks and their host, the Mithun, a comprehensive study was undertaken in the two Northeastern states of India viz., Nagaland and Arunachal Pradesh. A total of 365 ticks were collected from these regions, consisting of 252 ticks from Nagaland and 88 ticks from Arunachal Pradesh. These collected ticks underwent morphological identification using established reference keys. The salivary glands of these ticks were meticulously dissected for further analysis. A total of 275 whole blood samples were obtained from Mithun, with 206 samples collected from Nagaland and 69 from Arunachal Pradesh. Genomic DNA was extracted from the Mithun blood samples, tick salivary glands, and whole tick tissues following the manufacturer's guidelines using a commercial genomic DNA extraction kit (FavorPrep Genomic DNA mini kit). The quality and quantity of the purified genomic DNA were evaluated using a UV spectrophotometer and subsequently stored at -20 °C for future research purposes. The total genomic DNA samples extracted from blood, tick salivary glands, and tick tissues were used for PCR amplification targeting the *mosp* (merozoite piroplasm surface protein) gene, following established literature protocols with minor adjustments. The PCR procedure was standardized, involving an initial denaturation step at 95 °C for 2 minutes, followed by 35 cycles at 95 °C for 15 seconds, 57 °C for 30 seconds, and 72 °C for 1 minute, with a final extension at 72 °C for 10 minutes. These PCR reactions were conducted in 25 µl volumes using a standard primer set (TorF1: 5'-CTT TGCCTAGGATACTTCCT-3'; TorR1: 5'-ACGGCAAGTGGTGAG AACT-3') as described by Kamau et al. (2011). In the current study, the genomic DNA collected from *T. orientalis* positive cattle was used as the positive control. The resulting PCR amplicons were subsequently subjected to electrophoresis on a 1.2% agarose gel that had been stained with ethidium bromide. After electrophoresis, the gel was exposed to ultraviolet (UV) transillumination, and the DNA bands were visualized. Finally, for further analysis, the PCR amplicons were sent to the University of Delhi, New Delhi, for sequencing.

Sequence alignment searches were executed using the Basic Local Alignment Search Tool (BLAST). *T.orientalis mosp* gene reference sequences obtained from GenBank were aligned with the sequences obtained from our study.

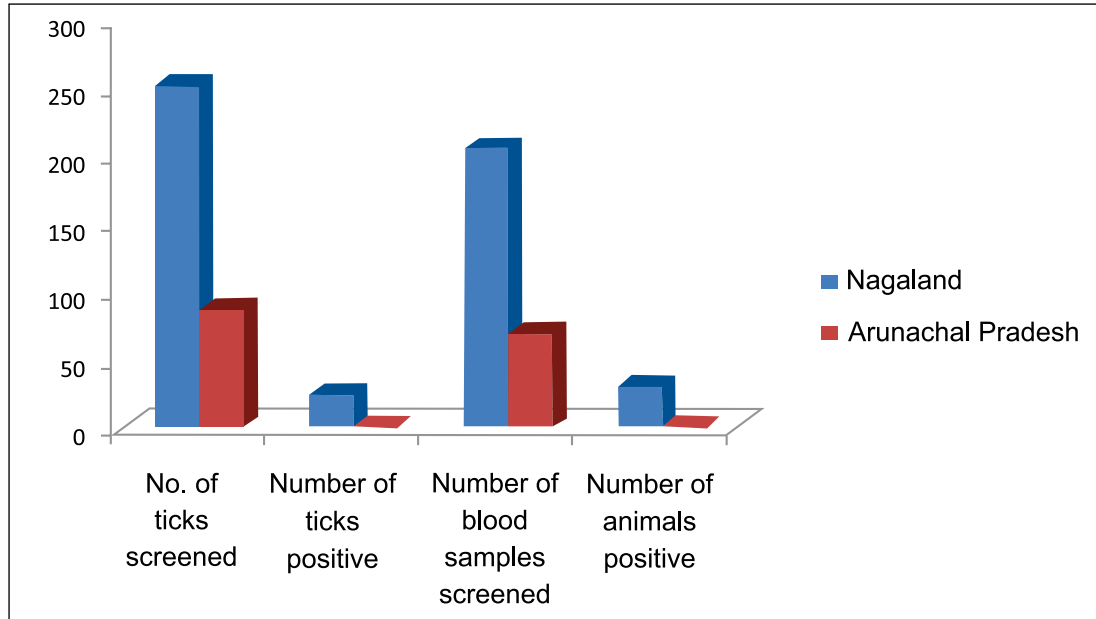
A total of 340 of *Rhipicephalus microplus* ticks and 25 *Amblyomma* sp. ticks were screened for the presence of *T. orientalis* through PCR. Among the *R. microplus* ticks examined, 25 of them tested positive for *T. orientalis* infection whereas none of the *Amblyomma* ticks were positive. Additionally, a total of 275 blood samples were collected from Mithun from Arunachal and Nagaland and 31 animals were found to be positive for *T. orientalis* infection. Notably, six positive cases were identified in Porba (Phek district), six in Tening, and one in Bamsiakilwa village (Peren district) of Nagaland. Moreover, out of the 41 animals examined at Medziphema farms, Nagaland, 18 were found to be positive for *T. orientalis* infection. Moreover, the phylogenetic investigation has unveiled the presence of the highly pathogenic Type 2 (Ikeda) *T. orientalis*

genotype in Mithun, supported by a strong bootstrap value of 100%. This study marks the initial documentation of oriental theileriosis in Mithun. It underscores the need for vigilant monitoring and active surveillance of Mithun populations in the Northeastern states of India. Timely treatment of infected animals is imperative to avert economic losses for the farmers.

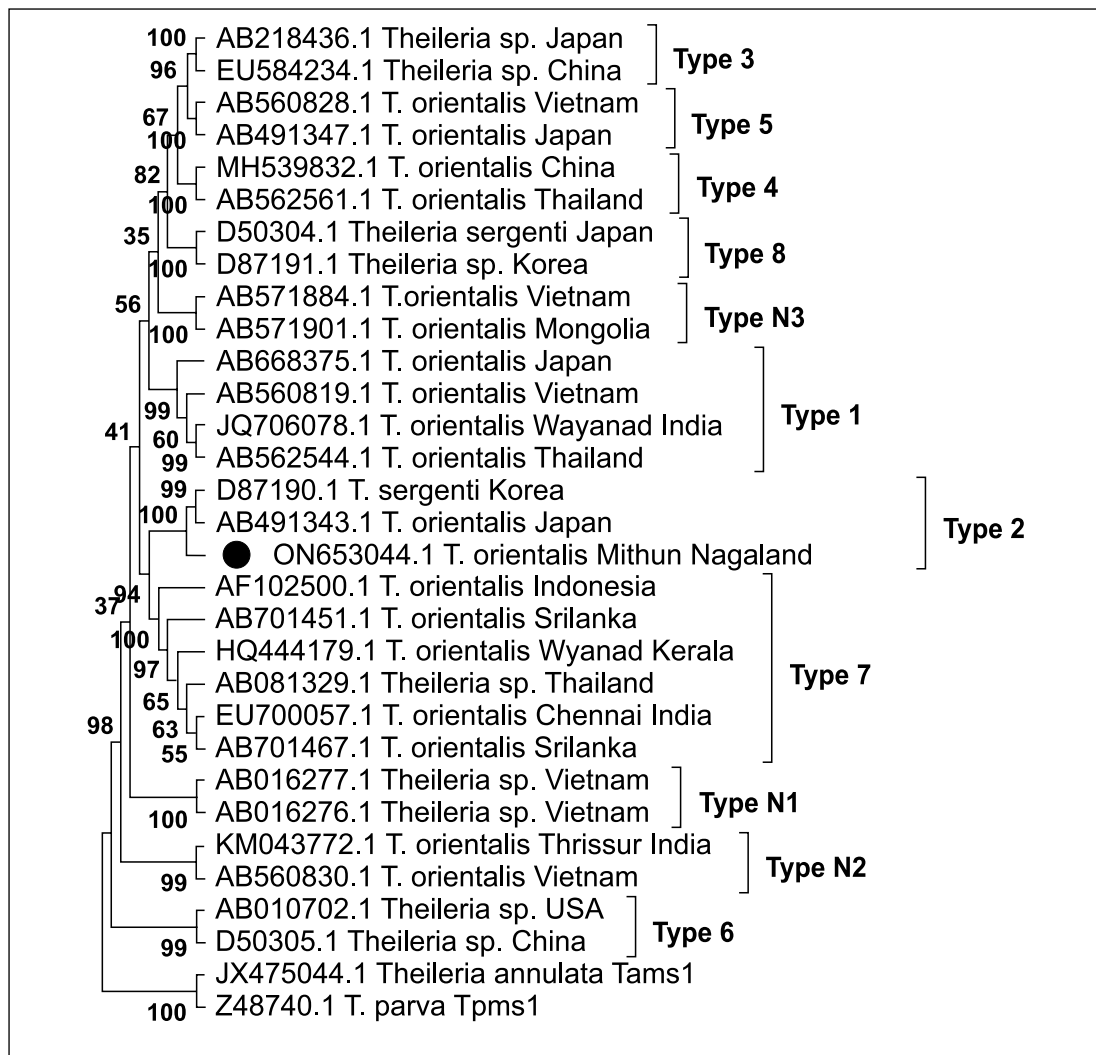
**Table 5: Screening of ticks and blood for the presence of *T. orientalis* by PCR methods**

State	Ticks ( <i>Rhipicephalus microplus</i> ) screened for <i>T. orientalis</i>			Whole blood of Animals examined for <i>T. orientalis</i>		
	Name of places	No. of ticks screened	Number of ticks positive (Figure in parenthesis indicate in percentage of infection)	Name of places	Number of blood samples screened	Number of animals positive (Figure in parenthesis indicate in percentage of infection)
Nagaland	Peren district (Tening village)	30	01 (3.33%)	Peren district (Tening village)	31	06 (19.35%)
	Peren district (Pungluwa village)	90	08 (8.88%)	Chumoukedima district (Medziphema)	41	18 (43.90%)
	Peren district (Bamsiakilwa Village)	25	Negative	Peren district (Bamsiakilwa Village)	8	01 (12.5%) positive
	Kohima district (Khonoma village)	47	Negative	Kohima district (Khonoma village)	53	Negative
	Phek district (Porba village)	60	16 (10%)	Phek district (Porba and Upper Khomi and Middle Khomi and Thevopisu Village)	73	06 (8.21%)
Arunachal Pradesh	East Siang, Pasighat (Meren village)	63	Negative	East Siang district, Pasighat (Meren village)	43	Negative
	Papumpare (Dorpa village)	25	Negative	Papumpare (Dorpa village)	26	Negative
<b>Total sample screened</b>		<b>340</b>	<b>25 (7.35%) samples showed positive</b>	<b>Total sample screened</b>	<b>275</b>	<b>31 (11.27%) samples showed positive</b>





Incidence of *T.orientalis* in ticks and blood of Mithun (*Bos frontalis*)



Phylogenetic analysis by maximum likelihood method using *mmsp* gene sequences of *T.orientalis*. The evolutionary history was inferred using Tamura-3 parameter model. The sequence marked with black solid circle indicates the sequence of the present study. The percentage of replicate tree in which associated taxa clustered together in the bootstrap test with 1000 replicates is shown next to branches.

In the present study, *T.orientalis* Ikeda genotype was documented in Mithun for the first time and the involvement of *R. microplus* ticks as vectors in the transmission of oriental theileriosis. The management of bovine theileriosis primarily revolves around regulating tick populations. *T. orientalis* primarily spreads through ticks, necessitating effective tick infestation control to safeguard the well-being and productivity of Mithun and other domesticated livestock. While conventional methods like acaricides and tick repellents are commonly employed, their efficacy in certain regions remains questionable. Integrated tick management (ITM) provides a holistic strategy incorporating chemical, biological, and physical control methods, alongside sound management practices, to curtail tick populations. This comprehensive approach aims to minimize chemical usage and prevent acaricides resistance.

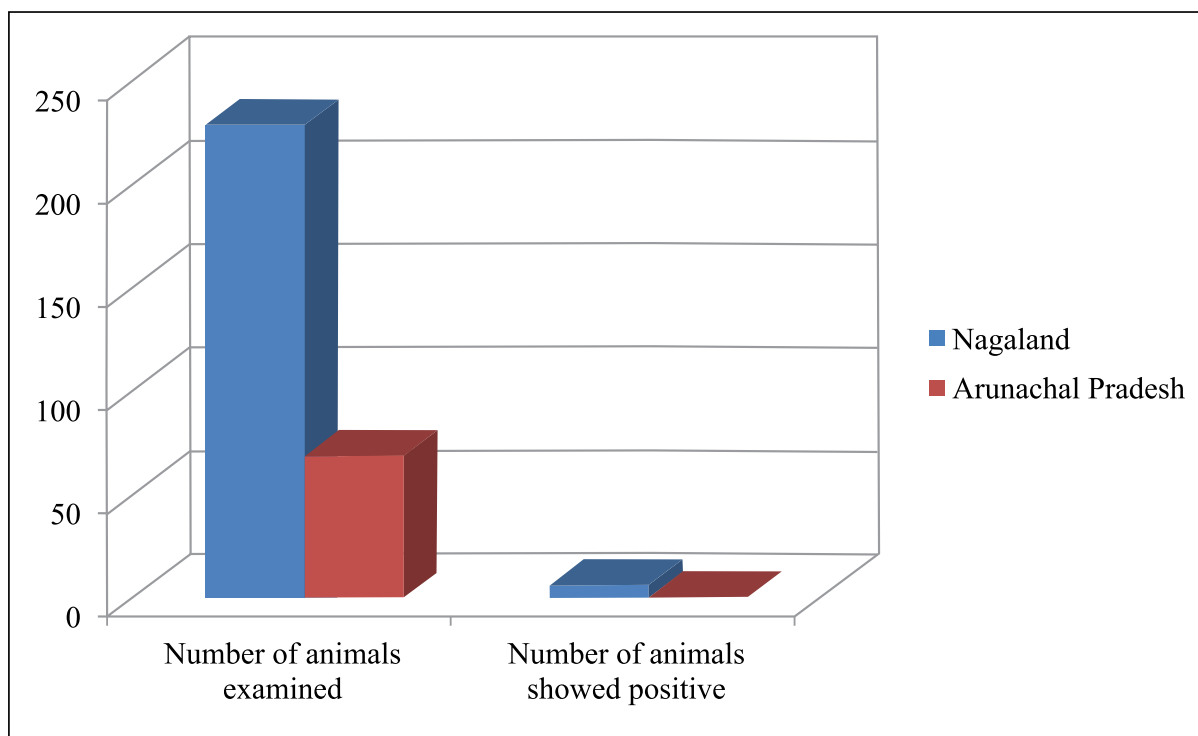
### First Report of Anaplasma species in Mithun (*Bos frontalis*) from North eastern Hilly region of India

In order to screen against the prevalence of Anaplasma parasites in ticks and the host Mithun through PCR in the states of Nagaland and Arunachal Pradesh, a total of 340 samples of *Rhipicephalus microplus* and 25 samples of *Amblyomma* ticks were screened from 2020 to 2023. These ticks were collected from various Mithun-inhabiting areas in Arunachal Pradesh and Nagaland. Ticks parasitizing Mithun in different study areas were collected, and salivary glands were dissected from these ticks. Total genomic DNA was extracted using a commercial genomic DNA extraction kit in accordance with the manufacturer's instructions (FavorPrep Genomic DNA mini kit - blood/cultured cell 100 preps). For Anaplasma infection in Mithun, genomic DNA was prepared from the blood of host animals and tick vector and DNA concentration was measured in a Nano-drop spectrophotometer. The genomic DNA was subjected to PCR amplification of 160 bp of merozoite piroplasm surface protein and the cycle was performed at 95°C, 1 min, 95°C, 1 min, 55°C, 1 min, 73°C, 1.5 min and 73°C, 15 min for 25µl of reaction with standard primer (Am: F1:5'-CAC ATT TCTTGG AGC TGG-3' and Am: R1:5'-TCT CTG GCACTT TGAACC-3' Figuerao *et al.*, 1993). The PCR amplicons were subjected to electrophoresis using a 1.0% agarose gel stained with ethidium bromide, docked in a UV transilluminator and subsequently sequenced from the University of Delhi, New Delhi. During the examination, only one sample showed positive for parasites out of 340 numbers of *Rhipicephalus microplus* tick samples screened. However, none of the samples of *Amblyomma* ticks showed positive for infection. A total of 298 numbers of animals' blood were examined from both Arunachal and Nagaland for Anaplasma species. During the investigations, only six samples showed positive for Anaplasma species PCR methods. Out of which, six animals were positive, three samples were from Thevopisu village, One from Peren district, one from Kohima and one from Medziphema (Chumukeidma). As a whole, 6 (2.01%) showed positives out of 298 animals examined for Anaplasma species in Mithun from North eastern hilly region of India.

**Table 6: Screening of whole blood for the presence of Anaplasma spp.**

State	Name of places	No. of blood samples screened	PCR amplification For <i>A. marginale</i>
Nagaland	Phek district (Porba and Upper Khomi and Middle Khomi and Thevopisu Village, Thetsumi village)	96	03 (3.70%) positives from Thevovisu village
	Peren district (Tening)	31	01 (9.67%)
	Bamsiakilwa village	8	Negative
	Kohima (Khonoma)	53	01 (1.96%) positive

State	Name of places	No. of blood samples screened	PCR amplification For <i>A. marginale</i>
	Medziphema	41	01 (2.43%) positive
Arunachal Pradesh	Pasighat	24	Negative
	Doimukh	19	Negative
	Papumpare	26	Negative
	<b>Total</b>	<b>298</b>	<b>6 (2.01%) showed positive</b>



Prevalence of Anaplasma species in the bloods of Mithun (*Bos frontalis*)

In order to have serological preview, a total of 42 samples examined from Tenin and Porba village of Phek district, showed positive for *Anaplasma marginale* by ELISA Kit. During the examination, only a total of five samples showed positive for the antibody of parasites.

Table 7: Serological screening of Anaplasma Antibody

State	Name of places	Serum sample screened by ELISA	Anaplasma
Nagaland	Peren district (Tening)	23	(21.73%) Positive
Nagaland	Porba village (Phek district)	19	Negative
	<b>Total</b>	<b>42</b>	<b>5 (11.90%)</b>

Anaplasmosis causes reduced productivity in animals and economic losses for the farmers. Therefore, effective therapeutic and preventive measures are needed to control Anaplasma infections, particularly in high-risk areas, in order to improve the economic benefits of dairy farming.

## DEVELOPMENT OF ARTIFICIAL INTELLIGENCE-BASED DIAGNOSIS SYSTEM FOR THE IDENTIFICATION OF HELMINTH PARASITIC INFECTIONS OF MITHUN AND ALLIED BOVINES

PI: Dr. J.K. Chamuah

Co-PI: Dr's H. Lalzampaia, S.S Hanah, Kobu Khate, Girish Patil, S.

### Artificial Intelligence model for diagnosis of helminth Parasites:

Parasites have detrimental effects on animal health and welfare, leading to clinical and subclinical parasitism. While parasitic infections may not always exhibit obvious disease symptoms, they result in reduced production, including slowed growth, decreased appetite and poor feed conversion. Microscopy is a commonly used method to diagnose livestock parasitic infections, but it presents challenges such as being time-consuming, labour-intensive, requiring specialized equipment and trained researchers. The NEH (North Eastern Hill) region of India faces additional difficulties in finding experts promptly due to limited resources and geographical constraints, resulting in economic losses for farmers, including reduced milk output, meat production and occasional animal mortality. To address this problem, a smart system utilizing AI (Artificial Intelligence) could offer a viable solution by accurately identifying and diagnosing parasitic infections. Such a system would mitigate the scarcity of professionals in the NEH region, providing effective identification and diagnostics of parasite management in livestock. Therefore, the NEH region desperately necessitates a different kind of system which can appropriately identify and diagnose the infections in livestock. In past, numerous researchers applied artificial intelligence to identify the diseases as well as for their diagnosis in living beings and in. As the microscopy based parasite identification and quantification is challenging, time consuming and labour intensive, requires microscope and well-trained researchers. But, finding an expert immediately is quite difficult in the NEH region due to a lack of resources and the terrain, which causes farmers to experience economic losses in terms of milk output, meat production, or occasionally animal death. Thus, the hypothesis of present study is that artificial intelligence can be used for the identification of parasitic infections in animals of NEH region as well as can be implemented for their diagnosis too. Thus, the present study is proposed to develop an artificial intelligence-based smart system to identify and diagnose parasitic infections in Mithun and allied domestic bovines.

In this innovative project, we've used the power of computer vision to revolutionize the identification of parasites, specifically focusing on both parasite eggs and adult parasites. Traditionally, such identification relied on human vision, but our project introduces a cutting-edge approach using Convolutional Neural Networks (CNNs) within the realm of computer vision. The application of CNNs facilitates the classification of images, creating a user-friendly model designed to monitor parasitic infections in the livestock of the North East region.

Our project showcases remarkable capabilities, with the ability to identify a diverse array of 18 different parasites. This achievement is made possible through the comprehensive training of the AI model using a rich variety of images representing these 18 parasite types. Feature extraction, a crucial step in this process, is carried out through convolution and ReLu methods. These extracted features are then transformed into a flat layer, seamlessly passing through a fully connected layer for image classification. The final touch involves employing a softmax activation function, yielding a probabilistic distribution for each parasite. This distribution, in turn, serves as the foundation for predicting the identification of the parasite in question. To evaluate the performance of our developed AI model we have used different performance evaluation matrix such as IOU, Precision, Recall and F1.

By leveraging computer vision and sophisticated AI techniques, our project not only automates and enhances the identification process but also contributes to monitoring parasitic infections in livestock effectively. The utilization of CNNs, coupled with a diverse training dataset, ensures the robustness and accuracy of our model in discerning among various parasitic species, ultimately benefiting the agricultural landscape of the North East region.

## INNOVATIVE INTERVENTIONS FOR PROMOTION OF THE MEAT SECTOR IN NORTH EASTERN REGION

**Project Coordinator: Dr. Girish Patil, S.**

**PI: Dr. J.K. Chamuah**

**Co-PIs: Dr's Vikram R, Jyoti, Kobu Khate, and Kezhavituo Vupru**

This survey serves as a foundation for strategizing the promotion of livestock production and meat processing as sustainable livelihood activities in the region. In line with these goals, the initiative is actively engaged in organizing awareness campaigns, capacity-building programs, and activities to promote entrepreneurship in the NER. As part of the initial steps, a baseline survey involving 23 farmers was conducted in Diphu, situated in the aspirational district of Karbi Anglong in Assam. This survey sheds light on the current status of the animal husbandry and veterinary sector, offering insights that will inform targeted strategies for the holistic development of meat animal production and processing in the NER. Moreover, a pivotal component of this initiative involves organizing awareness campaigns, capacity-building programs, and entrepreneurship promotion activities in the NER. By disseminating knowledge, enhancing skills, and encouraging entrepreneurial endeavors, this multifaceted approach seeks to empower local communities, ensuring the success and sustainability of livestock-related livelihoods in the North-Eastern Region. Through these concerted efforts, the initiative endeavors to catalyse positive transformations in the meat animal production and processing landscape, contributing to the socio-economic upliftment of the NER.

**Table 8: General Information of the Village/Block/District (Vety/AH Officers) of Karbi Anglong district**

S. No.	Parameters	Numbers
1	Population of the district	8,43,343
2	No. of FPOs in the District	Nil
3	No. of animal Vaccinated per year	-
4	No. of Veterinary Hospital	-
5	No. of Veterinary Dispensary	11
6	No of Veterinary Aid centre	15
7	No of Pranimitra/ pashumitra	38 (Pig bandhu)
8	No. of Livestock Service Provider	Nil
9	No. of Veterinary Officer:	22
10	No. of Veterinary Field Assistant	23
11	No. of Mobile Veterinary unit:	07
12	Availability of Slaughter house	Nil
13	Average monthly slaughter of animal	1245

Total farmers	Average monthly income		Type of family		Land holding		Total animals				No. of years engaged in livestock farming	
23	8	15	13	10	10	13	90	66	106	973	4	19

### Mithun adopted in Karbi Anglong district

Introduced for the First time semi-intensive Mithun farming in the Karbi Anglong areas and giving three Mithuns to one farmer along with TSP input materials for development of semi-



Mithun was introduced in the Karbi Anglong district of Assam on April 13th, 2023, in the presence of Dr. B. N. Tripathi, DDG (AS), ICAR, New Delhi



Mithun is being raised in a semi-intensive system by farmers in the Karbi Anglong district

intensive Mithun farming for increasing livelihood of farmers.

### Sensitization Workshop on Mithun Farming and Value Addition to Meat

ICAR-NRC on Mithun organized Sensitization Workshop on Mithun Farming and Value Addition to Meat in Karbi Anglong District, Assam in collaboration with ICAR-NRC on Meat, Hyderabad and Assam State Veterinary Department on 7<sup>th</sup> February 2023. The workshop aimed to discuss the potential of Mithun farming and value addition to Mithun meat. Dr. A. R Sen, Principal Scientist, ICAR-NRC on Meat emphasized that Mithun being a meat animal has immense potential for rearing in Karbi District. The processed value-added meat products double the income of farmers and there is a need for the formation of FPOs to increase farmers' advantage in emerging market opportunities and their competitiveness, he added. Dr. Dilip Mahanta, DVO, Karbi Anglong detailed the rearing of livestock and its conversion into value-added products. Dr. Girish Patil S., Director, NRC on Mithun emphasized Mithun production and processing of meat. The programme was also coordinated and assisted by Dr. David Bordoloi along with Dr. Sabnam, Dr. Anthony, Dr. Rukasen and Dr. Monika, to make it successful. This forest area is suitable for Mithun farming, there are a lot of market opportunities for processed Mithun meat and we are looking for active collaboration with farmers, he added. A total of 45 farmers attended the workshop.



Sensitization Workshop on “Mithun Farming and Value Addition to Meat”

## **DBT TWINNING PROJECT - MOLECULAR BASIS OF IMMUNE RESPONSE TO FMD VACCINATION MITHUN (*Bos frontalis*)**

**PI: Dr. H. Lalzampaia**

**CO-PI: Dr's L. Sunitibala Devi, Kobu Khate, J.K. Chamuah**

Collaborating Institute: ICAR – Indian Veterinary Research Institute Regional Centre, Bangalore

Collaborating Institute PI: Dr. Dechamma, Principal Scientist

Foot and mouth disease is one of the most important diseases of Mithun and it has a huge impact on the economy and sustainability of Mithun rearing in the field. Several outbreaks have been occurring in Mithun with high morbidity and mortality. This project is proposed to study and understand the efficacy of current commercially available FMD vaccine in Mithun as well as to explore the molecular insight of vaccine induced immunity in Mithun by using novel technologies like NGS and FACS in collaboration with ICAR-IVRI, Bangalore campus.

The project has been sanctioned on September 2023 for a period of 3 years with the following objectives:

- To study the global gene expression profile of FMDV vaccinated Mithun
- To determine the differentially expressed genes in low and high response group of vaccinated animals
- To determine the comparative differences in the immune response genes following FMD vaccination in the cattle and Mithun

## **DBT-NER INSTITUTIONAL LEVEL BIOTECH HUB AT ICAR-NRC ON MITHUN**

**PI: Dr. H. Lalzampaia**

**Co-PI: Dr's L Sunitibala Devi and Vikram R**

Institute Biotech hub created at ICAR-NRC on Mithun, Medziphema, Nagaland is the state-of-the-art laboratory in the region, equipped with all advanced and sophisticated instruments to carry out molecular and biotechnological work. The project is aimed to focus on training and sensitization of the students in and around the Institute. Basic information on biotechnology-related advancement and the ongoing development will be passing on to the young students and emphasis will be given on hands-on-experience-oriented training. Development of the quality standard molecular laboratory will be beneficial for the youngsters around the Institute to help them in the accumulation of scientific knowledge and ideas and to stimulate them in scientific and rational thinking for a better future.

## **ANIMAL PHYSIOLOGY & REPRODUCTION SECTION**

### **TESTING AND VALIDATION OF PREGNANCY DIAGNOSIS KIT, PREG-D IN MITHUN**

**ICAR-NRC on Mithun**

**ICAR-CIRB, Hisar**

**PI: Dr. Vikram R.**

**PI: Dr. A.K. Balhara**

**Co-PI: Dr. S.K. Phulia**

**Co-PI: Dr. R.K. Sharma**



## Pen side urine-based pregnancy diagnosis kit for Mithun: Preg-DM

Under this project, the Preg-D, pregnancy diagnosis kit for buffalo and cattle was tested in Mithun (n=227) and at day 45 the accuracy, sensitivity and specificity of the kit were 68%, 84.5% and 45%, respectively. To determine the changes in concentration of metabolites in the Mithun urine sample, day 0, 10, and 18 urine samples of estrus cycle from non-pregnant (control) and day 18, 35 and 45 urine samples from pregnant animals (treatment) were subjected to <sup>1</sup>H NMR Analysis. The comparison of the metabolic profile between pregnant and non-pregnant Mithun revealed ≥ 270 metabolites. Bioinformatics analysis indicated significantly higher VIP score metabolites in urine samples viz. Kynurenine, Kynurenate, 3-Hydroxykynurenine, quinolate, leucine, Tyrosine etc. The most powerful pregnancy-associated pathway modulations were determined by the effect values of those pathways that were over impact value 0.5 as determined by pathway topology analysis. Seven metabolic pathways viz. 1. Phenylalanine, tyrosine and tryptophan biosynthesis, 2. Tryptophan pathway, 3. D-Glutamine and D-Glutamate metabolism, 4. Alanine, aspartate and glutamate metabolism, 5. Glycolysis, 6. Histidine metabolism and 7. Glycine, serine and threonine metabolism were identified as the most important ones to be controlled in the early stages of pregnancy based on the effect values. Based on the metabolomics results, the new kit Preg-DM was developed and tested in Mithun (n=277). At day 45 the accuracy, sensitivity and specificity of the kit were 80%, 90% and 64%, respectively (Day 0 of estrus eliminated).



Pen side urine-based pregnancy diagnosis kit for Mithun: Preg-DM



Release of Kit by Dr. Bhupendra Nath Tripathi, Deputy Director General (Animal Science) on 12<sup>th</sup> April 2023

## DECIPHERING SPERM FUNCTIONAL AND PROTEOMIC ALTERATIONS IN MITHUN BULLS WITH POOR SPERM CRYOTOLERANCE

ICAR-NRC on Mithun

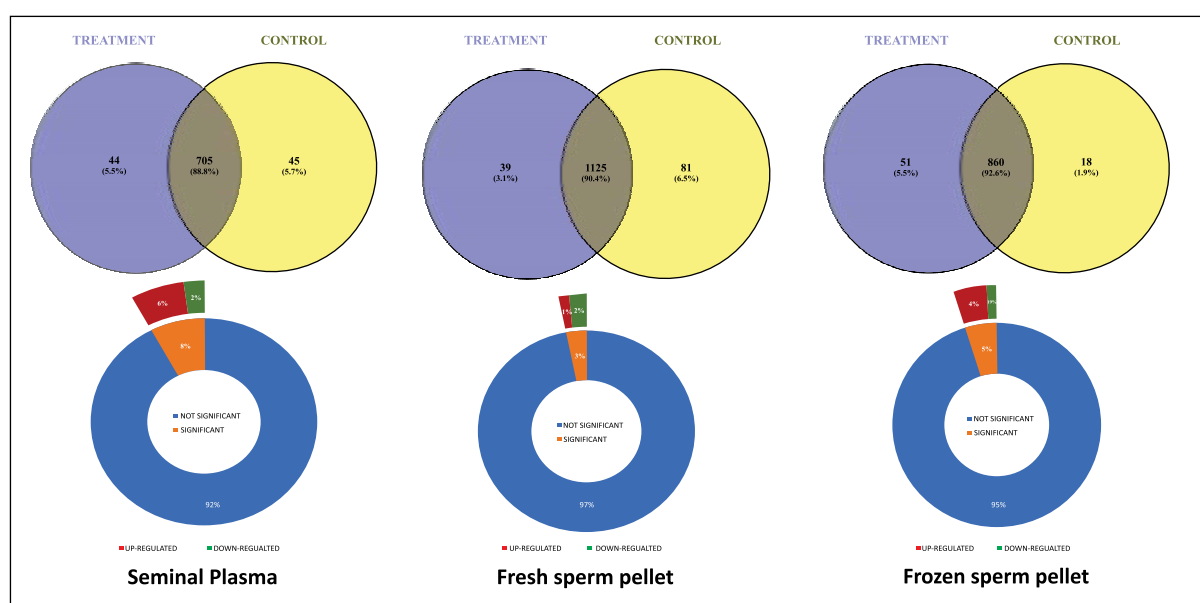
ICAR-SRS of NDRI

PI: Dr. Vikram R.

PI: Dr. A. Kumaresan

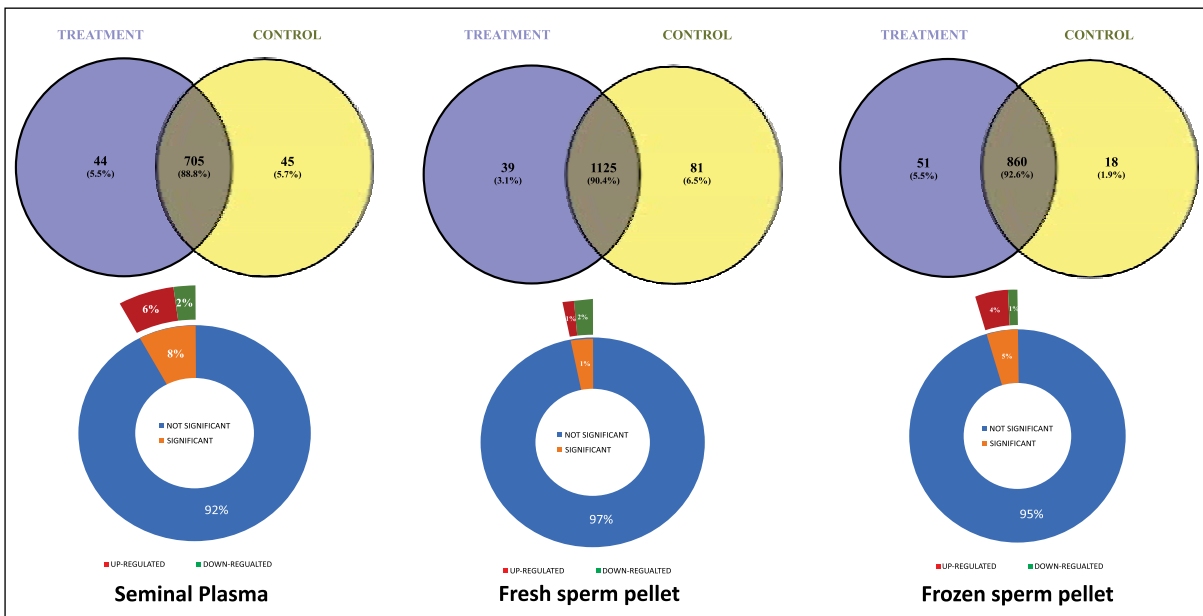
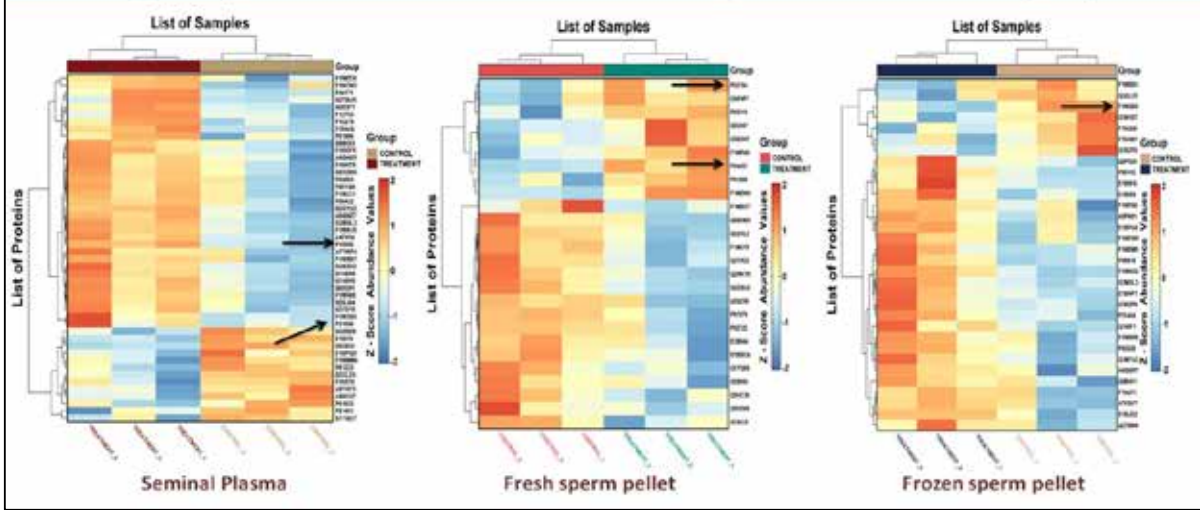
### Protein signatures of seminal plasma and spermatozoa and seminal plasma from high- and low-cryotolerance Mithun bulls

The present study investigated the seminal plasma and spermatozoa proteome of Mithun with low (LF; n = 3) and high (HF; n = 3) sperm freezing ability. The percentage of viable frozen-thawed sperm was determined by CASA and there was a significant difference in progressive motility between LF and HF samples. Seminal and spermatozoa proteins were analyzed by label-free mass spectrometry, with the support of statistical and bioinformatics analyses. Seminal plasma analysis identified 44 unique proteins in the low cryotolerance treatment, 45 in the high cryotolerance control, and 705 common proteins. Fresh sperm pellets showed 39 unique proteins in low cryotolerance, 81 in the high cryotolerance control, and 1125 common proteins. Frozen sperm pellets exhibited 51 unique proteins in low cryotolerance, 18 in the high cryotolerance control, and 860 common proteins. These results highlight distinct protein profiles associated with cryotolerance levels. The identified proteins were associated with capacitation, sperm oviduct interaction, cell adhesion, sperm motility etc., The statistical analysis revealed differentially expressed proteins ( $p < 0.05$ ) in seminal and spermatozoa proteins between LF and HF Mithun bulls. Based on multivariate analysis, osteopontin and glyceraldehyde-3-phosphate dehydrogenase in seminal plasma, seminal plasma protein (PDC-109) and seminal plasma protein A3 in fresh sperm pellet defined the low cryotolerance and Sperm associated antigen 16 in the frozen sperm pellet defined the high cryotolerance. This report is the first dataset of Mithun seminal plasma, fresh pellet and frozen pellet proteins. Specific proteins of the non-cellular and cellular microenvironment of semen can be potential markers of sperm cryotolerance.

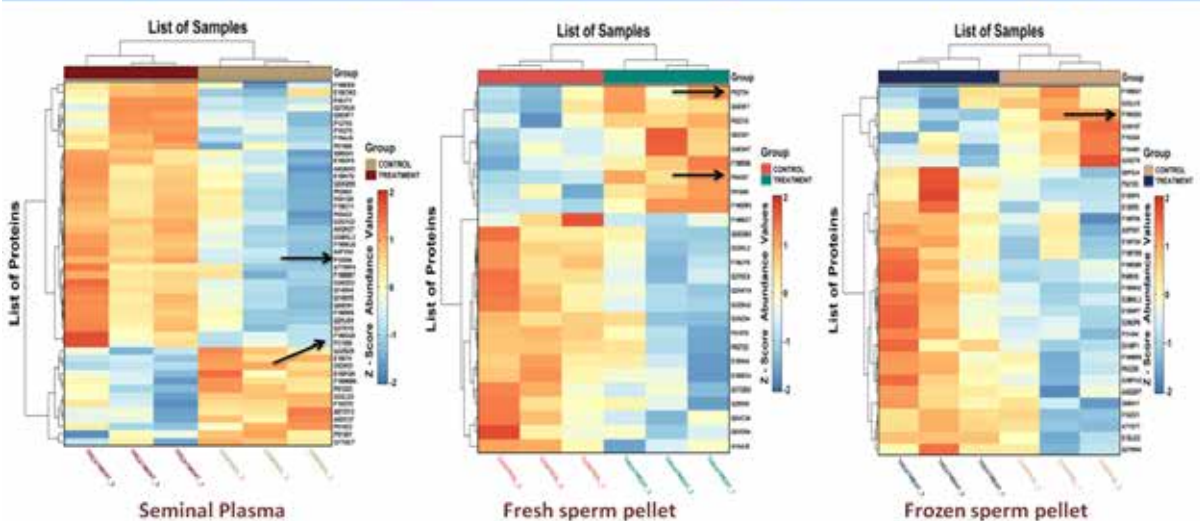


Venn diagram showing the number of proteins identified in the seminal plasma, fresh sperm pellet and frozen sperm pellet. The numbers in the intersection indicates total number of proteins and numbers in the individual circles indicate differentially expressed proteins

Heat map comparisons of calculated Z-scores for proteins differentially expressed



Heat map comparisons of calculated Z-scores for proteins differentially expressed



**LIVESTOCK PRODUCTION AND MANAGEMENT SECTION**  
**ASSESSMENT AND DOCUMENTATION OF THE EXISTING MITHUN REARING PRACTICES**  
**UNDER FREE RANGE SYSTEM IN NORTH EAST INDIA**

**PI: Dr. S.S. Hanah**

**Co-PI: Dr's H. Lalzampaia, L. Sunitibala Devi and Kobu Khate**

Mithun (*Bos frontalis*) the unique bovine species of North East India occupies an esteemed position among all livestock in terms of socio-economic value and cultural tradition. The study attempts to make a thorough assessment and documentation of the existing rearing practices that will help bridge the gap as to what interventions are to be incorporated by using a farmer's participatory research approach. Findings revealed that in most cases in all the four states viz; Arunachal Pradesh, Manipur, Mizoram and Nagaland, Mithun are reared under free-range forest ecosystems either in community forest or private land without scientific supervision of health, nutrition and reproduction. Though reared in free range, the managerial practices and adoption of Indigenous Technology Know-hows (ITKs) differ from State to State and even village to village. The study revealed that the Mithun owner occasionally bring their Mithun to the village, as they feel this will help develop a bond between them and the animal. For restraining of Mithun the herdsman from different States used ropes from vine trees or make out of bamboo and a basket made of bamboo for carrying salt and other essentials when visiting the Mithun sites once in every fortnight. Mithun human conflict is a common occurrence in most of the states, in order to prevent the trespassing of the Mithun into neighbouring villages and agricultural field, they fence their boundaries either with local bamboos, rocks or bio fences. Ear-notching is the only identification method adopted by the Mithun farmers. The rearing practices are more or less similar in all states but its socio-cultural and economic importance varies with tribes. Under the changing socio-economic scenario, Mithun warrants greater attention for being improved and preserved as an important farm animal.

**Table 9: ITKs in related to Mithun husbandry in Arunachal Pradesh, Nagaland & Manipur**

ITK adopted	Used for	Parts used	Local name
<b>Arunachal Pradesh</b>			
Application of Turmeric powder with salt	Eye infection	Powder as well as Juice extract	
Application of crushed glass powder	Eye infection	Powder form	
Feeding of leaves and tree bark of certain plants	Deworming and Other injuries	Leaves and barks	Hinger Pumlor
<b>Nagaland</b>			
Feeding of bark And leaves with salt	Any Diseases	Leaf and bark	Sukapai, Kokhaihang Kai
Application of trees and bark juice extract	Cut injury and other diseases	Tree sap and bark juice extract	Totokhai
Feeding of tree bark wrapped in fodder leaves	Wound infection	Leaf, tree sap and bark extract	Takpu
Application of Mithun dung Mixed with soil in wounds	Wound infection	Mithun dung	

ITK adopted	Used for	Parts used	Local name
<b>Manipur</b>			
Application of grind root (powder form) into the wound	Any type of wound	Root and leave	Namtul Singnahtang
Scrap the deer horn into powder form	Maggot wound	Deer horn	Sakhiki



Free range Mithun rearing system



Providing salt to the Mithun by the herdsman



Mithun rearing area being fenced with bio fencing and rocks



ID: Ear cutting/Notches

Glimpse of traditional managerial practices

### CONTRACT RESEARCH PROJECT

#### DESIGNING AND ESTABLISHMENT OF M-ANITRA: MITHUN REGISTRATION, TRACEABILITY & MARKET PLACE SYSTEM ALONG WITH BIOMETRICS AND BLOCK CHAIN BASED DATA MANAGEMENT

PI: Dr. SS Hanah

Co-PI: Dr's JK Chamuah and Girish Patil, S.

Mithun is a unique livestock species requiring special attention. The recent developments in digital connectivity can be used to develop a platform for Mithun Unique Identification, Traceability. Livestock traceability has a range of applications and utilities. Registration of the Mithun and their unique identification are basic requirements of the traceability system. Keeping this in mind, the Institute has taken up a contract project on “Designing and establishment of M-Anitra: Mithun registration, traceability & market place system along with biometrics and block chain based data management” in collaboration with ANITRA, Pvt. Ltd, Hyderabad. Under the project, Anitra has developed a solution for untagged animals, where the system will create a unique identification number for each animal. Anitra has also developed biometrics based system for unique identification, which helps in ownership ascertainment, eases the hassles involved in getting transportation clearances and enables precision farming, and scientific feeding and health management. We have also developed a Mobile App (M-Anitra), which is available in google play store.

M-Anitra is a block-chain based Mithun registration, traceability and online marketing system also it provide an information for promoting scientific Mithun production and marketing which will help in enhancing farmers income in North East India. The farmers can upload their animal in the app, there is also an option for selling and buying of Mithun. The app has different function, advantages to the Mithun farmers and to the Animal Husbandry Department and Service provider, such as-

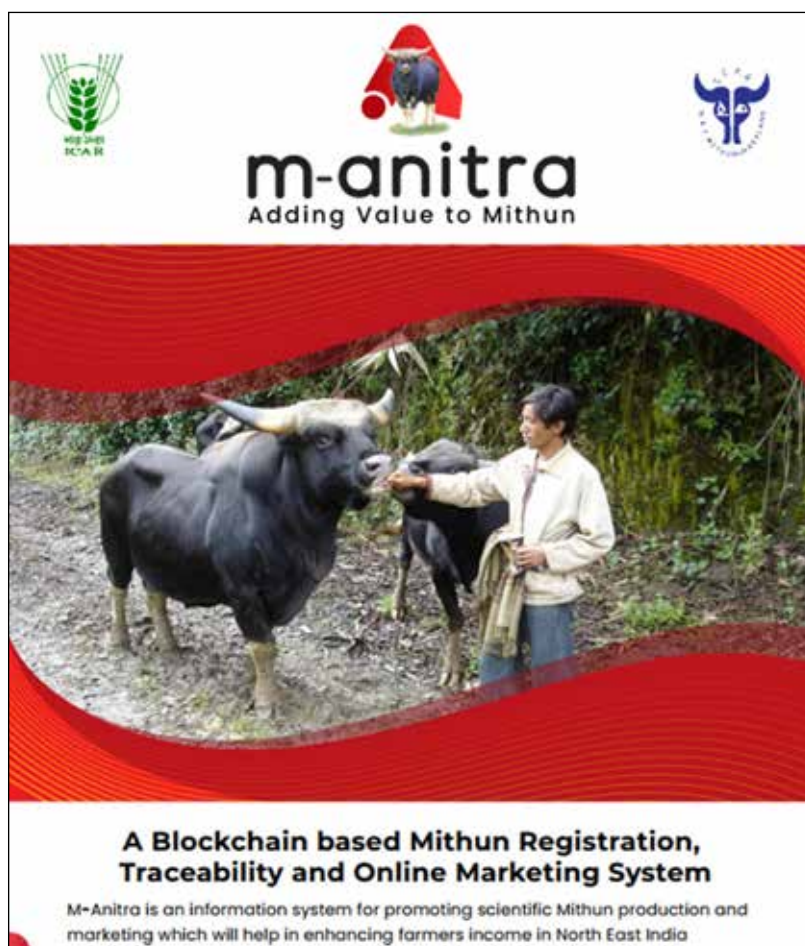
#### To the Mithun Farmers:

- M-Anitra will help farmers in getting fair price for their Mithun
- Provides platform for achieving traceability
- M-Anitra will facilitate periodic communication of scientific information on Mithun husbandry from experts
- M-Anitra helps to find the buyers of the Mithun through the application

- Monetization of livestock with the traceability also would help farmers to get access to various services such as finance, insurance, etc., from formal channels

### To the Animal Husbandry Departments and service providers

- Readily available data for program implementation for all stakeholders
- Effective implementation of disease control programs
- Will provide the foundation for development of organized Mithun sector



## ARTIFICIAL INTELLIGENCE BASED STUDIES ON ESTRUS AND PARTURIENT BEHAVIOUR OF MITHUN

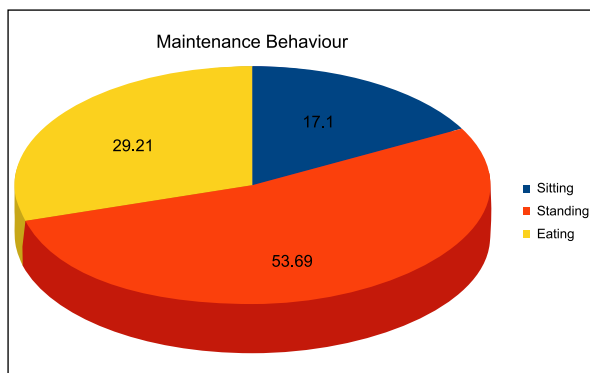
PI: Dr. L. Sunitibala Devi

Co-PI: Dr's S.S. Hanah, Vikram R. and Kobu Khate

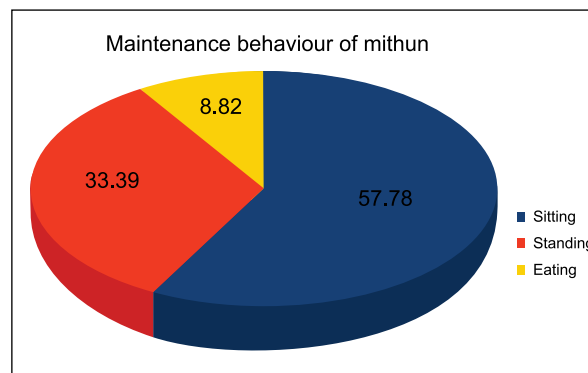
Collaborating Institute: National Institute of Technology, Dimapur, Nagaland

Collaborating PI: Arul Valan

A pilot study was conducted to record the various maintenance behaviour shown by 3 Mithun cows for a period of 2 hours (5 am to 7 am) through CCTV surveillance camera. The recorded behaviour in the CCTV camera was finally extracted for data through specialized behaviour coding sheet for each parameter. The parameters under observance were sitting, standing and eating behaviour. During the 2 hour behaviour recording animal shows 17.1 % sitting, 53.69 % standing and 29.21 % eating behaviour. The behaviour recording for a period of 6 hours (12 am to 6 am) shows 57.78% sitting, 33.39% standing and 8.82% eating behaviour.



Behaviour during 2 hours of recording (%)



Behaviour during 6 hours of recording (%)

## LIVESTOCK PRODUCTS TECHNOLOGY

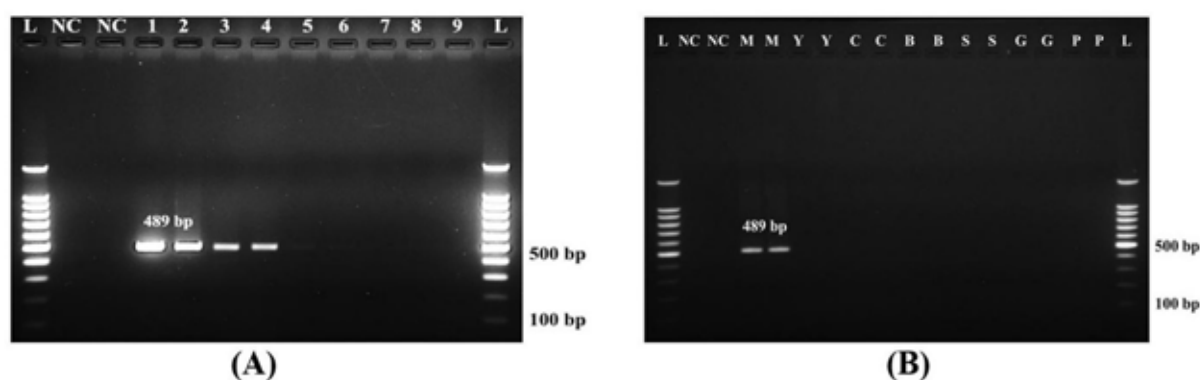
### STRENGTHENING THE MITHUN MEAT AND MILK VALUE CHAIN THROUGH INNOVATIVE VALUE ADDITION AND QUALITY ASSURANCE TECHNIQUES

PI: Dr. Jyoti

Co-PI: Dr's S. S. Hanah, Nazrul Haque, Vikram R, Sunitibala Devi and Girish Patil S

#### Development of alkaline lysis-polymerase chain reaction assay for the authentication of Mithun (*Bos frontalis*) species.

A novel DNA-based method, alkaline lysis-polymerase chain reaction (AL-PCR), was developed for the sensitive and specific identification of Mithun. Employing alkaline lysis DNA extraction followed by PCR amplification of a unique 489 bp mitochondrial D-loop region, AL-PCR exhibited high specificity, with no cross-amplification observed in yak, buffalo, cattle, sheep, goat, and pig. It demonstrated a sensitivity of 1 picogram and successfully identified Mithun in raw, cooked, autoclaved, microwaved, and fried meat samples, as well as in binary mixtures, validating its effectiveness for diverse applications.



**A) Sensitivity of Mithun AL-PCR.** Lanes L) 100 bp DNA ladder, NC) Negative

control, 1) 100 ng DNA, 2) 10 ng DNA, 3) 1 ng DNA, 4) 100 pg DNA, 5) 10 pg DNA, 6) 1 pg DNA, 7) 100 fg DNA, 8) 10 fg DNA, and 9) 1 fg DNA.

**B) Specificity of Mithun AL-PCR.** Lanes L) 100 bp DNA ladder, NC) Negative control, M) Mithun, Y) Yak, C) Cattle, B) Buffalo, S) Sheep, G) Goat, and P) Pig.



## Development Of Mithun Meat And Milk Products Through Innovative Value Addition.

### MITHUN MEAT PRODUCTS

#### A) Mithun meat nuggets

Mithun meat nuggets were prepared by mincing meat with a meat mincer, ensuring fine consistency. The minced meat was transferred to a bowl chopper and blended with 1.5–2% salt, 0.5% sodium tri-polyphosphate, 0.3% sugar, 0.015% sodium nitrite, 2–3 eggs, 10% refined oil, 3.5% onion and garlic paste, 3.5% wheat flour, 0.3% spices, including 0.1% Naga chili, and 0.5% monosodium glutamate, and thoroughly mixed until complete emulsification was achieved. This emulsified meat mixture was placed in a container coated with oil and precise autoclaving at 10 psi for 10 minutes, followed by 8 psi for 35 minutes was done. After gradual steam release, the cooked meat was removed, chopped into small pieces, and transformed into nuggets. These nuggets were finally packaged and stored, ready for consumption, in sealed polyethylene pouches.



Mithun meat nuggets

**-Yield:** The yield of the product is 84%

**-Proximate composition:** Proximate composition of Mithun meat nuggets

S. No.	Parameters	Percent
1.	Moisture	71.3
2.	Fat	11.77
3.	Ash	4.21
4.	Protein	12.90

#### B) Mithun meat sausages

Mithun meat sausages, classified as salted and seasoned processed meat products, are typically prepared with finely or coarsely ground lean muscle meat encased in natural or synthetic casings. Mithun meat sausages were prepared using a meat emulsion. For emulsion preparation, meat was minced, repeating the process for aged animals to achieve a finer texture. This minced meat was transferred to a bowl chopper and blended with specific amounts of salt (1.5–2%), ice (10%), sodium tri-polyphosphate (0.5%), sugar (0.3%), and sodium nitrite (0.015%), eggs, refined oil (10%), onion and garlic paste (3.5%), wheat flour (3.5%), spices (0.3%), including 0.1% Naga chilli and monosodium glutamate (0.5%), and thoroughly mixed until complete emulsification. A marination period of



Mithun meat sausages

at least 30 minutes allowed the spices to infuse the meat. Finally, the emulsion was stuffed into casings, twisted into individual sausages, and boiled. Once boiled, the casings were removed, revealing the finished Mithun meat sausages.

**-Yield:** The yield of the product is 84%

**- Proximate composition:** Proximate composition of Mithun meat sausages

S. No.	Parameters	Percent
1.	Moisture	71.69
2.	Fat	2.05
3.	Ash	3.91
4.	Protein	16.45

### C) Mithun meatballs

Mithun meatball is a small, typically roundish processed product made from finely ground Mithun meat mixed with various seasonings, herbs, spices, and binders. First, the meat was minced in a meat mincer, and for aged animals, this process was repeated to achieve a finer texture. Maintaining a cool temperature below 10°C throughout, the minced meat was then transferred to a bowl chopper and 1.5-2% salt, 8% ice, 0.5% sodium tripolyphosphate, 0.3% sugar, and 150 ppm sodium nitrite per kg of meat was carefully added and thoroughly blended for 6-7 minutes. The temperature of the meat was meticulously monitored, ensuring it remained below 10°C. Subsequently, 3% egg, 10% refined oil, 3-3.5% onion and garlic paste, 3.5% wheat flour, and 1.5-2% spices including 0.1% Naga chilli were incorporated and mixed. This emulsified meat mixture was then rolled into individual balls. Separately, water was boiled with 5% salt to a temperature of 65-70°C. The meat balls were carefully placed in the heated water and cooked until the water reached 80°C. Finally, the cooked meat balls were removed and cooled before being stored in the refrigerator to maintain freshness.



Mithun meatballs

**- Yield:** The yield of the product is 84-86%

**-Proximate composition:** Proximate composition of Mithun meatballs

S. No.	Parameters	Percent
1.	Moisture	67.36
2.	Fat	8.06
3.	Ash	3.21
4.	Protein	12.26

## D) Mithun meat samosa

Mithun meat samosa is a deep-fried enrobed product characterized by its triangular shape. Samosas were prepared through distinct steps. First, the meat was boiled, then minced to a fine consistency using a meat grinder. This minced meat was then fried until fully cooked. Next, 3% Maida flour and 1.5% salt were carefully incorporated into the ground meat. Finely chopped garlic (1%) and ginger (1%), monosodium glutamate (0.5%), 7-8% oil, Naga chilli (0.1%), and turmeric powder (0.5%), were added to the fried meat, completing the filling. The dough was prepared by combining flour, salt, oil, and water, kneaded until smooth and elastic, and allowed to rest for 30 minutes. It was then rolled out into thin sheets and cut into squares or triangles. For assembly, the filling was placed in the center of a dough square or triangle, and the dough was folded to form a triangle or cone shape. The edges were sealed, and the samosas were deep-fried until golden brown and crispy.



Mithun meat samosa

**Proximate composition:** Proximate composition of Mithun meat samosa

S. No.	Parameters	Percent
1.	Moisture	23.11
2.	Fat	20.93
3.	Ash	0.41
4.	Protein	5.83

## E) Mithun meat pickle

The preparation of Mithun pickle involved heating mustard oil in a deep bottom pan or kadhai and then frying (10–15 minutes) cooked meat on medium flame till it became slightly brown in color. Ginger (15%) and garlic (1-2%) were fried till golden brown and kept aside. Then, the spice mix, including Naga chilli (0.1%), was fried for a few minutes until the oil separated and was kept separately. Once all the ingredients were ready, some oil in a fresh pan or kadhai was taken, and fried spices, condiment paste, and all other ingredients were added to the fried Mithun meat and heated for a few minutes with intermittent mixing. After cooling, 20% v/w of vinegar was added. The remaining amount of mustard oil was added after cooling, and the pickle was packed in polyester/polyethylene laminate pouches or PET bottles and stored at room temperature.



Mithun meat pickle

**- Proximate composition:** Proximate composition of Mithun meat pickle

S. No.	Parameters	Percent
1.	Moisture	16.34
2.	Fat	35.36
3.	Ash	0.91
4.	Protein	6.56

## F) Mithun meat pakoda

Mithun meat pakoda is a savoury fritter, featuring tender pieces of Mithun meat coated in a spiced chickpea flour batter and deep-fried until golden brown and crispy. The enrobing process involved preparing a batter, followed by its application onto meat before frying. The breading and battering process encompassed: portioning the cuts, pre-dusting with flour for a 6% pickup, battering for a 5% pickup, and finally breading with a 25% pickup. It is crucial to ensure the total pickup remains within 30% for the coated products. These coated products then underwent frying: either a short par-frying at 190°C for 30-55 seconds or a longer cook depending on market needs. Frying solidified the coating system, adhering the breading to the surface and creating an appealing brown color.



Mithun meat pakodas

**-Proximate composition:** Proximate composition of Mithun pakoda

S. No.	Parameters	Percent
1.	Moisture	47.19
2.	Fat	7.53
3.	Ash	0.34
4.	Protein	16.92

## G) Mithun meat momos

Mithun meat momos are generally defined as steamed dumplings made with a dough of refined flour and water, filled with a mixture of ground meat, soya chunks, onions, and spices. First, the filling was prepared. Meat was minced, boiled, and then combined with 3% maida flour, 5-6% onions, 0.1% Naga chilli, 0.5% coriander powder, 0.5% cumin powder, 1% salt, and 0.5% MSG. Soya chunks were incorporated for additional texture and nutrients. The filling was then marinated for at least 10-15 minutes, allowing the flavors to meld. All-purpose flour was used to prepare a smooth dough. Once the dough was prepared, it was rolled out into thin circular sheets. Using a sharp knife, circular pieces were cut from the



Mithun meat momos

rolled-out dough. Each dough circle was then filled with a spoonful of the flavorful meat filling. Finally, the momos were cooked for 25–30 minutes in a steamer basket lined with parchment paper. When done, the momos were removed from the steamer.

**-Proximate composition:** Proximate composition of Mithun samosa

S. No.	Parameters	Percent
1.	Moisture	62.39
2.	Fat	0.78
3.	Ash	1.93
4.	Protein	15.30

## H) Mithun meat kabab

Mithun meat kababs, originating from the Arabic tradition of “kebab” (to roast), are small, skewered pieces of Mithun meat, often marinated and cooked over an open flame or in a griller. Mithun meat kababs, a delectable appetizer, main course, or snack, were crafted through a meticulous process. The meat was boiled and meticulously minced using a meat grinder. Subsequently, 3% maida flour and 1.5% salt were incorporated. Finely chopped garlic (1%) and ginger (1%), along with mono sodium glutamate (0.5%), 7-8% oil, Naga chilli (0.1%), and turmeric powder (0.5%), were added. The mixture was marinated for at least 30 minutes. Divided into equal portions and moulded into various shapes, the kababs were pan-fried until perfectly cooked.



Mithun meat kababs

**-Proximate composition:** Proximate composition of Mithun kababs

S. No.	Parameters	Percent
1.	Moisture	62.62
2.	Fat	4.02
3.	Ash	0.23
4.	Protein	12.56

## I) Mithun meat soup

Mithun meat soup is a traditional dish of the Northeastern region, featuring Mithun meat as the primary protein source, simmered in a flavorful broth, and often accented with regional vegetables and spices. The soup was prepared by simmering the Mithun bones, releasing their flavorful essence. This broth was then filtered carefully through a thin sieve or muslin cloth. Separately, Mithun meat broth and an equal amount of water were boiled. Condiments (onion, garlic, and ginger in a 3:1:1 ratio) were fried in a pan or kadhai on medium flame until slightly golden



Mithun meat soup

brown. The spice mixture was added, and frying continued. The filtered broth was poured into the frying pan and boiled. After boiling, the contents were filtered and set aside. With continuous stirring, corn flour (3–4%) and salt (1%) were dissolved in the boiled water. The filtered broth was added back, and the content was heated for 2–3 minutes under simmering conditions. Finally, citric acid (1%) was incorporated, and the content was removed from the heat after 30 seconds.

## J) Mithun meat patties

Mithun meat patties were prepared by mincing meat with a meat mincer, ensuring fine consistency. The minced meat was transferred to a bowl chopper and blended with 1.5–2% salt, 0.5% sodium triphosphate, 0.3% sugar, 0.015% sodium nitrite, 10% refined oil, 3.5% onion and garlic paste, 0.3% spices, including 0.1% Naga chili, and 0.5% monosodium glutamate, and thoroughly mixed until complete emulsification was achieved. This emulsified meat mixture was placed in a petri dish coated with butter paper and microwave cooking at 40°C for 10 minutes was done. The patties were finally packaged and stored in sealed polyethylene pouches.

**-Yield:** The yield of the product is 90%



Mithun meat patties

## K) Mithun meat vada

Mithun meat vadas were prepared by mincing 500 grams of meat with a meat mincer, ensuring fine consistency. The lentil base was prepared by soaking 10% chana dal, 2.5% cumin seeds, and 2.5% fennel seeds in water for 30 minutes. Afterward, they were ground into a coarse paste. The meat mixture was made by combining minced meat, 0.5% green chili, 1.5–2% salt, 1% turmeric powder, 0.1% Naga chili powder, 5% besan, 1% chopped ginger, 1% chopped garlic, 3% chopped onion, and 1% chopped coriander leaves in a bowl. The ingredients were mixed well. Vadas were formed by taking small portions of the meat mixture and shaping them into a round shape. The vadas were fried by heating oil in a pan or deep fryer. Once the oil was hot, the vadas were gently dropped into it and fried on medium heat until they turned golden brown and were cooked through.

**-Yield:** The yield of the product is 86%



Mithun meat vada

## Mithun Milk Products

### L) Mithun milk paneer

Mithun milk paneer is a traditional product from the Northeastern region of India produced by the heat and acid coagulation of Mithun milk. First, the milk was gently heated to 90°C for two minutes, leaving no room for harmful bacteria. After a controlled cool-down to 70–75 °C, a 1% citric acid solution was gradually introduced and stirred until clear separation occurred, forming distinct curds and whey. These curds and whey rested for 10–15 minutes, allowing the curds to consolidate and strengthen. The whey was then drained, leaving the curds in a muslin cloth. The cloth was tightly wrapped and gently pressed, typically with a 1:5 curd-to-weight ratio. For 10–15 minutes, excess moisture was extracted, ensuring a paneer with perfect firmness and resilience. Finally, the pressed curd was shaped into blocks, packaged in polyethylene pouches, and refrigerated at 4°C.



Mithun milk paneer

- **Yield:** The yield of the product is 25%

### M) Mithun milk Lassi

Mithun milk lassi is a fermented and flavored beverage prepared from Mithun milk. The product is characterized by its rich aroma, sweetened and mildly acidic taste, and creamy-viscous texture. Mithun milk lassi was prepared in various steps. One kilogram of Mithun milk curd and 2-3 litres of water were combined in a mixing bowl and stirred thoroughly until a smooth texture was achieved. 80 grams (8%) of sugar were gradually added and continuously stirred until fully dissolved. The mixture was then thoroughly blended using a blender for uniform consistency and optimal texture. Cardamom and almond were added to enhance the flavor profile. Finally, the prepared lassi was dispensed into polypropylene cups and securely sealed with foil paper to prevent contamination and preserve freshness.



Mithun milk flavoured lassi

- **Output:** One litre of Mithun milk can yield 2-3 litres of lassi.

### N.) Whey drink

A whey-based beverage derived from the liquid fraction of coagulated Mithun milk during cheese production. Rich in nutrients like lactose, whey protein, and essential minerals, it offers potential health benefits and diverse commercial applications. Mithun milk was transformed into a refreshing beverage through a detailed process. First, it was gently heated to 90°C, then cooled to 70–75 °C for curds and whey separation. A citric acid solution (1-2%) was then added to complete the separation, before straining the curds away using cheesecloth. The whey was subsequently heated to 90°C to ensure safety, then carefully maintained at 70°C

in a water bath. Meanwhile, a CMC solution was prepared and gradually incorporated into the whey for the desired consistency. Sugar was added and dissolved completely, followed by a filtered flavoring solution for a unique taste. Finally, the prepared whey beverage was poured into polypropylene cups, sealed, and stored at 4°C.

**-Yield:** The yield of the product is 75%



**Whey drinks**



# OUTREACH PROGRAMMES



MODIFIED TREVIS FOR RESTRAINING OF MITHUN



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ICAR – NRC on Mithun

## Outreach Programmes

Tribal Sub-Plan

Dr. Kobu Khate, Chief Technical Officer

Table 10: Animal Health and Vaccination camp

State	S. No.	Date	Address/ Venue	No. of beneficiaries
Arunachal Pradesh	1.	21.03.2023	Adi Pasi village, Upper Siang district	121
	2.	13.09.2023	Sago village, Leparada district	150
	3.	05.10.2023	Tadin village, West Siang district	60
Nagaland	1.	12.05.2023	Thuvopisu village, Phek district	58
	2.	12.05.2023	Tening village, Peren district	25
	3.	07.06.2023	Pathso & Yokao village, Noklak district	128
	4.	08.06.2023	Tening village, Peren district	53
	5.	13.07.2023	Porba village, Phek district	37
	6.	22.08.2023	Thetsumi village, Phek district	32
	7.	14.09.2023	Khonoma village, Kohima district	51
	8.	14.10.2023	Khonoma village, Kohima district	53
	9.	06.11.2023	Tening village, Peren district	41
<b>Total</b>				<b>809</b>





Table 11: Training and Exposure visit

STATE	S. No.	Date	Address/ Venue	No. of beneficiaries
NAGALAND	1.	01.02.2023 - 03.02.2023	Farmers from Mezoma and Khonoma village, Kohima district and Diphu, Assam	26
	2.	16.05.2023	Porba village, Phek district	121
	3.	22.05.2023- 26.05.2023	Training for VFAs	68
	4.	15.06.2023	Mithun farmers from Yachuli village, Arunachal Pradesh	22
	5.	28.08.2023 - 01.09.2023	Mithun farmers from Peren district	20
ASSAM	1.	07.02.2023	Diphu, Karbi Anglong district	50



Table 12: Mithun Mela

State	S. No.	Date	Address/ Venue	No. of beneficiaries
Arunachal Pradesh	1.	13.09.2023	Sago village, Leparada district	150
Nagaland	1.	15.11.2023	Khonoma village, Kohima district	107

### Mithun Mela at Sago Village, Arunachal Pradesh

On 13<sup>th</sup> September, 2023, the Mithun Mela unfolded in Sago village, Basar, Leparada district of Arunachal Pradesh, conducted through a collaborative endeavor between the ICAR-National Research Centre on Mithun and the Department of Animal Husbandry, Veterinary & Dairy Development, Government of Arunachal Pradesh. This event served as a platform for Mithun farmers to gain insights into scientific techniques, particularly the semi-intensive rearing approach, with a focus on utilizing the newly introduced M-ANITRA app developed in partnership with ANITRA Tech. Under the tribal sub-plan, vital supplies such as barbed wire,

CGI sheets, casting rope, and Travis were distributed. Approximately 80 Mithuns received FMD vaccination, accompanied by veterinary medications for routine healthcare. Dr. T Heli provided an overview of the current status and future prospects of Mithun farming in the region. The event featured a Mithun judging competition, recognizing excellence in adult female, adult male, heifer, and calf categories. Distinguished guests, including Sri Gokar Basar and Dr. Tachi Taku, elevated the occasion, making the Mithun Mela a celebration of Arunachal Pradesh's Mithun farming heritage and a promising glimpse into its future.



## Mithun Mela cum Farmers-Scientists Interaction in Khonoma Village, Kohima

In a collaborative effort with the ICAR-National Meat Research Institute, Hyderabad, the ICAR-National Research Centre on Mithun successfully organized the “Mithun Mela cum Farmers-Scientists Interaction” in Khonoma Village, Kohima on 15<sup>th</sup> November, 2023. Dr. Ravi Yadav, Director of the National Rainfed Area Authority, New Delhi, graced the occasion as the Chief Guest. The program commenced with a warm welcome by Dr. Narendra V N and a keynote address by Dr. Kobu Khate, Chief Technical Officer. Scientists from ICAR-NRCM delivered insightful presentations on Mithun farming, focusing on the unique challenges faced by Khonoma Mithun farmers. Dr. Ravi Yadav appreciated ICAR-NRCM's initiatives and stressed the importance of innovative technologies for direct benefits to Mithun farmers. Dr. Girish Patil encouraged farmer participation, emphasizing regular communication with ICAR-NRCM. The event facilitated dynamic interaction between farmers and scientists, addressing queries on Mithun farming. Dr. Narendra V.N. and Dr. Kobu Khate spearheaded the program, skilfully coordinated by Dr. Nazrul Haque, Dr. J.K. Chamuah, Dr. S.S. Hanah, Dr. Vikram R, and Dr. Plabita Goswami, with over 100 Mithun farmers actively participating and significantly contributing to the event's success.



Table 13: Semi-intensive farming unit established by providing inputs under TSP

State	S. No.	Date	Address/ Venue	No. of beneficiaries
Arunachal Pradesh	1.	21/03/2023	Adi Pasi village/ Upper Siang district	121
	2.	05/10/2023	Tadin village/ West Siang district	60
	3.	13/09/2023	Sago village/ Leparada district	150
Nagaland	1.	06/03/2023	Ruzazho village/ Phek district	28
	2.	24/03/2023	PKMFU, Khonoma village/ Kohima district	35
	3.	28/03/2023	Mesulumi village/ Phek district	45
	4.	28/03/2023	Upper Khomi village/ Phek district	30
	5.	17/04/2023	Thanamir village/ Kiphire district	50
	6.	07/06/2023	Pathso village/ Tuensang district	35
	7.	07/06/2023	Yokao village/ Tuensang district	93
	8.	22/08/2023	Thetsumi village/ Phek district	32
	9.	14/10/2023	Catsu Kuotsu Merhü Gwi Keperi Krotho ( KCM), Khonoma village/ Kohima district	53
	10.	01/11/2023	Seikhake, Khonoma village/ Kohima district	25
	11.	01/11/2023	Mhozieke, Khonoma village/ Kohima district	20
	12.	06/11/2023	Tening village/ Peren district	41
	13.	06/11/2023	Nzau village/ Peren district	52
	14.	05/12/2023	Benreu village/ Peren district	53
Assam	1.	16/02/2023	Diphu/ Karbi Anglong district	50

# AICRP-FMD



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## AREA SPECIFIC MINERAL MIXTURE FOR MITHUN



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## All India Coordinated Project on Foot and Mouth Disease

PI: Dr. H. Lalzampaia

As a collaborating center, routine seromonitoring and serosurveillance in Mithun has been conducted as per the ICAR-DFMD guidelines. Trainings and vaccination camps were conducted periodically under FMD network project (AICRP). During 2023, 4 programmes were conducted under NEH activity and more than 200 Mithun farmers attended the programme. The programme usually consists of awareness on the importance of vaccination as a means to control Foot and Mouth disease in the country, along with general health care and treatment, as well as random samples collection for sero-surveillance.

Table 14: List of programmes conducted under DFMD Activity

S No.	Content of the programme	Date	Place and District	Name of organizer	No. of Farmers participated
1	FMD vaccination cum health camp	12-05-2023	Thuvopisu village, Phek District Nagaland	ICAR-NRC on Mithun	60
2	FMD awareness and vaccination at Tening village, Peren District	08-06-2023	Tening village, Peren District Nagaland	ICAR-NRC on Mithun	54
3	FMD Awareness and Vaccination (National FMD Control Awareness week)	14-09-2023	Khonoma Village, Kohima District, Nagaland	ICAR-NRC on Mithun & Department of AH & Veterinary Services, Nagaland In collaboration with ICAR-National Institute on Foot and Mouth Disease, Arugul, Bhubaneswar	52
4	Health camp and TSP input distribution	05-10-2023	Tadin Village West Siang District, Arunachal Pradesh	ICAR-NRC on Mithun	68





# KRISHI VIGYAN KENDRA, PHEK



INNOVATIVE CHICKEN KILLING CONE



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ICAR – NRC on Mithun

## Krishi Vigyan Kendra, Phek

### Research projects

#### National Innovation of Climate Resilient Agriculture Project

PI: Dr. Sanjeev Kumar Singh

Co-PI: Dr. T. Esther Longkumer and Dr. Hannah K. Asangla

Funding agency: ICAR

National Innovations on Climate Resilient Agriculture (NICRA) is a network project of the Indian Council of Agricultural Research (ICAR) launched in February, 2011. The project aims to enhance resilience of Indian agriculture to climate change and climate vulnerability through strategic research and technology demonstration. The research on adaptation and mitigation covers crops, livestock, fisheries and natural resource management. Under this project five villages namely Thipuzu, K. Basa, Kikruma and Phusachodu selected under the Phek district and technology demonstration was conducted on straw mulching in garden pea, organic nutrient management in turmeric, low-cost water harvesting, zero tillage in field pea, medium duration soybean, short duration millet and system of rice intensification.

Table 15: Description of various activities under NICRA

S.No	Activities	Number of activities	Total number of participants
1	Training	22	404
2	Method demonstration	5	100
3	Field day	2	35
4	Kisan gosthi	1	70

#### Establishment of Large Cardamom nursery at KVK Phek Farm

PI: Dr. T. Esther Longkumer

Funding agency: Directorate of Arecanut and Spices Development, Ministry of Agriculture and Farmer's Welfare, Government of India Calicut, Kerala

Under CCS-MIDH through the Directorate of Arecanut and Spices Development, Kerala, a project on setting up of Large Cardamom Mother Block and Nursery for Nagaland at KVK, Phek was approved for the benefit of the large cardamom growers of the district as well as the state. On 14<sup>th</sup> November 2022, an amount of Rs.5.00 lakhs were released. For the development of mother blocks 15000 numbers of large cardamom suckers variety "Sawney" was purchased from Department of Horticulture, Government of Sikkim, South Sikkim and planting was done at KVK farm in the last week of May 2023. Recommended organic agriculture package and practices followed for the growth of healthy crop.

## Promotion Of Indigenous Germplasm Of Foxtail Millet And Seed Bank To Preserve Millet Genetic Diversity In Phek District Of Nagaland

PI: Dr. Hannah K. Asangla

Funding agency: NABARD

The NABARD-sponsored project for two years on promotion of indigenous germplasm of foxtail millet and establishment of the seed bank to conserve the millet genetic resources under the Phek District of Nagaland started in July 2022. In this project, the four self-help groups comprising 100 women farmers from two villages, namely, Zelome and Zhavame, of Phek district, were identified. An area of 2 hectare each from the adopted villages was selected for the foxtail millet cultivation. The local germplasm of foxtail millet were collected from different millet growing pockets of the district and distributed to the selected beneficiaries. Training and method demonstration on improved/recommended package and practices were imparted to the women farmers. As per the project proposal a seed bank was constructed at Zelome village for collection and conservation of local germplasms for future use. On 19<sup>th</sup> September 2023, the seed bank at Zelome was officially inaugurated by the Deputy General Manager, NABARD Dimapur and also a field day on foxtail millet was conducted on the same day at Zhavame. The millet yield was recorded 12.23 and 8.02 quintal per hectare in Zelome and Zhavame villages respectively.

For the 2nd phase, the villages proposed were Porba and Gidemi, involving 4 self-help groups comprising 100 women farmers from two villages, wherein an area of 2 hectares each from the proposed adopted villages was also selected for the foxtail millet cultivation. A seed bank at Porba village will be established for the conservation and utilization of local germplasm.



Establishment of community seed bank at Zelome village under NABARD



Inside view of community seed bank of Zelome village

A follow up in all the 4 adopted villages will be initiated for horizontal spread.

**Table 16: Seminar/Symposium/Conferences/meetings/workshops etc. attended by the KVK staff (online/physical)**

S. No	Name of the scientist	Participation in Seminar/Symposium/Conferences/meetings/workshops	Date	Venue
1	Dr. T. Esther Longkumer, Chief Technical officer	Annual action plan workshop 2023	14 <sup>th</sup> to 15 <sup>th</sup> March 2023	ATARI, Uiam
2	Dr. T. Esther Longkumer, Chief Technical officer	Awareness programme on Farmers Producer Organization (FPO) for Mithun Farmer's Prosperity	16 <sup>th</sup> May 2023	Porba, Phek
3	Dr. Hannah K. Asangla, Chief Technical officer	Meeting on Market driven millet production, processing and value addition technologies	10 <sup>th</sup> May 2023	SAMETI, Medziphema
4	Dr. T. Esther Longkumer, Chief Technical officer	Annual workshops of KVK, 2023	20 <sup>th</sup> to 22 <sup>nd</sup> July 2023	ICAR-NRC on Mithun, Medziphema.
5	Dr. S.K. Singh, Senior Scientist cum Head	1 <sup>st</sup> Institute Biosafety Committee Meeting	12 <sup>th</sup> Oct 2023	NRC on Mithun Medziphema
6	Dr. S.K. Singh, Senior Scientist cum Head	Interface Meeting on Animal Genetic Resources of Nagaland	13 <sup>th</sup> Oct 2023	NRC on Mithun Medziphema
7	Dr. S.K. Singh, Senior Scientist cum Head	Mithun health camp	14 <sup>th</sup> Oct 2023	Khonoma Village, Kohima
8	Dr. S.K. Singh, Senior Scientist cum Head, Dr. T. Esther Longkumer, Chief Technical officer, Dr Hannah K. Asangla, Chief Technical officer	Zonal Monitoring Committee meeting of NICRA	21 <sup>st</sup> & 22 <sup>nd</sup> Nov 2023	NRC on Mithun Medziphema and KVK-Phek
9	Dr. S.K. Singh, Senior Scientist cum Head, Dr Hannah K. Asangla, Chief Technical officer	CAU Regional Agri cum Education Fair, 2023- 24.	12 <sup>th</sup> to 14 <sup>th</sup> Dec 2023	Agri fair ground, Chümoukedima, Nagaland

## HRD programme organized

**Table 17: Trainings/ workshops/seminar etc. Organized for the faculty/students/stakeholders**

S. No	Name of Program Conducted	Number of Participants	Date	Venue	Revenue generated
1	HRD programme on Scientific interventions for enhancing production and productivity in Mithun farming	134	18-01-23	KVK Phek	-



Training on soil amendment for farmwomen



Training and method demonstration on millet at Zhavame village



HRD programme on scientific interventions for enhancing production and productivity in Mithun rearing



Awareness on recent agricultural technologies cum seed distribution

## Extension and awareness programme

Table 18: Awareness programmes/ other events organized by the KVK, Phek

Extension Activities	Programme		Beneficiaries	
	Targets	Achievement	Targets	Achievement
Diagnostic visits	44	49	58	105
Scientists visit to farmers field	48	52	57	116
Field day	9	12	80	133
Farmers visit to KVK	9	17	32	40
Method Demonstrations	9	10	130	205
Film show	2	4	55	94
Exhibition	4	6	110	506
Celebration of important days	9	27	220	1328
Kisan Mela	2	4	150	388
Farmers Scientist Interaction	3	4	80	633
Jal Shakti Abhiyan	-	1	-	32

Extension Activities	Programme		Beneficiaries	
	Targets	Achievement	Targets	Achievement
Soil health Campaign	1	1	30	30
World Soil Day	1	1	50	85
Webcasting	-	7	-	194
<b>Total</b>	<b>141</b>	<b>195</b>	<b>1052</b>	<b>3889</b>



Kisan Gosthi organized at KVK, Phek



Millet recipe contest organized for farm women at KVK, Phek



Kisan Gosthi under natural farming



Demonstration under natural farming



Students visited the KVK Phek



Skill Training of Rural Youth (STRY) on vermicomposting

## Swacch Bharat events organized

KVK Phek organized, within and outside the campus, different Swacch Bharat programmes where students and farmers also participated.

### Swachhta Pakhwada at KVK-Phek



Swachhta pakhwada organized at KVK campus



Cleanliness drive organized in campus



Lecture on Swachhta Pakhwada and cleanliness drive organized at Govt. High School Porba



Swachhta campaign organized at KVK campus


## Variety registered/ Notified/ Patent

Five farmers varieties of rice namely *Tengabe*, *Losamiru*, *Echumiru*, *Tanye* and *Menabe* from Phek district Nagaland registered by Krishi Vigyan Kendra-Phek under the Protection of Plant Varieties and Farmers Rights Act, 2001 at Protection of Farmers Varieties and Farmers Rights Authority (Govt. of India), New Delhi.




KVK Phek

## Registration Certificates of Farmers Varieties of Rice in Protection of Farmers Varieties and Farmers Rights Authority (Govt. of India) New Delhi




सत्यमेव जयते



PPVFRA

**प्रारूप O-2, FORM O-2**  
(कृषया नियम 36 और 37 देखें) (See rules 36 and 37)  
**भारत सरकार / GOVERNMENT OF INDIA**



### पौधा किस्म रजिस्ट्री PLANT VARIETIES REGISTRY

पौधा किस्म और कृषक अधिकार संरक्षण प्राधिकरण / PROTECTION OF PLANT VARIETIES & FARMERS' RIGHTS AUTHORITY  
सी पी एस मार्ग, निकट टोदापुर गाँव, नई दिल्ली – 110012 / D P S Marg, Near Todapur Village, New Delhi - 110012

### रजिस्ट्रीकरण प्रमाण-पत्र / Certificate of Registration

पंजीकरण सं./ Registration No.: REG/2014/326	दखिल करने की तारीख/Date of Filing: 03 फरवरी / February, 2014
	जारी करने की तारीख/ Date of Grant: 27 नवंबर / November, 2023

श्री ख्वेनिये खामो, ग्राम लोसामी, जिला प्हेक, नागालैंड -797107 ने घोषित किया है कि उसने चावल (*Oryza sativa* L.) फसल को कृषक पौधा किस्म इचुमिरु विकसित किया है और यह उसका वास्तविक प्रजनक (या वास्तविक प्रजनक का विधिक प्रतिनिधि या समनुदेशिकी) है और पौधा किस्म संरक्षण और कृषक अधिकार अधिनियम, 2001 के उपबंधों को ध्यान में रखते हुए वह उक्त पौधा किस्म को अधिकार का हकदार है और यह कि उसके पत्र में पौधा किस्म के पंजीकरण के प्रति कोई आपत्ति नहीं है। और, यह उक्त पौधा किस्म के लिए आवेदन करते हुए अनुरोध करता है कि कृषक पौधा किस्म का पंजीकरण उसका नाम पर किया जाये,

और, उसने अपने आवेदन द्वारा और उसके, उक्त पौधा किस्म के विभिन्न विशिष्ट लक्षणों और उसके अभिधान का उल्लेख किया है;

अतः यह दिल्ख है कि उपरोक्त आवेदक (जिसमें उसके विधिक प्रतिनिधि और समनुदेशिकी या इनमें से कोई भी है) पौधा किस्म संरक्षण और कृषक अधिकार अधिनियम, 2001 के उपबंधों और उक्त अधिनियम की धारा 47 में विनिर्दिष्ट शर्तों और तत्समय प्रवृत्त किसी अन्य विधि द्वारा विनिर्दिष्ट शर्तों और उपबंधों के अधीन रहते हुए वर्ष 2023 के नवंबर माह की 27 तारीख से छः वर्षों की अवधि के लिए एवं शेष वर्षों के लिए नवीनीकरण के उपरांत, उस किस्म के उत्पादन, विक्रय, विपणन, वितरण, आयात या निर्यात करने और ऐसा करने के लिए किसी अन्य व्यक्ति को प्राधिकृत करने का अनन्य अधिकार होगा, इस शर्त के अधीन रहते हुए कि इस पंजीकरण की विधि बान्सा प्रत्यागत नदी की जाती है और इस पंजीकरण को बनाए रखने के लिए विहित कीस का लुभ्यक रूप से संदाय किया जाता है।


Whereas, Sri Khwenyipe Khamo, Village Losami, District Phek, Nagaland -797107 has declared that he has developed ECHUMIRU of Rice (*Oryza sativa* L.) as Farmer plant variety and that he is the true breeder thereof (or the legal representative or assignee of the true breeder) and that he is entitled to a plant variety right on the said variety, having regard to the provisions of the Protection of Plant Varieties and Farmers' Rights Act, 2001 and that there is no objection to the registration of plant variety in favor of him.


And whereas he has, by an application, requested that registration of Farmer plant variety may be allowed to him for the said plant variety;

And whereas he has, by and in his application, particularly described the various distinctive features and mentioned the denomination of the said plant variety;

Now, these presents that the above said applicant (including his legal representatives and assignees or any of them) shall, subject to the provisions of the Protection of Plant Varieties and Farmers' Rights Act, 2001 and the conditions specified in section 47 of the said Act, and the conditions and provisions specified by any other law for the time being in force, from the 27<sup>th</sup> day of November, 2023, have the exclusive right to produce, sell, market, distribute, import or export the variety for initial term of Six years & renewable for the remaining years and of authorizing any other person to do so, subject to the conditions that the validity of this registration is not guaranteed and that the fee prescribed for the continuance of this registration are duly paid.

इसके साथ ही स्वयं रजिस्ट्रार ने वर्ष 2023 के नवंबर माह की 27 तारीख को पंजीकरण पर मुहर लगाई है। In witness thereof, the Registrar has caused this registration to be sealed as of the 27<sup>th</sup> day of November, 2023.





रजिस्ट्रार के हस्ताक्षर व मुहर/ Seal and Signature of the Registrar,  
पौधा किस्म रजिस्ट्री/ Plant Varieties Registry

**टिप्पण/Note :** इस पंजीकरण को बनाए रखने के लिए फीस, यदि इसे बनाए रखा जाता है तो वर्ष 2024 के नवंबर माह की 27 तारीख को और उसके पश्चात प्रत्येक वर्ष उसी तारीख को वैध होगी। The fees for maintenance of this registration, if it is to be maintained, will fall due on 27<sup>th</sup> day of November, 2024 and on the same day in every year thereafter.

E-mail: ppvfra-agri@nic.in; Website: www.plantauthority.gov.in





समर्पण करते



PPVFRA

**प्ररूप O-2, FORM O-2**  
(कृषया नियम 36 और 37 देखें) (See rules 36 and 37)  
**भारत सरकार / GOVERNMENT OF INDIA**



**पौधा किस्म रजिस्ट्री PLANT VARIETIES REGISTRY**  
पौधा किस्म और कृषक अधिकार संरक्षण प्राधिकरण / PROTECTION OF PLANT VARIETIES & FARMERS' RIGHTS AUTHORITY  
डी पी एस मार्ग, निकट टोडापुर गाँव, नई दिल्ली – 110012 / D P S Marg, Near Todapur Village, New Delhi - 110012

**रजिस्ट्रीकरण प्रमाण-पत्र / Certificate of Registration**

पंजीकरणसं./ Registration No.: REG/2014/328	दखिल करने की तारीख/ Date of Filing: 03 फरवरी / February, 2014
	जायी करने की तारीख/ Date of Grant: 26 नवंबर / November, 2023

श्री क्वेचेपे मेबो, विलेज लोसामी, जिला फेक, नगालैंड ने घोषित किया है कि उसने चावल (*Oryza sativa* L.) फसल की कृषक पौधा किस्म LOSAMIRU विकसित किया है और वह उसका वास्तविक प्रजनक (या वास्तविक प्रजनक का विधिक प्रतिनिधि या समनुदेशिकी) है और पौधा किस्म संरक्षण और कृषक अधिकार अधिनियम, 2001 के उपबंधों को ध्यान में रखते हुए वह उक्त पौधा किस्म के अधिकार का हकदार है और यह कि उसके पास में पौधा किस्म के पंजीकरण के प्रति कोई आपेक्ष नहीं है।

और, वह उक्त पौधा किस्म के लिए आवेदन करते हुए अनुरोध करता है कि कृषक पौधा किस्म का पंजीकरण उसके नाम पर किया जाये, और, उसने अपने आवेदन द्वारा और उसके, उक्त पौधा किस्म के विभिन्न विशिष्ट लक्षणों और उसके अनियान का उल्लेख करते हैं;

अतः यह धिलेख है कि उपर्युक्त आवेदक (जिसमें उसके विधिक प्रतिनिधि और समनुदेशिकी या इनमें से कोई भी हैं) पौधा किस्म संरक्षण और कृषक अधिकार अधिनियम, 2001 के उपबंधों और उक्त अधिनियम की धारा 47 में विनिर्दिष्ट शर्तों और उत्समय प्रवृत्त किसी अन्य विधि द्वारा विनिर्दिष्ट शर्तों और उपबंधों के अधीन रहते हुए वर्ष 2023 के नवंबर माह की 26 तारीख से छः वर्षों की अवधि के लिए एवं शेष वर्षों के लिए नवीनीकरण के उपरांत, उस किस्म के उत्पादन, विक्रय, विपणन, वितरण, आयात या निर्यात करने और ऐसा करने के लिए किसी अन्य व्यक्ति को प्राधिकृत करने का अनन्य अधिकार होगा, इस शर्त के अधीन रहते हुए कि इस पंजीकरण की विधि मान्यता प्रत्याभूत नहीं की जाती है और इस पंजीकरण को बनाए रखने के लिए विहित फीस का सम्यक रूप से संदाय किया जाता है।

Whereas Sh. Kewechephe Mebou, Village Losami, Dist: Phek, Nagaland has declared that he has developed LOSAMIRU of Rice (*Oryza sativa* L.) as Farmer plant variety and that he is the true breeder thereof (or the legal representative or assignee of the true breeder) and that he is entitled to a plant variety right on the said variety, having regard to the provisions of the Protection of Plant Varieties and Farmers' Rights Act, 2001 and that there is no objection to the registration of plant variety in favour of him.

And whereas he has, by an application, requested that registration of Farmer plant variety may be allowed to him for the said plant variety;

And whereas he has, by and in his application, particularly described the various distinctive features and mentioned the denomination of the said plant variety;

Now, these presents that the above said applicant (including his legal representatives and assignees or any of them) shall, subject to the provisions of the Protection of Plant Varieties and Farmers' Rights Act, 2001 and the conditions specified in section 47 of the said Act, and the conditions and provisions specified by any other law for the time being in force, from the 26<sup>th</sup> day of November, 2023, have the exclusive right to produce, sell, market, distribute, import or export the variety for initial term of Six years & renewable for the remaining years and of authorizing any other person to do so, subject to the conditions that the validity of this registration is not guaranteed and that the fee prescribed for the continuance of this registration are duly paid.

इसके साथ ही प्ररूप रजिस्ट्रार ने वर्ष 2023 के नवंबर माह की 26 तारीख को पंजीकरण पर मुहर लगाई है। In witness thereof, the Registrar has caused this registration to be sealed as of the 26<sup>th</sup> day of November, 2023.





रजिस्ट्रार के हस्ताक्षर व मुहर/ Seal and Signature of the Registrar,  
पौधा किस्म रजिस्ट्री/ Plant Varieties Registry

**टिप्पण/ Note :** इस पंजीकरण को बनाए रखने के लिए फीस, यदि इसे बनाए रखा जाना है तो वर्ष 2024 के नवंबर माह की 26 तारीख को और उसके पश्चात प्रत्येक वर्ष उसी तारीख को देय होगी। The fees for maintenance of this registration, if it is to be maintained, will fall due on 26<sup>th</sup> day of November, 2024 and on the same day in every year thereafter.

E-mail: ppvfra-agn@nic.in; Website: www.plantauthority.gov.in



प्रारूप O-2, FORM O-2  
 (कृषक विधम 36 और 37 देखें) (See rules 36 and 37)

भारत सरकार / GOVERNMENT OF INDIA

## पौधा किस्म रजिस्ट्री PLANT VARIETIES REGISTRY

पौधा किस्म और कृषक अधिकार संरक्षण प्राधिकरण / PROTECTION OF PLANT VARIETIES & FARMERS' RIGHTS AUTHORITY  
 डी पी एस मार्ग, निकट टोडापुर गाँव, नई दिल्ली - 110012 / D P S Marg, Near Todapur Village, New Delhi - 110012

### रजिस्ट्रीकरण प्रमाण-पत्र / Certificate of Registration

पंजीकरणसं./ Registration No.: REG/2014/319	दाखिल करने की तारीख/ Date of Filing: 03 फरवरी / February, 2014
	जारी करने की तारीख/ Date of Grant: 26 नवंबर / November, 2023

श्री वेलहिपे चिरो, चैयरमैन तकेटा फार्मर क्लब, लोअर खेल, मेसुलुमी विलेज, जिला: फेक, नगालैंड ने घोषित किया है कि उसने चावल (*Oryza sativa* L.) फसल की कृषक पौधा किस्म MENABE विकसित किया है और वह उसका वास्तविक प्रजनक (या वास्तविक प्रजनक का विधिक प्रतिनिधि या समनुदेशिनी) है और पौधा किस्म संरक्षण और कृषक अधिकार अधिनियम, 2001 के उपबंधों को ध्यान में रखते हुए वह उक्त पौधा किस्म के अधिकार का हकदार है और वह कि उसके पत्र में पौधा किस्म के पंजीकरण के प्रति कोई आपे नही है।

और, वह उक्त पौधा किस्म के लिए आवेदन करते हुए अनुरोध करता है कि कृषक पौधा किस्म का पंजीकरण उसके नाम पर किया जाये, और, उसने अपने आवेदन द्वारा और उसके, उक्त पौधा किस्म के विभिन्न विशिष्ट लक्षणों और उसके अभिधान का उल्लेख करते हैं,

अतः यह विलेख है कि उपर्युक्त आवेदक (जिसमें उसके विधिक प्रतिनिधि और समनुदेशिनी या इनमें से कोई भी हैं) पौधा किस्म संरक्षण और कृषक अधिकार अधिनियम, 2001 के उपबंधों और उक्त अधिनियम की धारा 47 में विनिर्दिष्ट शर्तों और तत्सम्य प्रवृत्त किसी अन्य विधि द्वारा विनिर्दिष्ट शर्तों और उपबंधों के अधीन रहते हुए वर्ष 2023 के नवंबर माह की 26 तारीख से छः वर्षों की अवधि के लिए एवं छह वर्षों के लिए नवीनीकरण के उपरंत, उक्त किस्म के उत्पादन, विक्रय, विपणन, वितरण, आयात या निर्यात करने और ऐसा करने के लिए किसी अन्य व्यक्ति को प्राधिकृत करने का अनन्य अधिकार होगा, इस शर्त के अधीन रहते हुए कि इस पंजीकरण की विधि मान्यता प्रत्याभूत नहीं की जाती है और इस पंजीकरण को बनाए रखने के लिए विहित फीस का सम्यक रूप से संदाय किया जाता है।

Whereas Sh. Welhipe Chiero, Chairman Taketa Farmer Club, Lower Khel, Mesulumi Village, Dist: Phek, Nagaland has declared that he has developed MENABE of Rice (*Oryza sativa* L.) as Farmer plant variety and that he is the true breeder thereof (or the legal representative or assignee of the true breeder) and that he is entitled to a plant variety right on the said variety, having regard to the provisions of the Protection of Plant Varieties and Farmers' Rights Act, 2001 and that there is no objection to the registration of plant variety in favour of him,

And whereas he has, by an application, requested that registration of Farmer plant variety may be allowed to him for the said plant variety;

And whereas he has, by and in his application, particularly described the various distinctive features and mentioned the denomination of the said plant variety;


Now, these presents that the above said applicant (including his legal representatives and assignees or any of them) shall, subject to the provisions of the Protection of Plant Varieties and Farmers' Rights Act, 2001 and the conditions specified in section 47 of the said Act, and the conditions and provisions specified by any other law for the time being in force, from the 26<sup>th</sup> day of November, 2023, have the exclusive right to produce, sell, market, distribute, import or export the variety for initial term of six years & renewable for the remaining years and of authorizing any other person to do so, subject to the conditions that the validity of this registration is not guaranteed and that the fee prescribed for the continuance of this registration are duly paid.

इसके साथ त्वरान रजिस्ट्रार ने वर्ष 2023 के नवंबर माह की 26 तारीख को पंजीकरण पर मुहर लगाई है। In witness thereof, the Registrar has caused this registration to be sealed as of the 26<sup>th</sup> day of November, 2023.




रजिस्ट्रार के हस्ताक्षर व मुहर/ Seal and Signature of the Registrar,  
 पौधा किस्म रजिस्ट्री/ Plant Varieties Registry

टिप्पण/ Note : इस पंजीकरण को बनाए रखने के लिए फीस, यदि इसे बनाए रखा जागा है तो वर्ष 2024 के नवंबर माह की 26 तारीख को और उसके पश्चात प्रत्येक वर्ष उसी तारीख को देय होगी। The fees for maintenance of this registration, if it is to be maintained, will fall due on 26<sup>th</sup> day of November, 2024 and on the same day in every year thereafter.



सत्यमेव जयते



PPVFR

प्रारूप O-2, FORM O-2  
(कृषकानुसार 36 और 37 देखें) (See rules 36 and 37)  
भारत सरकार / GOVERNMENT OF INDIA

## पौधा किस्म रजिस्ट्री PLANT VARIETIES REGISTRY

पौधा किस्म और कृषक अधिकार संरक्षण प्राधिकरण / PROTECTION OF PLANT VARIETIES & FARMERS' RIGHTS AUTHORITY  
डी पी एस मार्ग, निकट टोडापुर गाँव, नई दिल्ली - 110012 / D P S Marg, Near Todapur Village, New Delhi - 110012

### रजिस्ट्रीकरण प्रमाण-पत्र / Certificate of Registration



पंजीकरण सं./ Registration No.: REG/2014/325	दाखिल करने की तारीख/ Date of Filing: 03 फरवरी/ February, 2014
	जारी करने की तारीख/ Date of Grant: 27 नवंबर/ November, 2023

श्री सिजोप्रा निनु, रंगुजु नासा, पी.ओ. चोयुबा, जिला - पhek, नागालैण्ड -797107 ने घोषित किया है कि उसने चावल (*Oryza sativa* L.) फसल को कृषक पौधा किस्म TANYE (RUNGUZU NASA) विकसित किया है और वह उसका वास्तविक प्रजनक (या वास्तविक प्रजनक का विधिक प्रतिनिधि या सम्बन्धित) है और पौधा किस्म संरक्षण और कृषक अधिकार अधिनियम, 2001 के उपबन्धों को ध्यान में रखते हुए वह उक्त पौधा किस्म के अधिकार का ठेकदार है और यह कि उसके पास में पौधा किस्म के पंजीकरण के प्रति कोई आपत्ति नहीं है।

और, वह उक्त पौधा किस्म के लिए आवेदन करते हुए अनुरोध करता है कि कृषक पौधा किस्म का पंजीकरण उसके नाम पर किया जाये, और, उसने अपने आवेदन द्वारा और उसके, उस पौधा किस्म के विभिन्न विशिष्ट लक्षणों और उसके अभिधान का उल्लेख किया है;

अतः यह विवेक है कि उपरोक्त आवेदक (जिसमें उसके विधिक प्रतिनिधि और सम्बन्धितों या इनमें से कोई भी है) पौधा किस्म संरक्षण और कृषक अधिकार अधिनियम, 2001 के उपबन्धों और उक्त अधिनियम की धारा 47 में विनिर्दिष्ट शर्तों और लक्ष्यम प्रकृत किसी अन्य विधि द्वारा विनिर्दिष्ट शर्तों और उपबन्धों के अधीन रहते हुए वर्ष 2023 के नवंबर माह की 27 तारीख से छः वर्षों की अवधि के लिए एवं शेष वर्षों के लिए नवीनीकरण के उपरांत, उस किस्म के उत्पादन, विक्रय, विपणन, निर्यात, आयात या निर्यात करने और ऐसा करने के लिए किसी अन्य व्यक्ति को प्राधिकृत करने का अल्पकाल अधिकार होगा, इस शर्त के अधीन रहते हुए कि इस पंजीकरण की विधि मान्यता प्रत्याभूत नहीं की जाती है और इस पंजीकरण को बनाए रखने के लिए विहित फीस का सम्यक रूप से संदाय किया जाता है।

Whereas, Shri Cizopra Nienu, Runguzu Nasa, P.O. Chozuba, District- Phek, Nagaland -797107 has declared that he has developed TANYE (RUNGUZU NASA) of Rice (*Oryza sativa* L.) as Farmer plant variety and that he is the true breeder thereof (or the legal representative or assignee of the true breeder) and that he is entitled to a plant variety right on the said variety, having regard to the provisions of the Protection of Plant Varieties and Farmers' Rights Act, 2001 and that there is no objection to the registration of plant variety in favor of him;


And whereas he has, by an application, requested that registration of Farmer plant variety may be allowed to him for the said plant variety;

And whereas he has, by and in his application, particularly described the various distinctive features and mentioned the denomination of the said plant variety;

Now, these presents that the above said applicant (including his legal representatives and assignees or any of them) shall, subject to the provisions of the Protection of Plant Varieties and Farmers' Rights Act, 2001 and the conditions specified in section 47 of the said Act, and the conditions and provisions specified by any other law for the time being in force, from the 27<sup>th</sup> day of November, 2023, have the exclusive right to produce, sell, market, distribute, import or export the variety for initial term of Six years & renewable for the remaining years and of authorizing any other person to do so, subject to the conditions that the validity of this registration is not guaranteed and that the fee prescribed for the continuance of this registration are duly paid.

इसके साथ स्वल्प रजिस्ट्रार ने वर्ष 2023 के नवंबर माह की 27 तारीख को पंजीकरण पर मुहर लगाई है। In witness thereof, the Registrar has caused this registration to be sealed as of the 27<sup>th</sup> day of November, 2023.





रजिस्ट्रार के हस्ताक्षर व मुहर/ Seal and Signature of the Registrar,  
पौधा किस्म रजिस्ट्री/ Plant Varieties Registry

**टिप्पणी/Note :** इस पंजीकरण को बनाए रखने के लिए फीस, यदि इसे बनाए रखा जाता है तो वर्ष 2024 के नवंबर माह की 27 तारीख को और उसके पश्चात प्रत्येक वर्ष उसी तारीख को देना होगा। The fees for maintenance of this registration, if it is to be maintained, will fall due on 27<sup>th</sup> day of November, 2024 and on the same day in every year thereafter.

E-mail: ppvfra-agri@nic.in; Website: www.plantauthority.gov.in



प्ररूप O-2, FORM O-2

(कृषया नियम 36 और 37 देखें) (See rules 36 and 37)

भारत सरकार / GOVERNMENT OF INDIA

**पौधा किस्म रजिस्ट्री PLANT VARIETIES REGISTRY**पौधा किस्म और कृषक अधिकार संरक्षण प्राधिकरण / PROTECTION OF PLANT VARIETIES & FARMERS' RIGHTS AUTHORITY  
डी पी एस मार्ग, निकट टोडापुर गाँव, नई दिल्ली - 110012 / D P S Marg, Near Todapur Village, New Delhi - 110012**रजिस्ट्रीकरण प्रमाण-पत्र / Certificate of Registration**

पंजीकरणसं./ Registration No.: REG/2014/320	घाशिल करने की तारीख/ Date of Filing: 03 फरवरी / February, 2014
	जायी करने की तारीख/ Date of Grant: 26 नवंबर / November, 2023

श्री देवहिने चिरो, चैयरमैन टकेटा फार्मर क्लब, लोअर खेल, मेसुलुमी विलेज, जिला: फेक, नगालैंड ने घोषित किया है कि उसने चावल (*Oryza sativa* L.) फसल की कृषक पौधा किस्म TENGABE विकसित किया है और वह उसका वास्तविक प्रजनक (या वास्तविक प्रजनक का विधिक प्रतिनिधि या समनुदेशिकी) है और पौधा किस्म संरक्षण और कृषक अधिकार अधिनियम, 2001 के उपबंधों को ध्यान में रखते हुए वह उक्त पौधा किस्म के अधिकार का हकदार है और यह कि उसके पक्ष में पौधा किस्म के पंजीकरण के प्रति कोई आपेप नहीं है। और, वह उक्त पौधा किस्म के लिए आवेदन करते हुए अनुरोध करता है कि कृषक पौधा किस्म का पंजीकरण उसके नाम पर किया जाये; और, उसने अपने आवेदन द्वारा और उसके, उक्त पौधा किस्म के विभिन्न विशिष्ट लक्षणों और उसके अधिधान का उल्लेख करते हैं:

अतः यह विलेख है कि उपर्युक्त आवेदक (जिसने उसके विधिक प्रतिनिधि और समनुदेशिकी या इनमें से कोई भी है) पौधा किस्म संरक्षण और कृषक अधिकार अधिनियम, 2001 के उपबंधों और उक्त अधिनियम की धारा 47 में विनिर्दिष्ट शर्तों और तत्समय प्रवृत्त किसी अन्य विधि द्वारा विनिर्दिष्ट शर्तों और उपबंधों के अधीन रहते हुए वर्ष 2023 के नवंबर माह की 26 तारीख से छः वर्षों की अवधि के लिए एवं शेष वर्षों के लिए नवीनीकरण के उपरांत, उक्त किस्म के उत्पादन, विक्रय, विपणन, वितरण, आयात या निर्यात करने और ऐसा करने के लिए किसी अन्य व्यक्ति को प्राधिकृत करने का अनन्य अधिकार होगा, इस शर्त के अधीन रहते हुए कि इस पंजीकरण की विधि मान्यता प्रत्याभूत नहीं की जाती है और इस पंजीकरण को बनाए रखने के लिए विहित फीस का सम्यक रूप से संदाय किया जाता है।

Whereas Sh. Welhipe Chiero, Chairman Taketa Farmer Club, Lower Khel, Mesulumi Village, Dist: Phek, Nagaland has declared that he has developed TENGABE of Rice (*Oryza sativa* L.) as Farmer plant variety and that he is the true breeder thereof (or the legal representative or assignee of the true breeder) and that he is entitled to a plant variety right on the said variety, having regard to the provisions of the Protection of Plant Varieties and Farmers' Rights Act, 2001 and that there is no objection to the registration of plant variety in favour of him.

And whereas he has, by an application, requested that registration of Farmer plant variety may be allowed to him for the said plant variety;

And whereas he has, by and in his application, particularly described the various distinctive features and mentioned the denomination of the said plant variety;

Now, these presents that the above said applicant (including his legal representatives and assignees or any of them) shall, subject to the provisions of the Protection of Plant Varieties and Farmers' Rights Act, 2001 and the conditions specified in section 47 of the said Act, and the conditions and provisions specified by any other law for the time being in force, from the 26<sup>th</sup> day of November, 2023, have the exclusive right to produce, sell, market, distribute, import or export the variety for initial term of six years & renewable for the remaining years and of authorizing any other person to do so, subject to the conditions that the validity of this registration is not guaranteed and that the fee prescribed for the continuance of this registration are duly paid.

इसके सख्य स्वक्य रजिस्ट्रार ने वर्ष 2023 के नवंबर माह की 26 तारीख को पंजीकरण पर मुहर लगाई है। In witness thereof, the Registrar has caused this registration to be sealed as of the 26<sup>th</sup> day of November, 2023.

रजिस्ट्रार के हस्ताक्षर व मुहर/ Seal and Signature of the Registrar,  
पौधा किस्म रजिस्ट्री/ Plant Varieties Registry

टिप्पण/Note : इस पंजीकरण को बनाए रखने के लिए फीस, यदि इसे बनाए रखा जाना है तो वर्ष 2024 के नवंबर माह की 26 तारीख को और उसके पश्चात प्रत्येक वर्ष उसी तारीख को देय होगी। The fees for maintenance of this registration, if it is to be maintained, will fall due on 26<sup>th</sup> day of November, 2024 and on the same day in every year thereafter.

## The HRD activities carried out by the KVK Phek

Table 19: Training programmes

Training programmes				
Clientele	Number of Courses		Number of Participants	
	Targets	Achievement	Targets	Achievement
Farmers	25	33	625	880
Rural youth	8	11	210	263
Extension functionaries	2	2	20	20
<b>Total</b>	<b>35</b>	<b>46</b>	<b>855</b>	<b>1163</b>

Table 20: Vocational training programmes

Date (Duration)	Training title	Participants		
		Male	Female	Total
07-08-2023 to 11-08-2023	Post-Harvest management in Foxtail millet	8	7	15
16-11-2023 to 21-11-2023	Soil fertility management	8	12	20
<b>Total</b>		<b>16</b>	<b>19</b>	<b>35</b>



Vocational training on soil fertility management



Vocational training on post-harvest management in Foxtail millet

## On farm Testing and Front-Line Demonstration

A total number of five OFT were conducted by the KVK out of this three under the Agronomy and two in Soil Science discipline. Under Agronomy discipline on farm testing was conducted on performance of soybean variety MACS 1460 in Porba and Yoruba villages. The performance of high yielding garden pea variety VL Sabjimatar 13 and VL Sabjimatar 14 was conducted at Gidemi village and assessment of local Foxtail millet viz., sticky type and non-sticky type was conducted to assess the productivity of the local germplasm at Zelome village. Under the Soil Science discipline, on farm testing was conducted to assess the organic nutrient management in carrot var. early Nantes at Porba and Upper Khomi villages, assessment of Natural Farming Practices in Foxtail millet cultivation under acid soil condition at Chizami and Porba villages. Altogether, four numbers of demonstrations were conducted under FLD programme viz., on popularization of integrated crop management in Paddy var. RCM 13 at Yoruba village and zero till conservation in field pea was demonstrated at Kikruma village, popularization of organic nutrient management in cabbage at Chizami, Pfutsero, Porba and Zhavame villages, low-cost water harvesting structure was demonstrated at Chozuba, Runguzu Nasa and Runguzu Bawe villages.

Table 21: On Farm Testing (OFT) and Frontline Demonstrations (FLD)

Discipline	On Farm Testing			Frontline Demonstrations		
	Crop / Enterprise	No. of technology	No of trials	Crop / Enterprise	No. of technology	No of demonstration
Agronomy	Soybean	1	5	Paddy	1	4
	Garden Pea	1	5	Field pea	1	6
	Foxtail millet	1	5			
Soil Science	Carrot	1	3	Cabbage	1	5
	Millet	1	3	Low-cost water harvesting structure	1	5
<b>Total</b>		<b>5</b>	<b>21</b>		<b>4</b>	<b>20</b>



OFT on Foxtail millet



OFT on assessment of natural farming practices in Foxtail millet cultivation under acid soil condition.



FLD on popularization of organic cabbage cultivation



FLD on Low-cost water harvesting



OFT on assessment of organic nutrient management in Carrot.



Field day on Foxtail millet at Zelome

### Participation in the Exhibitions



Participated in CAU Agri fare 2023-24 at Chumukedima, Nagaland



Participated in Hornbill Festival 2023 at Kohima Nagaland

### Celebration of Important days



Celebration of World Soil Day



Celebration of Kisan Divas and demonstration of drone application in agriculture

## Visit of dignitaries and Important Meetings



Visit of QRT team to review the activities of KVK, Phek



Visit of Zonal monitoring committee of NICRA for reievw the activities at Phek



# NATIONAL AGRICULTURE INNOVATION FUND SCHEME – ITMU



MITHUN MEAT NUGGETS



ANNUAL REPORT – 2023  
ICAR – NRC on Mithun

## NAIF Scheme: ITMU

### INSTITUTE TECHNOLOGY MANAGEMENT UNIT (ITMU)

#### ITMU Project under National Agricultural Innovation fund

PI: Dr. J.K. Chamuah

Co-PI: Dr. H. Lalzampaia

The Institute Technology Management Unit has been constituted in the Institute with the aim to promote development of infrastructural facilities for registration of intellectual property by facilitating the improvement of legal, institutional and administrative framework assists and facilitates owners of intellectual property and to conduct training and capacity building activities for scientists and other research workers. The ITMU unit of NRC on Mithun has initiated filing of Patents, Trade mark and Geographical Indication. This cell works in consultation with other scientific, technical and administrative staff for smooth functioning of the unit. Under the initiative of the Institute, organized two workshops and one Industry Scientist meet in 2023. The workshop and Scientist Industry meet was part of the capacity building programme with the objective to educate and awareness among scientific communities about intellectual property rights of research activities. This year, the Institute received three copyrights, one design, and four patents and commercialized five technologies and ten certified technologies were certified by the council. During 2023, the Institute also applied for one patent to the patents office, Kolkata during this year demonstrating its commitment to innovation and the advancement of intellectual property.

### Technologies certified by Indian Council of Agricultural Research

In the year 2023, Indian Council of Agricultural Research initiated a process of certification of technologies. The technology details are verified by a Committee headed by Deputy Director General, ICAR. During the ICAR Foundation day ceremony held on 16<sup>th</sup> July 2023, ICAR – National Research Centre on Mithun was awarded certification for following ten technologies:

**Table 22: Technologies certified by Indian Council of Agricultural Research in year 2023**

S. No.	Name	Lead Developer	Associate Developer
1	Innovative Chicken Killing Cone	Dr Debojyoti Borkotoky (Lead),	Dr Nazrul Haque Dr Rinku Bharali Dr Abhijit Mitra
2	Poultry Maize Feeder	Dr Debojyoti Borkotoky	Dr Nazrul Haque Dr Hannah K. Asangla Dr Abhijit Mitra
3	Meat Dryer	Dr. Debojyoti Borkotoky	Dr Nazrul Haque Dr T. Esther Longkumer Dr Abhijit Mitra
4	Portable Mineral Block Dispenser with Adjustable Height	Dr. Nazrul Haque	Dr Debojyoti Borkotoki Dr. Saroj Toppo Dr Harish Chandra Yadav Dr Abhijit Mitra
5	De-Save Portable Mineral Block Dispenser for Animals	Dr. Nazrul Haque	Dr Debojyoti Borkotoki Dr. Saroj Toppo Dr Harish Chandra Yadav Dr Abhijit Mitra

S. No.	Name	Lead Developer	Associate Developer
6	Large Animal Ectoparasite Expeller cum Drug Applicator	Dr. Debojyoti Borkotoky	Dr Jayanta Kumar Chamuah Dr Abhijit Mitra
7	Travis for Restraining of Bovines'	Dr. Sapunii Stephen Hanah	Dr. Kezhavituo Vupru, Dr. Kobu Khate Dr. Laishram Sunitibala Devi, Scientist Dr. J.K. Chamuah Dr. Girish Patil, S.
8	Method of Preparing Mineral Block added with Environment Friendly Materials	Dr. Nazrul Haque,	Dr Kobu Khate Dr Debojyoti Borkotoki Dr. Saroj Toppo Dr Abhijit Mitra
9	Preg-DM: Urine-based Pregnancy Diagnosis Kit for Mithun	ICAR-NRCM Dr. Vikram R. Dr. Ashok Kumar Balhara (ICAR-CIRB)	ICAR-NRCM Dr. M. H. Khan Dr. Abhijit Mitra ICAR-CIRB Mrs. Suman Sangwan Dr. S K Phuli Dr. R K Sharma Dr. Sajjan Singh Dr. T K Datta
10	Mithun Semen Collection by Electro-ejaculation Technique and Cryopreservation	Dr. M. H. Khan	Dr. Vikram R. Dr. A. Mitra

## Salient Achievements of ITMU Section under National Agricultural Innovation Fund

**Table 23: Patent granted**

S. No	Application Number allotted by the issuing Authority	Title	Patent number	Date of Grant
1	1277/KOL/2012	An energy efficient post tanning process for Mithun hides	428786	13.04.2023
2	360/KOL/2012 (Transferred to L.S. Davar)-Complete filed on 1 <sup>st</sup> April 2013	A process of making leather without any large machinery	432257	19.05.2023
3	192/KOL/2013	A method of processing rabbit fur on leather	431823	15.05.2023
4	183/KOL/2013	A method of removal of chromium from chrome liquor obtained after processing of Mithun hides	442476	02.08.2023



**INTELLECTUAL PROPERTY INDIA**  
PATENT OFFICE, GOVERNMENT OF INDIA

भारत सरकार  
GOVERNMENT OF INDIA  
पेटेंट कार्यालय  
THE PATENT OFFICE  
पेटेंट प्रमाणपत्र  
PATENT CERTIFICATE  
(Under the Provisions of the Patents Act, 1970)

आवक सं. - 00324004  
SL. No. :

पेटेंट सं. / Patent No. :	430100
आवेदन सं. / Application No. :	127400/2012
पेटेंट दाखिल की तिथि / Date of Filing :	07/11/2012
पेटेंट / Patentee :	NATIONAL RESEARCH CENTRE ON MITHUN (ICAR)

इसमें निम्न विषय के लिए पेटेंट की प्रमाणित प्रतियाँ AN ENERGY EFFICIENT POST TANNING PROCESS FOR MITHUN HIDES नाम अधिनियम के तहत, पेटेंट अधिनियम, 1970 में प्रदान की गई हैं।  
 It is hereby certified that a patent has been granted to the patentee for an invention entitled AN ENERGY EFFICIENT POST TANNING PROCESS FOR MITHUN HIDES as disclosed in the above mentioned application for the term of 20 years from the 7<sup>th</sup> day of November 2012 in accordance with the provisions of the Patents Act, 1970.

**INTELLECTUAL PROPERTY INDIA**  
DESIGNS, TRADE MARKS & GEOGRAPHICAL INDICATIONS

पेटेंट की तिथि / Date of Grant : 12/04/2023

अधीक्षक पेटेंट  
Controller of Patents

Note - as this is subject of the Act, it is to be maintained till 12<sup>th</sup> day of November 2012 and on the same day in every year thereafter.

**INTELLECTUAL PROPERTY INDIA**  
PATENT OFFICE, GOVERNMENT OF INDIA

भारत सरकार  
GOVERNMENT OF INDIA  
पेटेंट कार्यालय  
THE PATENT OFFICE  
पेटेंट प्रमाणपत्र  
PATENT CERTIFICATE  
(Under the Provisions of the Patents Act, 1970)

आवक सं. - 00324003  
SL. No. :

पेटेंट सं. / Patent No. :	430257
आवेदन सं. / Application No. :	166400/2012
पेटेंट दाखिल की तिथि / Date of Filing :	30/03/2012
पेटेंट / Patentee :	NATIONAL RESEARCH CENTRE ON MITHUN (ICAR)

इसमें निम्न विषय के लिए पेटेंट की प्रमाणित प्रतियाँ LEATHER MATERIAL DERIVED FROM THE HIDE OF THE BOVINE SPECIES OF MITHUN AND A METHOD FOR PREPARING THE SAME IN RURAL INDUSTRY नाम अधिनियम के तहत, पेटेंट अधिनियम, 1970 में प्रदान की गई हैं।  
 It is hereby certified that a patent has been granted to the patentee for an invention entitled LEATHER MATERIAL DERIVED FROM THE HIDE OF THE BOVINE SPECIES OF MITHUN AND A METHOD FOR PREPARING THE SAME IN RURAL INDUSTRY as disclosed in the above mentioned application for the term of 20 years from the 30<sup>th</sup> day of March 2012 in accordance with the provisions of the Patents Act, 1970.

**INTELLECTUAL PROPERTY INDIA**  
DESIGNS, TRADE MARKS & GEOGRAPHICAL INDICATIONS

पेटेंट की तिथि / Date of Grant : 18/05/2023

अधीक्षक पेटेंट  
Controller of Patents

Note - as this is subject of the Act, it is to be maintained till 30<sup>th</sup> day of March 2012 and on the same day in every year thereafter.

**INTELLECTUAL PROPERTY INDIA**  
PATENT OFFICE, GOVERNMENT OF INDIA

भारत सरकार  
GOVERNMENT OF INDIA  
पेटेंट कार्यालय  
THE PATENT OFFICE  
पेटेंट प्रमाणपत्र  
PATENT CERTIFICATE  
(Under the Provisions of the Patents Act, 1970)

आवक सं. - 00324440  
SL. No. :

पेटेंट सं. / Patent No. :	431803
आवेदन सं. / Application No. :	182900/2013
पेटेंट दाखिल की तिथि / Date of Filing :	10/02/2013
पेटेंट / Patentee :	NATIONAL RESEARCH CENTRE ON MITHUN (ICAR)

इसमें निम्न विषय के लिए पेटेंट की प्रमाणित प्रतियाँ A METHOD OF PROCESSING RABBIT FUR ON LEATHER नाम अधिनियम के तहत, पेटेंट अधिनियम, 1970 में प्रदान की गई हैं।  
 It is hereby certified that a patent has been granted to the patentee for an invention entitled A METHOD OF PROCESSING RABBIT FUR ON LEATHER as disclosed in the above mentioned application for the term of 20 years from the 10<sup>th</sup> day of February 2013 in accordance with the provisions of the Patents Act, 1970.

**INTELLECTUAL PROPERTY INDIA**  
DESIGNS, TRADE MARKS & GEOGRAPHICAL INDICATIONS

पेटेंट की तिथि / Date of Grant : 19/05/2023

अधीक्षक पेटेंट  
Controller of Patents

Note - as this is subject of the Act, it is to be maintained till 10<sup>th</sup> day of February 2013 and on the same day in every year thereafter.

**INTELLECTUAL PROPERTY INDIA**  
PATENT OFFICE, GOVERNMENT OF INDIA

भारत सरकार  
GOVERNMENT OF INDIA  
पेटेंट कार्यालय  
THE PATENT OFFICE  
पेटेंट प्रमाणपत्र  
PATENT CERTIFICATE  
(Under the Provisions of the Patents Act, 1970)

आवक सं. - 00324440  
SL. No. :

पेटेंट सं. / Patent No. :	440475
आवेदन सं. / Application No. :	183400/2013
पेटेंट दाखिल की तिथि / Date of Filing :	18/02/2013
पेटेंट / Patentee :	NATIONAL RESEARCH CENTRE ON MITHUN (ICAR)

इसमें निम्न विषय के लिए पेटेंट की प्रमाणित प्रतियाँ A METHOD OF REMOVAL OF CHROMIUM FROM CHROME LIQUOR OBTAINED AFTER PROCESSING OF MITHUN HIDES नाम अधिनियम के तहत, पेटेंट अधिनियम, 1970 में प्रदान की गई हैं।  
 It is hereby certified that a patent has been granted to the patentee for an invention entitled A METHOD OF REMOVAL OF CHROMIUM FROM CHROME LIQUOR OBTAINED AFTER PROCESSING OF MITHUN HIDES as disclosed in the above mentioned application for the term of 20 years from the 18<sup>th</sup> day of February 2013 in accordance with the provisions of the Patents Act, 1970.

**INTELLECTUAL PROPERTY INDIA**  
DESIGNS, TRADE MARKS & GEOGRAPHICAL INDICATIONS

पेटेंट की तिथि / Date of Grant : 02/06/2023

अधीक्षक पेटेंट  
Controller of Patents

Note - as this is subject of the Act, it is to be maintained till 18<sup>th</sup> day of February 2013 and on the same day in every year thereafter.

**Table 24: Patent submitted**

S. No.	Application/Registration No	Name of Innovation/ Technology/Products/ Verities	Date of Filing/Registration	Status
1	202331027331	Process for drying agro-industrial by-products and using it as a component of animal feed block	13.04.2023	Applied

**Table 25: No. of design granted**

S. No.	Name of design	Application number	Application date	Date of filing request examination	Date of submission of reply to FER	Remarks
1	Travis for restraining of bovines.	38107-001; Class No. 30-02	08.03.2023	-	-	Granted on 25.05.2023

**Table 26: Copyright granted**



Name of Copyright	Application/Registration No	Name of Innovation/ Technology/Products/ Verities	Date of Filing/Registration	Status
Cinematograph Film	Diary Number: 19874/2022-CO/CF	Estrus detection and Artificial Insemination (AI) in Mithun	20.09.2022	Granted 23.05.2023
Artistic work	Diary Number: 26993/2022-CO/A	Semi-intensive rearing model	23.12.2022	Granted 22.11.2023
Cinematograph Film	Diary Number: 19876/2022-CO/CF	Diversified uses of Mithun	20.09.2022	Granted 15.11.2023

**Table 27: Technology commercialization**

S. No.	Name of technology	Commercialized through party	Date
1	Large Animal Ectoparasite Expeller cum Drug Applicator	Creative Displayers, West Bengal	24.02.2023
2	De-Save Portable Mineral Block Dispenser for Animals	Creative Displayers, West Bengal	16.07.2023
3	Production of Value Added Products from Mithun Meat and Providing Incubation Services	M/s. North East Animal Farming Initiative LLP, First floor, Reid marwet, next to boos lodge, Opp CRPF 2nd gate, 9th mile, Ribhoi, Meghalaya	01.09.2023
4	Production of Value Added Products from Mithun Meat and Providing Incubation Services	Life Ministry Learning Centre (LMLC), Ruve Khel, Naga United Village, 4th Mile, Dimapur 797115	01.09.2023
5	Commercialization of two products of Mithun Meat (Nuggets and Sausages).	M/s. North East Animal Farming Initiative LLP, First floor, Reid marwet, next to boos lodge, Opp CRPF 2nd gate, 9th mile, Ribhoi, Meghalaya	21.11.2023


**Table 28: Workshops/training programmes organized**

S. No.	Title of programme	Date	Number of participants
1	Women and IP: Accelerating Innovation and Creativity"	26 <sup>th</sup> April 2023	31
2	Unleashing Creativity through Intellectual Property Rights of North East India	23 <sup>rd</sup> August 2023	112
3	ICAR-Industry Interface Meeting	13 <sup>th</sup> October 2023	10

ORIGINAL

क्रमांक - 137665



भारत सरकार  
GOVERNMENT OF INDIA  
पेटेंट ब्यूरो  
THE PATENT OFFICE  
विज्ञान के प्रौद्योगिकी एवं प्रदर्शन  
CERTIFICATE OF REGISTRATION OF DESIGN

डिजाइन नं. / Design No.

3A1031-001

दिनांक / Date

08/05/2023

सापेक्षता तालिका / Reciprocity Data\*


देश / Country

प्रमाणित किया जाता है कि संलग्न चित्र में दर्शाए डिजाइन के TRAVIS FOR RESTRAINING OF BOVINES में दर्शाए गये डिजाइन, क्लास 30-02 में Indian Council of Agricultural Research के नाम में पंजीकृत किया गया है।

Certified that the design of which a copy is annexed hereto has been registered as of the number and date given above in class 30-02 in respect of the application of such design to TRAVIS FOR RESTRAINING OF BOVINES in the name of Indian Council of Agricultural Research.

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# SWACHH BHARAT MISSION



MITHUN MEAT SAUSAGES



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## Swachh Bharat Mission

Table 29: Swachhta Events conducted during 2023

Name of the events and activities	Date
Observance of Swachhta Special Campaign 2.0	2-31 <sup>st</sup> October 2023
Observance of Swachhta Pakhwada	16-31 <sup>st</sup> December 2023
Celebration of Kisan Diwas, inviting farmers and civil societies and felicitated them for their active participation in the swachhta initiatives.	23 <sup>rd</sup> December 2023
Disposal of junk items and created a free space of about 600 sqft in farm as well as institute campus	3 <sup>rd</sup> December 2023
Round the year practice of transforming organic waste to wealth by Vermicomposting method	
Strict practice of banning single use plastics including packaged drinking bottles in all official meetings	

### Swachhta Pakhwada

ICAR - NRC on Mithun consistently organized diverse initiatives as part of the Swachhta Pakhwada observance, spanning from 16<sup>th</sup>-31<sup>st</sup> December, 2023. Some of the activities conducted under the mission were:

- Banners promoting Swachhta awareness and highlighting the observance of Swachhta Pakhwada adorned National Highway-29 and key public spaces.
- Personnel of diverse categories, including contracted individuals, actively participated by taking and vocalizing the Swachhta Pledge.
- An impactful SHRAMDAN initiative took place on the roadside to enhance the cleanliness of the surroundings at ICAR-National Research Centre on Mithun on the 27<sup>th</sup> December 2023.
- Dr. Kezhavituo Vupru, CTO of ICAR-NRC on Mithun Medziphema on 28<sup>th</sup> December 2023, led a visit to local waste disposal sites. Gaon Buras, public leaders, and health workers were engaged to raise awareness and promote responsible waste management within the community. The visit aimed to educate stakeholders on proper disposal methods, emphasizing the connection between waste management and public health. This collaborative effort seeks to instill a sense of responsibility and foster sustainable practices among community members.
- Demonstration of recycling of waste technologies for conversion of waste to wealth through vermicomposting etc.





## Kisan Diwas

'Kisan Diwas' was celebrated on 23<sup>rd</sup> December 2023 at Mungpoo in Darjeeling district of West Bengal.





# LINKAGES AND COLLABORATIONS



MITHUN MEAT BALLS



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## Linkages and Collaborations

Table 30: List of MoUs signed in 2023

S. No	Date	MoU between ICAR-NRCM & other institutes	Validity period / duration of MoU
<b>ACADEMIC</b>			
1	03/08/2023	Karnataka Veterinary, Animal and fishery sciences University, Bidar	5 years
2	03/04/2023	M/s Anitra Tech Pvt Ltd, Hyderabad, Telangana	5 years
3	17/02/2023	Central Agricultural University, Imphal	5 years
4	27/01/2023	School of Engineering and Technology (SET), Nagaland University	5 years
<b>INDUSTRIAL</b>			
5	26/05/2023	a-IDEA (ICAR - NAARM, Hyderabad)	5 years
6	01/09/2023	NEAFI LLP (Entrepreneur), Guwahati	5 years
7	01/09/2023	Life Ministry Learning Centre (NGO), Chumukedima	5 years



Glimpses of MoUs signed in current financial year

### Gift of Mithun by the Honorable Chief Minister of Nagaland

The Honorable Chief Minister of Nagaland has presented a Mithun, the gorgeous bovine species, to ICAR - National Research Centre on Mithun, Nagaland. Dr Girish Patil, S., Director of the Institute expressed his deep appreciation for this generous gesture. The female Mithun, which is approximately five years old and in its second calving stage, weighs 320 kg and has a black body coat with clean white stockings and a grayish forehead. This Mithun will be a valuable addition to the ICAR - National Research Centre on Mithun's repository and further its conservation efforts. ICAR - National Research Centre on Mithun is the only research institution in the world dedicated exclusively to research activities on Mithun. The Institution's primary objective is to conserve and propagate this unique species for economic livelihood for many people, particularly in the Northeast Hill region.



Gift of Mithun by the Honorable Chief Minister of Nagaland

# MEETINGS AND OTHER ACTIVITIES



MITHUN MEAT DUMPLING



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## Meetings and Other Activities

### Fifth Quinquennial Review Team (2017-2022)

The 5<sup>th</sup> Quinquennial Review Team, chaired by Dr. Habibar Rahman, Regional Representative for South Asia, ILRI, visited ICAR-NRC on Mithun, Nagaland from January 17<sup>th</sup>-19<sup>th</sup>, 2023. The team, including members Dr. Ravinder Sharma, Dr. K. K. Baruah, Dr. S. Mendiratta, and Dr. A. K. Mohanty, analyzed the Institute's research and development activities from 2017-2022. They interacted with staff, visited the Mithun farm and facilities, including the Model Semi-intensive Mithun Farm in Khonoma village and KVK Phek. The team also met with Mithun farmers and officials from Veterinary & Animal Husbandry, Govt. of Nagaland and Nagaland Livestock Development Board to strengthen collaboration for Mithun development.



The second meeting of the Fifth Quinquennial Review Team took place from 30<sup>th</sup> April to 2<sup>nd</sup> May, 2023, chaired by Dr. Habibar Rahman, Regional Representative for South Asia, International Livestock Research Institute. The team included Dr. Ravinder Sharma, Dr. A. K. Mohanty, Dr. S. Pan, Dr. S. K. Saha, Dr. Girish Patil S., Dr. S. K. Mendiratta, and Dr. K. K. Baruah. The meeting involved a comprehensive review of the Institute's research, extension, and educational activities. On 1<sup>st</sup> May, 2023, the team visited the Mithun conservation unit established by ICAR - National Research Centre on Mithun at Thevopisu village, Phek district, Nagaland, interacting with Mithun farmers to understand their challenges. On 2<sup>nd</sup> May, 2023, the team engaged with the Institute Management Committee, gathering input on their recommendations.





## Submission of QRT Report to the Council

ICAR - National Research Centre on Mithun, Nagaland, submitted its Quinquennial Review Team Report (2017-2022) to Dr. Himanshu Pathak, Hon'ble DG of ICAR, in the presence of Dr. J. K. Jena, DDG (AS), Dr. Amrish Kumar Tyagi, ADG (ANP), and Dr. Ashok Kumar, ADG (AH). Dr. H. Rahman, Former DDG (AS), ICAR and Regional Representative, ILRI, chairman of Quinquennial Review Team, and Dr. Girish Patil S, Director of ICAR - NRC on Mithun, presented the brief highlights of the report. Dr. Nazrul Haque, the Member Secretary of the Quinquennial Review Team, and Principal Scientist from ICAR - NRC on Mithun also attended the meeting.



## Institute Research Council (IRC) Meeting

The ICAR-NRC on Mithun convened its annual Institute Research Committee (IRC) meeting on 3<sup>rd</sup> April, 2023. Attended by all Institute scientists, the meeting centered on presenting completed and upcoming research projects with a focus on enhancing research practices and quality. Dr. I. Shakuntala, Dean C.V. Sc., CAU Jalukie, participated as an external expert, offering valuable insights and suggestions to improve research outcomes. The discussions were fruitful and informative, promising to bolster research success at ICAR-NRC on Mithun. Dr. M.H. Khan, Principal Scientist (AR) & Member Secretary IRC, welcomed Dr. Shakuntala, outlining the meeting agenda, project status, and new proposals. Additionally, Dr. Girish Patil. S, Director, ICAR-NRC on Mithun presented the institute's vision for the next five years.



## Half-yearly Institute Research Council Meeting

The half-yearly Institute Research Committee meeting of ICAR-National Research Centre on Mithun, Medziphema - 797106 Nagaland, conducted on September 27<sup>th</sup>, 2023, was a significant event. Distinguished experts from ICAR, Dr. Keshav Barman, Principal Scientist, Animal Science SMD, and Dr. V. Kulkarni, Former Director of the National Meat Research Institute, Hyderabad, graced the occasion. The meeting featured comprehensive presentations of ongoing project achievements and the submission of fresh research proposals. Dr. SS Hanah, Senior Scientist, delivered a heartfelt vote of thanks.



## 30<sup>th</sup> Institute Management Committee meeting held on 2<sup>nd</sup> May 2023

The 30<sup>th</sup> meeting of the Institute Management Committee was held on 2<sup>nd</sup> May, 2023, chaired by Dr. Girish Patil S., Director of ICAR-NRC on Mithun, Nagaland. Members included Dr. Amrish Kumar Tyagi, Dr. Arnab Sen, Dr. N. H. Mohan, Dr. A. R. Sen, Dr. S. K. Saha, Mr. Gaurang Ghosh, and Shri. Sambu Siangiu, and Er. S. Jami. Dr. Girish Patil S. presented the Institute's achievements since the 29<sup>th</sup> IMC meeting and led the meeting's agenda. IMC Members applauded the Director and scientists for their remarkable accomplishments in the past year. Following the IMC meeting, interactions were held with the Chairman and Members of the Quinquennial Review Team. The meeting concluded with a vote of thanks by Mr. Th. Dipal, AAO and I/c FAO, ICAR – NRC on Mithun, Nagaland.



## XVI Research Advisory Committee Meeting from September 20<sup>th</sup> to 24<sup>th</sup>, 2023

The XVI Research Advisory Committee Meeting of the ICAR – National Research Centre on Mithun held from 20<sup>th</sup>-24<sup>th</sup> September, 2023. The meeting commenced with a thorough exploration of our laboratories and Mithun museum on 20<sup>th</sup> September, where the Committee had the opportunity to engage with our dedicated scientists. Subsequently, on 21<sup>st</sup> September 2023, the Committee visited our Mithun farm in Medziphema and convened a significant meeting with esteemed members, including Dr. M. R. Saseendranath, Vice Chancellor of Kerala Veterinary and Animal Sciences University, Pookode, Kerala, who chaired the meeting. Other committee members were also present:

- **Dr. Amrish Kumar Tyagi**, Assistant Director General (ANP), ICAR, Krishi Bhavan, New Delhi
- **Dr. Girish Patil, S., Director**, ICAR – NRC on Mithun, Nagaland
- **Dr. R. B. Sharma**, Former National Coordinator, NAHEP, ICAR, New Delhi
- **Dr. S. Pan**, Professor (Retired), Veterinary College, WBUAFS, Kolkata
- **Dr. A. K. Sangwan**, Professor, Veterinary College, CAU, Jalukie, Nagaland
- **Dr. Reena Arora**, Principal Scientist, ICAR – National Bureau of Animal Genetic Resources (NBAGR), Karnal, Haryana
- **Mr. Sambu Siong**, West Kemang, Arunachal Pradesh (Joined online)
- **Dr. Nazrul Haque**, Principal Scientist, ICAR - NRCM & Member Secretary, RAC

All the institute scientists and technical officers were also present in attendance. During the field visits on 22<sup>nd</sup> & 23<sup>rd</sup> September, the Committee ventured to the Mithun Conservation Unit at Khonoma and the ICAR – National Research Centre on Mithun Station and Krishi Vigyan Kendra at Porba. These visits provided valuable insights into the on-ground activities and collaborations in place to further our research mission. Key recommendations emerged from



the discussions, encompassing areas such as filling vacancies, ensuring equipment maintenance, breed registration, engaging students from various universities, promoting hygienic meat production, and addressing issues related to predator attacks. These recommendations are poised to advance our research efforts significantly.

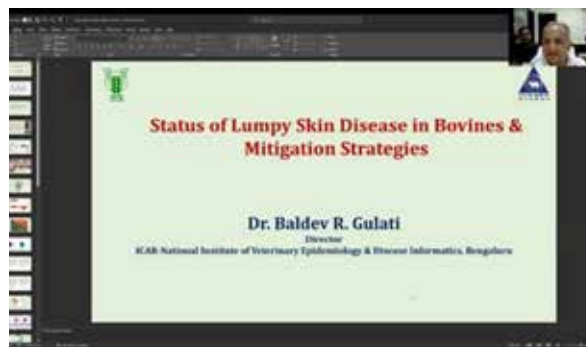
### First Institute Biosafety Committee Meeting

The first Institute Biosafety Committee meeting of ICAR-National Research Centre on Mithun, Medziphema – 797106, Nagaland, took place on 12<sup>th</sup> October, 2023. Director, ICAR - NRC on Mithun Dr. Girish Patil, S. & Dr. Arnab Sen, a distinguished expert and Head of the Regional Station, ICAR-IVRI, Kolkata, presided over the meeting and provided invaluable insights into biosafety concepts and the future direction of ICAR-NRC on Mithun. The meeting encompassed in-depth discussions on the current projects related to biosafety regulations.



### Interactive Meeting on Lumpy Skin Disease (LSD) Preparedness in Mithun

On 21<sup>st</sup> June, 2023, the ICAR-NRC on Mithun organized an Online Discussion and Interactive Meeting on “Lumpy Skin Disease (LSD) Preparedness in Mithun.” Dr. Girish Patil, Director of ICAR-NRCM, welcomed the Chief Guest, Speakers, and participants. Dr. Amrish Kumar Tyagi, ADG (Animal Nutrition and Physiology), ICAR, New Delhi, emphasized the importance of preventing and controlling animal diseases and commended the Institute’s efforts in providing a platform for discussing the ongoing LSD outbreak in the country. Dr. Baldev Raj Gulati, Director of ICAR-NIVEDI, Bangalore, discussed the status of LSD in bovines, mitigation strategies in India, and the disease’s economic impact. Dr. Niranjana Mishra, Principal Scientist, ICAR-NIHSAD, Bhopal, presented diagnostic techniques for LSD, emphasizing genotypic characterization to understand disease progression and showcased LSDV strain variants. Dr. T.K. Bhattacharya, Director, ICAR-NRC on Equines, Hisar, Haryana, presented insights on the development of a homologous vaccine for LSD, expected to be commercially available soon. Discussions centered on LSD status in Mithun-rearing states and the drafting of an action plan for preparedness. State veterinary departments highlighted challenges, and strategies to control and prevent transboundary animal diseases were discussed. Over 80 participants, including scientists from ICAR institutes, the Vice-Chancellor of Kerala Veterinary University, experts nationwide, faculty from Jalukie Veterinary College, and Directors and veterinarians from Mithun-rearing states, attended the program.



### Eighth Institute Animal Ethics Committee (IAEC) meeting

The eighth Institute Animal Ethics Committee (IAEC) meeting of ICAR-National Research Centre on Mithun, Medziphema – 797106, Nagaland, took place on 17<sup>th</sup> October, 2023. All the projects submitted to IAEC for approval were reviewed in the presence of external CCSEA nominees and internal IAEC members. The meeting was attended by Dr. Gunjan Das (main nominee), Dr. P. Chattopadhyay (Scientist from outside of the Institute), Mr. L. Biswajeet Meitei (Socially Aware nominee), IAEC Chairman Dr. Nazrul Haque, Member Secretary, Dr. H. Lalzampuia and other scientists of the Center.



### Ninth Institute Animal Ethics Committee (IAEC) meeting

The 9<sup>th</sup> Institute Animal Ethics Committee (IAEC) meeting of ICAR-National Research Centre on Mithun, Medziphema – 797106, Nagaland, took place on 5<sup>th</sup> December, 2023. All the projects submitted to IAEC for approval were reviewed in the presence of external CCSEA nominees and internal IAEC members. The meeting was attended by Dr. Girish Patil S, Director, NRC on Mithun, Dr. Gunjan Das (Main nominee), Dr. P. Chattopadhyay (Scientist from outside of the Institute), Mr. L. Biswajeet Meitei (Socially Aware nominee), IAEC chairman Dr. Nazrul Haque, Member secretary, Dr. H. Lalzampuia and other scientists of the Center.





## Committees

### Quinquennial Review Team (2017-22)

S. No.	Name	Designation	Name of the Discipline	Chairman/Member
1.	Dr. H. Rahman	Former DDG (AS), Regional Representative for South Asia International Livestock Research Institute (ILRI), C-Block, 1st Floor, CG Centres, NASC Complex, Dev Prakash Shastri Marg, PUSA, New Delhi – 110012, India. Email: <a href="mailto:R.Habibar@cgiar.org">R.Habibar@cgiar.org</a> Mobile No: 9483527849	Veterinary Public Health	Chairman
2.	Dr. Ravindra Sharma	Former Director (Research), LUVAS, Hisar. 698, Sec. 15-A, Hisar. Email: <a href="mailto:rsharma698@gmail.com">rsharma698@gmail.com</a> Mobile No: 9896823198	Animal Health	Member
3.	Dr. K. K. Baruah	Former Director, ICAR-NRC on Yak, Dirang. Flat No. 1B, Central Apartment, Borthakur Mill Road, South Sarania, Ulubari, Guwahati – 781007. Email: <a href="mailto:baruahkk1@gmail.com">baruahkk1@gmail.com</a> Mobile No: 9435551429	Animal Nutrition	Member
4.	Dr. Dharmeshwar Das	Former Joint Director, ICAR-IVRI, House No. 1, Saturbhuj Path, Jayanagar, Khanapara, Guwahati-781022, Assam. Email: <a href="mailto:drdasd@rediffmail.com">drdasd@rediffmail.com</a> Mobile No: 09401059192, 07086254525	Animal Genetics & Breeding	Member
5.	Dr. S. Pan	Professor (Retd.), West Bengal University of Animal and Fisheries Sciences, Kolkata. Resi: 180/1, N. Basu Rd, Telmarui, PO-Burdwan-713101. (West Bengal). Email: <a href="mailto:span28@rediffmail.com">span28@rediffmail.com</a> Mobile No: 9810872527	Extension, Social Sciences and Others	Member
6.	Dr. S. K. Mendiratta	Joint Director (Academic), ICAR-IVRI, Bareilly – 243122, Uttar Pradesh Email: <a href="mailto:mendiratta_65@yahoo.co.in">mendiratta_65@yahoo.co.in</a> Mobile No: 9412445311	Livestock Products Technology	Member
7.	Dr. A. K. Mohanty	Director, ICAR-Agricultural Technology Application Research Institute (ATARI) Umiam-793103, Meghalaya. Email: <a href="mailto:dramulyakumar@gmail.com">dramulyakumar@gmail.com</a> Mobile No: 9485175853	Extension, Social Sciences and Others	Member
8.	Dr. Nazrul Haque	Principal Scientist, ICAR-NRC on Mithun, Medziphema, Dimapur, Nagaland. Email: <a href="mailto:Nazrul.Haque@icar.gov.in">Nazrul.Haque@icar.gov.in</a> Mobile No: 8732871857, 9436831367	Animal Nutrition	Member Secretary

## Research Advisory Committee

S. No.	Name	Address	RAC Members
1.	Prof. (Dr.) M. R. Saseendranath	Hon'ble Vice Chancellor, Kerala Veterinary and Animal Sciences University, Pookode, Wayanad, Kerala - 673576. Phone No: 04936-209209, 04936-209210, 04936 -2563782 (Fax). Mobile No: 9447236514 Email: vc@kvasu.ac.in	Chairman
2.	Dr. Amrish Kumar Tyagi	ADG (ANP), ICAR, Krishi Bhavan, New Delhi - 110001. Phone No: 011-23046553. Mobile No: 9416950175 Email: amrishtyagi1963@yahoo.com	Member
3.	Dr. G. D. Singh	Ex. Dean, Animal Reproduction, DUVASU, Mathura - 281001, U. P. Mobile No: 9536505777 Email: gdsingh431@gmail.com	Member
4.	Dr. (Mrs) Reena Arora	Principal Scientist (Animal Biotechnology), ICAR-National Bureau of Animal Genetic Resources, Karnal - 132001. Mobile No: 9896273333 Email: reena.arora@icar.gov.in	Member
5.	Dr. A. K. Sangwan	Prof. & Head, Department of Veterinary Parasitology, College of Veterinary Sciences and Ani-mal Husbandry, CAU, Jalukie, Peren - 797110, Nagaland. Mobile No: 9896117977 Email: sangwan_arun@hotmail.com	Member
6.	Dr. S. Pan	Ex-Head, Department of Livestock Products Technology Management), West Bengal University of Animal and Fisheries Sciences, Kolkata. Resi: 180/1, N. Basu Rd, Telmarui, P.O. -Burdwan - 713101 (West Bengal). Mobile No: 9433365563, 9810872527 Email: span28@rediffmail.com	Member
7.	Dr. R. B. Sharma	Former National Coordinator, ICAR-NAHEP, New Delhi. Resi: E 202, The Jewel of Noida, Sector 75, Noida, Uttar Pradesh Mobile No: 9719292507 Email: rbsharmalpt@gmail.com	Member
8.	Dr. Girish Patil S.	Director, ICAR-NRC on Mithun, Medziphema, Nagaland. Mobile No: 9401262522. Phone No: 03862-247-340 (O), 03862-247341 (F). Email: director.nrcMithun@icar.gov.in	Member
9.	Er. Senkathung Jami	Pangti Village, ETC Road, Wokha Town - 797-111, Nagaland. Mobile No: 9436641138, 9612418212 Email: ersenkajami9@gmail.com	Member
10.	Sh. Sambu Siongju	Dibbin Village, West Kameng District, Nafra - 790001, Arunachal Pradesh. Mobile: 8258007675 Email: siongjusambu712@gmail.com	Member
11.	Dr. Nazrul Haque	Principal Scientist, ICAR-NRC on Mithun, Medziphema - 797106, Nagaland. Mobile No: 8732871857, 9436831367 Email: Nazrul.Haque@icar.gov.in	Member Secretary

## Institute Management Committee

Position	Name and Designation
Chairman	Dr. Girish Patil S., Director, ICAR-NRC on Mithun, Medziphema, Nagaland.
Member Two Non-Official person nominated by the President, ICAR.	Er. Senkathung Jami, Pangti Village, ETC Road, Wokha Town - 797111, Nagaland. Email: ersenkajami9@gmail.com, Mobile No: 9436641138, 9612418212. Sh. Sambu Siangju, Dibbin Village, West Kameng District, Nafra -790001, Arunachal Pradesh. Email: <a href="mailto:siongjusambu712@gmail.com">siongjusambu712@gmail.com</a> . Mobile No: 825007675, 7085996240
Member Four DG nominated Scientists	Dr. N. H. Mohan, Principal Scientist (Animal Physiology) & ICAR-National Fellow, ICAR-National Research Centre on Pig, Rani, Guwahati-781131, Assam. Email: mohan.icar@gmail.com, Mohan.NH@icar.gov.in, Mobile No: 8812017891. Dr. Arnab Sen, Joint Director, ICAR, Research Complex for NEH Region, Manipur Centre, Lamphelpat, Imphal-795004, Manipur. Email: jdmn.icar@nic.in, arnabsen123@gmail.com. Mobile No: 8974027632. Dr. S. K. Saha, Principal Scientist, Animal Nutrition, ICAR-Indian Veterinary Research Institute, Izatnagar Bareilly-243122, Uttar Pradesh. Email: subodhksaha@yahoo.com, Mobile No: 9412822615. Dr. A. R. Sen, Principal Scientist (Livestock Products Technology) and Nodal Officer-NEH Program, ICAR-National Research Centre on Meat, Chengicherla, Hyderabad-500092, Telangana. Email: arup.sen@icar.gov.in, Mobile No: 8420108024.
Member A DG nominated representative from the Council nominated.	Dr. Amrish Kumar Tyagi, ADG (ANP), ICAR, Krishi Bhavan, New Delhi - 110001. Phone No: 011-23046553, Mobile No: 9416950175. Email: amrishtyagi1963@yahoo.com.
Member Representative of the State Govt. nominated by President, ICAR.	Dr. Nsanthung Ezung, Director, Dept. of Vety. & Animal Husbandry, Govt. of Nagaland, Govt. of Nagaland, Kohima, Nagaland.
Member A representative of any other State govt. concerned with the research in the Institute nominated by President of ICAR.	Director, Dept. of Vety. & Animal Husbandry, Govt. of Arunachal Pradesh, Itanagar, Arunachal Pradesh.
Member A representative of the Agricultural University under the jurisdiction nominated by the President, ICAR.	Dr. Lalnuntluangi Hmar Dean, College of Veterinary Sciences & A. H., CAU, Aizawl, Mizoram.
Member The Financial Advisor of the Council or DARE or the Accounts Officer of the same or another Institute.	Shri Gauranga Ghosh, Sr. F&AO, ICAR Res. Complex for NEH Region, Barapani, Umroi Road, Umiam-793103, Meghalaya. Email: gauranga.ghosh@icar.gov.in, Mobile No: 9531856545.
Member Secretary	Ms. Aloi Rengma, AAO, ICAR-NRC on Mithun, Medziphema, Nagaland.

## Institute Research Council (IRC)

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

## Institute Animal Ethics Committee (IAEC)

Position	Name
Chairman	Dr. Nazrul Haque
Main Nominee	Dr. Gunjan Das
Link Nominee	Dr. Amrit Sagar Dehingia
Scientist from outside of the Institute	Dr. P. Chattopadhyay
Socially Aware Nominee	Mr. Lourembam Biswajeet Meitei
Scientist In-charge of Animal House Facility	Dr. Kobu Khate
Member Secretary	Dr. H. Lalzampaia
Veterinarian	Dr. M.H. Khan
Biological Scientist	Dr. J.K. Chamuah

## Institute Biosafety Committee (IBSC)

Position	Name and Designation
Chairman	Dr. Girish Patil S., Director ICAR- NRC on Mithun, Medziphema, Nagaland
DBT Nominee	Dr. Arnab Sen, Head IVRI Regional Centre, Kolkata
Member Secretary	Dr. H. Lalzampaia, Scientist, ICAR- NRC on Mithun, Medziphema, Nagaland
Biosafety Officer	Dr. Thepfusatuo Krose
Link Nominee	Dr. Amrit Sagar Dehingia
Internal Member	Dr. Nazrul Haque Principal Scientist, ICAR- NRC on Mithun, Medziphema, Nagaland
Internal Member	Dr. J. K. Chamuah, Senior Scientist, ICAR- NRC on Mithun, Medziphema, Nagaland
Internal Member	Dr. L. Sunitibala Devi Scientist, ICAR- NRC on Mithun, Medziphema, Nagaland

## Institute Technology Management Committee (ITMC)

S. No.	Position	Name and Designation
1	Chairman	Dr. Girish Patil S., Director, ICAR-NRC on Mithun, Medziphema, Nagaland
2	Member	Dr. M. H. Khan, Principal Scientist
3	Member Secretary	Dr. J.K. Chamuah, Senior Scientist, ICAR-NRC on Mithun, Medziphema, Nagaland
4	Member	Dr. S.S. Hanah, Senior Scientist , ICAR-NRC on Mithun, Medziphema, Nagaland
5	Member	Dr. H. Lalzampaia, Scientist, ICAR-NRC on Mithun, Medziphema, Nagaland
6	External Member	Dr. H. Kalita, Head, ICAR-RC for NEHR, Nagaland Centre, Medziphema





### Technical Evaluation Committee (TEC)

S. No.	Position	Name and Designation
1	Chairman	Dr. H. Lalzampaia, Scientist, ICAR-NRC on Mithun, Medziphema, Nagaland
2	Member	Dr. J.K. Chamuah, Senior Scientist, ICAR-NRC on Mithun, Medziphema, Nagaland
4	Member	Dr. Vikram R., Scientist, ICAR-NRC on Mithun, Medziphema, Nagaland

### Purchase Advisory Committee (PAC)

S. No.	Position	Name and Designation
1	Chairman	Dr. Nazrul Haque, Principal Scientist, ICAR-NRC on Mithun, Medziphema, Nagaland
2	Member	Dr. L. Sunitibala Devi, Scientist, ICAR-NRC on Mithun, Medziphema, Nagaland
3	Member	Dr. Kezhavituo Vupru, CTO, ICAR-NRC on Mithun, Medziphema, Nagaland
4	Member	Th. Dipal Meitei, F&AO I/C, ICAR-NRC on Mithun, Medziphema, Nagaland
5	Member Secretary	Ms Aloli Rengma, AAO(S), ICAR-NRC on Mithun, Medziphema, Nagaland



# CELEBRATIONS



MITHUN MEAT ENROBED PRODUCTS



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## Celebrations

### 74<sup>th</sup> Republic Day celebration

The 74<sup>th</sup> Republic Day was celebrated in the Institute on the 26<sup>th</sup> of January 2023. Dr Meraj Haider Khan unfurled the tricolor in the morning while singing the National Anthem. The children and family members of the staff also took an active part in the celebration. After which a light refreshment was distributed.



### International Women's Day Celebration

On 9<sup>th</sup> March 2023, in celebration of International Women's Day, ICAR-NRC organized a training program titled "Processing of Mithun meat and milk for income generation." Specifically tailored for Women Self Help Groups (SHGs) from Kukidolong, the event aimed to empower women economically. Dr. Kezhavituo Vupru, CTO and Program Coordinator, introduced the significance of Women's Day and the importance of women's empowerment. Dr. M.H. Khan, Principal Scientist, highlighted the availability of various income generation schemes for women and stressed the benefits of value addition to agricultural products. Dr. Girish Patil, S., Director of the institute, praised Nagaland women for their empowerment and urged them to focus on economic empowerment. He noted the high female literacy rate in Nagaland and the significant role of women in Naga society. Dr. Patil encouraged women to engage in meat product processing and marketing activities, offering support from the Institute, including access to meat processing facilities. A total of 25 members from different SHGs participated in the training program, demonstrating the commitment to women's economic empowerment in the region.



## World Environment Day 2023

World Environment Day 2023 was celebrated on 5<sup>th</sup> June with a thrust on the mission “Life” i.e. **Lifestyle for Environment**”. Various representatives from Medziphema area joined hands with NRCM in the celebration. Representatives from Medziphema Mechii Krotho, GB Union, and Medziphema Town Youth Organization participated in the tree plantation campaign at NRCM Mithun Farm Medziphema. Various tree species were planted at the enclosed grazing area of the farm. There were 57 participants during the occasion. Our effort in spreading the message “Life” concluded successfully.



## Ninth International Yoga Day Celebration

On 21<sup>st</sup> June, 2023, ICAR-NRC on Mithun in Nagaland celebrated the 9<sup>th</sup> International Day of Yoga with Director Dr. Girish Patil S. leading yoga sessions. The theme was “Serving humanity.” Participants were guided through yoga asanas and breathing exercises, emphasizing physical and mental well-being. Mrs. Swapna, H. S., the Director’s wife, demonstrated yoga for female staff.



## Independence Day Celebration

The 77<sup>th</sup> Independence Day at ICAR-National Research Centre on Mithun was a proud moment filled with patriotism. Director Dr. Girish Patil S. hoisted the National Flag, emphasizing national unity. Achievements included Mithun’s recognition as a food animal by FSSAI, 10 NRC Mithun technologies certified by ICAR, and 3 patents granted, showcasing scientific advancement. 6 scientists achieved these milestones, with 5 new additions for future success. The institute conducted 16 training programs in Mithun husbandry, highlighting its role in agricultural expertise. The event also featured a symbolic tree-planting ceremony, reinforcing our commitment to nature and sustainability.



## First Mithun Day Celebration and Brainstorming session

ICAR-National Research Centre on Mithun celebrated its inaugural Mithun Day on 1<sup>st</sup> September, 2023, marking the official recognition of Mithun as a food animal by FSSAI. Shri Kazheto Kinimi, Advisor of AH & Veterinary Services, Govt. of Nagaland, was the Chief Guest, acknowledging Mithun's cultural significance. Shri Temjen Imna Along, Hon'ble Minister of Higher Education & Tourism, Govt. of Nagaland, highlighted ICAR-NRCM's role in supporting Mithun farmers. Dr. Abhijit Mitra, Animal Husbandry Commissioner, DAHD, Gol, emphasized Mithun's potential for organic food and urged sustainable development. Shri M Iboyaima Meitei, Advisor (Horticulture), North East Council, emphasized conservation efforts. The celebration included the release of the m-Anitra app, two MoUs for Mithun trading, and a brainstorming session on Mithun sector development, attended by dignitaries, experts, and farmers from the region.



## Hindi Week Celebrations

ICAR-National Research Centre on Mithun inaugurated Hindi Week 2023 with the celebration of Hindi Diwas on 14<sup>th</sup> September 2023. Dr. Saroj Toppo, Former Principal Scientist at ICAR-NRCM, served as the Chief Guest, emphasizing Hindi's status as the Official Language of the Central Government. Dr. Girish Patil, S. Director, highlighted the institute's encouragement of staff to use Hindi in official work. The valedictory function of Hindi Week 2023 took place from 14<sup>th</sup> to 20<sup>th</sup> September, 2023, at ICAR-NRCM in Medziphema, Nagaland. Dr. M. R. Saseendranath, Vice Chancellor of KVASU, Kerala, and Dr. AK Tyagi, ADG (AN&P), ICAR, New Delhi, graced the event as special and chief guests, respectively. They commended the institute's efforts to promote Hindi. Dr. Girish Patil underscored Hindi's profound significance in daily activities, fostering effective communication and unity. Prizes were awarded to winners of various events



during the week-long celebration. Dr. Vikram R, in charge of the Hindi Cell, reported organizing nine competitions with 70 participants. Dr. Harshit Kumar concluded the event with a gracious vote of thanks.

### Vigilance Awareness Week

ICAR-NRC on Mithun observed Vigilance Awareness Week from 30<sup>th</sup> October to 5<sup>th</sup> November, with the theme “Say no to Corruption; Commit to the Nation.” Activities included an integrity pledge led by Director Dr. Girish Patil S., a capacity-building lecture on “Procurement,” and various competitions engaging 196 participants. The week concluded with a valedictory program presided over by Dr. Nazrul Haque, Principal Scientist. Dr. Sapunii Stephen Hanah, Senior Scientist and Vigilance Officer, coordinated the program, emphasizing the institute’s commitment to vigilance and anti-corruption efforts. Mr. PK Jain, CAO, ICAR – IVRI delivered lecture on procurement.



### Foundation Day Celebration, Stakeholders meet and Industry Interface Meeting on Animal Genetic Resources in Nagaland

The 36<sup>th</sup> Foundation Day and Stakeholders meet of ICAR - National Research Centre on Mithun, Nagaland, held on 13<sup>th</sup> October, 2023, celebrated a significant milestone. Chief Guest Padma Shree Dr. Udabh Bharali and Special Guest Dr. BP Mishra, Director, ICAR-NBAGR, Karnal, graced the occasion. Dr. Mishra’s Foundation Day Lecture highlighted the importance of conserving indigenous animal genetic resources. The event recognized scientists and staff for their outstanding performance, unveiling an inaugural technology inventory, “Technologies for Scientific Mithun Production and Processing.” A parallel ICAR-Industry Interface Meeting chaired by Dr. Udabh Bharali featured presentations on societal development, business opportunities in the Mithun sector, perspectives on the meat industry, and Intellectual Property Rights. Stakeholders from various sectors participated, fostering collaboration. Another session,

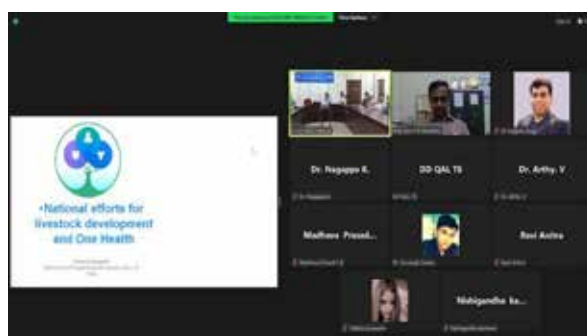
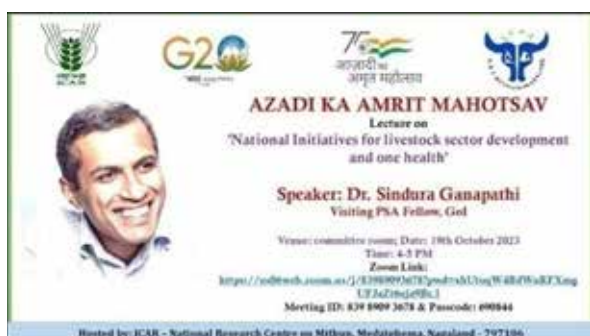
chaired by Dr. BP Mishra, focused on the urgent need for conservation efforts for indigenous goat and pig breeds in Nagaland. The meeting emphasized collective responsibility and active participation from State Animal Husbandry Department officials. ICAR - NRC on Mithun extends gratitude to all participants, showcasing a shared commitment to preserving Animal Genetic Resources in Nagaland and India's rich genetic heritage.



### Azadi Ka Amrit Mahotsav lecture series:

#### National Initiatives for livestock sector development and One health

A lecture was organized by ICAR - NRC on Mithun, Nagaland in hybrid mode under “Azadi Ka Amrit Mahotsav” on ‘National Initiatives for livestock sector development and one health’ on 19<sup>th</sup> October 2023. The speaker was Dr. Sindoor Ganapati, a Visiting PSA Fellow from the Government of India.





## Distinguished Visitors

### Bharat Darshan (Winter Study Tour) of 17 IAS Phase I Officer Trainees

On 29<sup>th</sup> January, 2023, 17 IAS Officers trainees visited ICAR-NRC on Mithun as part of their Winter Tour. The Director welcomed them, providing an overview of the institute, followed by a question and answer session. Subsequently, the trainees were taken to the Mithun Farm for a practical demonstration of Semi-Intensive farming methods.



### DDG (Animal Science), ICAR visits ICAR-NRC on Mithun, Nagaland

On 12<sup>th</sup> April, 2023, Dr. Bhupendra Nath Tripathi, Deputy Director General (Animal Science) at ICAR, visited ICAR-National Research Centre on Mithun (NRCM) in Medziphema. The visit included the inauguration of a fodder museum and demonstration plot, as well as the virtually inaugurated residential quarters and Conservation and Propagation units of Mithun at various locations in Nagaland. Dr. Tripathi emphasized the importance of expanding Mithun farming initiatives and facilitated the handover of Mithun to farmers in Assam. He commended the institute's efforts and urged expansion into Arunachal Pradesh, emphasizing collaboration with other ICAR Institutes. The visit also included the release of a urine-based pregnancy diagnosis kit and a compilation of publications from ICAR-NRCM. Dr. Girish Patil S., Director of ICAR-NRC on Mithun, Nagaland, provided a welcome address, highlighting the institute's activities aimed at fostering innovation, collaboration, and sustainable growth in the Mithun farming sector.



## Honourable Justice B. S. Patil, Lokayukta of Karnataka visited Mithun farm, Medziphema

Honourable Justice B.S. Patil, the Lokayukta of Karnataka, visited the Mithun farm at Medziphema, Nagaland, on 7<sup>th</sup> April 2023. During his visit, he expressed a keen interest in learning about the Mithun and observed the daily activities of the farm. The visit was a personal initiative of the Lokayukta to get to know more about the Mithun and the farming practices in Nagaland. Interacting with the Lokayukta, Dr. Girish Patil S., Director, ICAR-NRC on Mithun highlighted the various achievements of the institute in the last 35 years.



# HINDI CELL



MITHUN MEAT PICKLE



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## Hindi Cell

### In-charge: Dr. Vikram R.

The Hindi Cell at the ICAR-NRC on Mithun plays a pivotal role in promoting the Hindi language and facilitating communication within the organization. The Official Language Implementation Committee (OLIC) of the institute is diligently working towards promoting the use of Hindi in the organization. The Hindi Cell ensures that information, publications, and official communications are accessible in Hindi. In addition, Hindi cell undertakes several key responsibilities, including translating scientific literature, research papers, and technical documents into Hindi, making them more comprehensible to a wider audience. Additionally, the in-charge regularly attends workshops, seminars, and training programs conducted by various other institutes. Furthermore, the Hindi Cell actively participates in the development of educational materials, brochures, and multimedia content in Hindi to disseminate agricultural knowledge and innovations to farmers, extension workers, and rural communities.

The Hindi Cell also organizes cultural events, Hindi week celebrations, and competitions to promote Hindi language and culture among employees and stakeholders. These activities include Hindi essay, Hindi poetry recitations, music performances, and translation.

### ICAR-NRC on Mithun received "Commendation Certificate" during the Town Official Language Implementation Committee (TOLIC), Dimapur meeting at ARTC & S, Sukhovi on 30th August 2023



# TRAININGS



MITHUN MEAT KEBABS



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## Trainings

### Training programme on Implementation of Scientific Managemental Practices in Mithun Farming for Doubling Farmers' Income

ICAR-NRC on Mithun, Medziphema conducted a 3 days training programme on "Implementation of Scientific Managemental Practices in Mithun Farming for Doubling Farmers' Income" from 1<sup>st</sup> to 3<sup>rd</sup> February 2023. The training programme was conducted in collaboration with NABARD, Kohima. Mithun farmers from Kohima district along with farmers from Diphu, Karbi Anglong district, Assam attended the training programme.



### One-Day training on Mithun Husbandry

ICAR-NRC on Mithun was visited by 14 farmers from Arunachal Pradesh for a one-day training on Mithun Husbandry on 7<sup>th</sup> March 2023. The programme was initiated by Dr. Kezhavituo. Various Mithun husbandry practices were taught to them by Dr. M. H. Khan, Dr. Kobu Khate, and Dr. Lalzampaia. A brief explanation about their husbandry practices at their native places were given by the farmers. There was a Farmer-Scientist interaction in the evening after formal programme was done.



### Training program on "Recent Biotechnological Techniques"

A three days training programmes entitled "Recent Biotechnological Techniques" was organized by ICAR-NRC on Mithun, Nagaland from 22<sup>nd</sup> to 24<sup>th</sup> March 2023. B.Sc. (Zoology) students from Patkai Christian College along with two faculty members. During three days training programme, lectures were imparted on various recent techniques like DNA and RNA isolation, PCR, Gel Electrophoresis, ELISA, proteomics and assisted reproductive technologies. Practical trainings were provided to each student for better understanding and learning the techniques.



## North East Sustainability Conclave on Productivity and Green Growth

The North East Sustainability Conclave on Productivity and Green Growth, jointly organized by NPC, DPIIT, MoC&I, GoI, and ICAR-NRC on Mithun, held on 13<sup>th</sup> April, 2023, aimed at fostering sustainable economic development in the Northeast region of India. Dr. B N Tripathi, DDG (Animal Science), ICAR, highlighted the global goal of achieving net-zero greenhouse gas emissions by 2070 and emphasized the growing popularity of organic and natural farming practices in Nagaland. Dr. D. N. Thakur, National President, Sahakar Bharati, addressed the issue of food waste, urging farmers to focus on biogas usage. Dr. K. M. Bujarbaruah discussed crop and livestock-based natural farming, while Dr. S. Venugopal emphasized green manufacturing in Northeast India. Shri Sundeeep Kumar Nayak, IAS, Director General, NPC, emphasized the role of private sector and green finance for sustainability. Dr. Girish Patil S., Director of ICAR-NRCM, highlighted the significance of Mithun in natural farming.



## Cluster based approach for promoting Scientific Mithun Production Practices

ICAR-NRC on Mithun has initiated work on a cluster-based approach for promoting scientific Mithun production in North East India. As part of this, the Centre has established Mithun Conservation Unit in the Thopovisu Cluster, Phek district, Nagaland State. The unit was inaugurated by Dr. B. N. Tripathi, DDG (AS), ICAR on 12<sup>th</sup> April 2023. In the Thopovisu cluster, an Animal health camp cum vaccination programme was organized on 12<sup>th</sup> May 2023. In the camp more than 60 Mithun belonging to the cluster were ear tagged with the INAPH ear tags, all Mithun were FMD vaccinated, their health was examined and the blood samples were collected for screening of the diseases. Animals infested with ectoparasites were administered Ivermectin.



## Awareness programme on “Farmer Producer Organization (FPO)” for Mithun Farmers Prosperity at Porba, Phek

ICAR-NRC on Mithun Organized Awareness programme on “Farmer Producer Organization (FPO) for Mithun Farmers Prosperity” at Panchayat hall, Porba, Phek on 16<sup>th</sup> May 2023. The programme was chaired by Dr. Girish Patil S, Director, NRC on Mithun and Dr. Imsunaro, DDM (Phek), NABARD acted as Chief Guest. The programme witnessed other Dignitaries and about 120 farmers from five villages of Phek district, Nagaland. Finally, the programme was addressed by the Chairman who listed the interventions being undertaken by NRCM to promote Mithun production in the Phek district of Nagaland. After the program input materials viz., fencing material and feed were distributed to the farmers by Dr. S. K. Verma, Principal Scientist and Dr. Sushil Kumar, Principal Scientist, CIRC in the presence of Dr. Girish Patil, S., Director and other Scientists of NRCM.



## Charis High Academy, Chumukedima visit

The students of Charis High Academy, Chumukedima visited ICAR-NRC on Mithun as a part of School Field Trip on 11<sup>th</sup> May, 2023. The objective was to enhance and strengthen the students' knowledge on the unique majestic bovine, Mithun. A total of 54 students from class III to VI accompanied by 5 teachers had an opportunity to interact with the scientist and witnessed the Semi-Intensive Mithun rearing system at the Institute's farm.





### Training for Veterinary Field Assistant diploma students

ICAR- NRC on Mithun Medziphema conducted 5 days programme “Hands on training on Mithun Husbandry Practices for Veterinary Field Assistant (VFA) Trainees” from Veterinary Field Assistant Training Institute, Medziphema –Nagaland under Institute under Tribal Sub-Plan from 22<sup>nd</sup>-26<sup>th</sup> May 2023. This programme was organized as a part of the capacity-building program with the objectives to educate and to create awareness and enhance their knowledge and skill about Mithun husbandry practices so that the whole farming community benefited. The programme covered both practical and theory. Scientists delivered the lectures on various topics like care and management of different categories of Mithun, selection, breeding, feeding and fodder resources management for Mithun, health and reproductive management etc.



### Two days Mithun Farmers’ Exposure Tour to ICAR-NRC on Mithun, Medziphema, Nagaland

Mithun farmers from Anjaw & Lower Subansiri, Arunachal Pradesh visited ICAR-NRC on Mithun as a part of an exposure tour organized under CSS-RGM by the District Animal Husbandry & Veterinary office, Arunachal Pradesh from 15<sup>th</sup> to 16<sup>th</sup> June 2023. A Mithun farmers’ exposure tour was an educational program where farmers visited NRCM, Mithun farm, meat and milk processing lab, semen lab and fodder demonstration plot to learn and exchange ideas. It was a platform to broaden their perspectives on the Semi-Intensive system of Mithun rearing where they were shown regular farm practices such as feeding, housing, mineral supplementation, health check-ups, vaccinations, and deworming to prevent and control diseases. In addition, practical classes were also conducted during the exposure visit. Dr. Girish Patil S, Director, while addressing the farmers, urged them to take up Mithun farming as a commercial activity to fetch more returns and assured them to extend necessary facilities to establish semi-intensive Mithun rearing units. A total of 22 farmers and 2 veterinary doctors from the state veterinary department, Arunachal Pradesh were present during the visit.



### **“Five Days Training Programme” in collaboration with ICAR-NMRI, Hyderabad and KVK Peren**

ICAR-NRC on Mithun, in collaboration with ICAR-NMRI, Hyderabad, and KVK, Peren, conducted a five-day training program from 28<sup>th</sup> August to 1<sup>st</sup> September, 2023, under the ICAR-NMRI-NEH fund. Themed “Improving Mithun Operations through Commercial Production and Value Addition,” the program aimed to enhance the productivity, quality, and profitability of Mithun farming in Nagaland. Expert-led lectures, discussions, and field visits provided hands-on experience to Mithun farmers.



### **Three day Biotechnology Training Programme from 1<sup>st</sup>-3<sup>rd</sup> August 2023**

ICAR-National Research Centre on Mithun organized a highly beneficial and informative three-day training programme on “Basic Biotechnology” under NEH fund. The training took place from 1<sup>st</sup>-3<sup>rd</sup> August 2023, and saw enthusiastic participation from 10 students pursuing their 3<sup>rd</sup> year BSc in Biotechnology from St. Joseph University, Chümoukedima, Nagaland. The training program aimed to provide the students with practical insights into the fascinating world of biotechnology and enhance their understanding of fundamental concepts. Through a series of interactive sessions, demonstrations, and laboratory exercises, the participants were given a comprehensive understanding of various techniques and applications of biotechnology.



### One day Training Programme on Artificial Insemination in Mithun

The ICAR-NRC on Mithun organized a training program on Artificial Insemination in Mithun, on 8<sup>th</sup> August 2023. The programme saw the participation of four veterinarian officers, twelve veterinarian field assistants, and two dairy farmers. Detailed explanations were provided for various crucial aspects of the Mithun reproductive management which included semen collection, cryopreservation, artificial insemination, and pregnancy diagnosis. Furthermore, participants were not only presented with theoretical knowledge but also had the opportunity to engage in hands-on practical sessions.



### Students of Govt. Middle School, Vidima, Nagaland

The students of Govt. Middle School Vidima, visited ICAR-NRC on Mithun as part of a student life skill exposure trip on 6<sup>th</sup> September 2023. A total of 25 students accompanied by 8 teachers, had the opportunity to interact with the Director, ICAR-NRCM and scientists, witnessed the Semi-Intensive Mithun rearing system at the Institute's farm.



## An awareness programme on semi-intensive Mithun farming practices in Tening, Nagaland

On 6<sup>th</sup> November, 2023, an awareness program on the “Advantages of Mithun Rearing under Semi-Intensive Farming System” was successfully organized in Tening, Peren District, Nagaland. The event brought together farmers from Nzaw and Tening villages to explore the benefits and practical aspects of semi-intensive Mithun rearing. The program was chaired by the esteemed Hon’ble Director, Dr. Girish Patil, S. and actively participated by the Mithun Society President, Secretary and Members of Tening and Nzaw villages. Following an informative awareness session, an interactive dialogue with the farmers provided a platform for addressing their concerns and fostering a deeper understanding of semi-intensive Mithun rearing practices.



## Rural Agricultural Work Experience & Agro-Industrial Attachment (RAWE & AIA) training on “Mithun Husbandry for Rural prosperity and Employment Creation in NER” for the B.Sc. (Hons. IVth Year)

From 26<sup>th</sup> October to 8<sup>th</sup> November 2023, ICAR - NRC on Mithun, Medziphema, Nagaland hosted 2 weeks Rural Agricultural Work Experience & Agro-Industrial Attachment (RAWE & AIA) training on “Mithun Husbandry for Rural prosperity and Employment Creation in NER” for the B.Sc. (Hons.) Agriculture IVth Year students of Dolphin (P.G.) Institute of Biomedical & Natural Sciences, Dehradun - Uttarakhand.



## Five-day training program on “Scientific Management of Mithun husbandry with special reference to Mithun meat production”

On 24<sup>th</sup> November, 2023, ICAR-NRC on Mithun, Medziphema, concluded a five-day training program on “Scientific Management of Mithun Husbandry with Special Reference to Mithun Meat Production.” The program targeted educated tribal youths from Karbi Anglong district, focusing on livestock husbandry practices, specifically Mithun husbandry. Dr. Girish Patil S, Director of ICAR-NRCM, congratulated participants and stressed the ongoing need for such training initiatives. Dr. P.K. Mandal from Rajib Gandhi Veterinary College provided hands-on training on “Processing of Meat Products and Their Value Addition,” while Dr. Manjunath Patel from ICAR-Indian Veterinary Research Institute discussed “Innovative Housing Design for Semi-intensive Mithun Farming.” The initiative was part of the ICAR-NEH project, “Innovative Interventions for Promotion of the Meat Sector in the North Eastern Region,” in collaboration with ICAR-National Meat Research Institute, Hyderabad





# AWARDS AND RECOGNITIONS



MITHUN MEAT SAMOSAS



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## Awards and Recognitions

- **Dr Girish Patil, S.**, Director received award for the **best book in Kannada** for the book on 'Value addition to meat for entrepreneurship development'. The award was conferred by **Karnataka Science and Technology Academy, Government of Karnataka**
- **Dr. Girish Patil, S.**, Director was conferred with **prestigious fellowship of National Academy of Biological Sciences, Chennai** during the 13<sup>th</sup> NABS-National conference & AGM held at Periyar University, Salem, TN on 25<sup>th</sup> January, 2023
- **Dr. Harshit Kumar, Scientist** was conferred with **prestigious BEST FOCARS TRAINEE** award from ICAR – NAARM, Hyderabad for FOCARS 112 course on 19.07.2023



- **Dr. Plabita Goswami, Scientist** was conferred with **prestigious BEST FOCARS TRAINEE** award from ICAR – NAARM, Hyderabad for FOCARS 113 course on 17.10.2023





- **ICAR-NRC on Mithun** received “**Commendation Certificate**” during the Town Official Language Implementation Committee (TOLIC), Dimapur meeting at ARTC & S, Sukhovi on 30<sup>th</sup> August 2023
  - **Best oral presentation awards: Dr. Harshit Kumar, Scientist (AGB)**, received four best poster presentation awards at ISAGB National Conference held at NBAGR, Karnal
1. Kumar, H., Panigrahi, M., Bhushan, B., & Dutt, T. (2023). Unveiling Positive Selection in Tharparkar Cattle through Deep Neural Networks. Abstract presented at the XVII Annual Convention of Indian Society of Animal Genetics & Breeding, ICAR-NBAGR, Karnal, November 16-17, 2023
  2. Kumar, H., Panigrahi, M., Bhushan, B., & Dutt, T. (2023). Leveraging Machine Learning Algorithms for Indian Cattle Breed Traceability with SNP Markers. Abstract presented at the XVII Annual Convention of Indian Society of Animal Genetics & Breeding, ICAR-NBAGR, Karnal, November 16-17, 2023.
  3. Kumar, H., Yadav, A., Hanah, S. S., Devi, L. S., Khate, K., & Girish, P. S. (2023). Genetic Parameters and Correlations of Body Weight Traits in Mithun (*Bos frontalis*) Using Animal Model. Abstract presented at the XVII Annual Convention of Indian Society of Animal Genetics & Breeding, ICAR-NBAGR, Karnal, November 16-17, 2023.



4. Kumar, A., VN, M. A., N S, N., Kumar, H., Rout, A. A., & Mishra, A. (2023). Deciphering Role of Shutdown Chicken Pulmonary miRNA During Highly Pathogenic Avian Influenza (H5N1) Infection. Abstract presented at the XVII Annual Convention of Indian Society of Animal Genetics & Breeding, ICAR-NBAGR, Karnal, November 16-17, 2023.



## Award for farmers under KVK, Phek, organized by Krishi Jagran, New Delhi.

- Mrs. Vezokholu Chuzhao - "National" Millionaire Farmer of India Award 2023 for high value fruit crops- Kiwi, Persimmon, Medicinal plants, Pig breeding and Poultry
- Mrs. Kuhukhrulu Khamo - "District" Millionaire Farmer of India Award 2023 for field crops, Horticultural crops and Floriculture

# HUMAN RESOURCE DEVELOPMENT



MITHUN MEAT SOUP



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## Human Resource Development

### Training/Workshop/Seminar/Conference etc. attended by Scientific staff

Name of Scientist	Designation	Program attended	Date	Venue
Dr. Girish Patil S	Director	Executive Development Programme - NAARM	22 <sup>nd</sup> -27 <sup>th</sup> May, 2023	ICAR – NAARM, Hyderabad
Dr. Nazrul Haque	Principal Scientist	Capacity Building program under Vigilance Awareness campaign.	30 <sup>th</sup> October, 2023	ICAR-NRC on Mithun, Nagaland
Dr. Jayanta Kumar Chamuah	Senior Scientist	Capacity Building program under Vigilance Awareness campaign.	30 <sup>th</sup> October, 2023	ICAR-NRC on Mithun, Nagaland
Dr. Sapunii Stephen Hanah	Senior Scientist	Hands on training on Processing and value addition of livestock products”	30 <sup>th</sup> January to 3 <sup>rd</sup> February, 2023	ICAR-CIRG Makhdoom, Mathura, U.P.
		Online training on “ E-Marketing: connecting farmers with value chain linkage	20 <sup>th</sup> December, 2023	National Institute of Agricultural Extension Management-Hyderabad
		Capacity Building program under Vigilance Awareness campaign, 2023	30 <sup>th</sup> October, 2023	ICAR-NRC on Mithun, Nagaland
Dr. Lalzampuia	Scientist	Training programme on “Laboratory Quality Management System and Internal Audit as per ISO/ IEC 17025: 2017”	13 <sup>th</sup> -17 <sup>th</sup> March, 2023	National Institute of Plant Health Management, Hyderabad
		Capacity Building program under Vigilance Awareness campaign.	30 <sup>th</sup> October, 2023	ICAR-NRC on Mithun, Nagaland
Dr. Laishram Sunitibala Devi	Scientist	Annual zonal workshop of KVK (Zone VII) entitled “ Translating Research to Development for Sustainable Agriculture in North-East Region”	20 <sup>th</sup> -22 <sup>nd</sup> July, 2023	ICAR-NRC on Mithun, Medziphema
		Workshop on “Unleashing Creativity through Intellectual Property Rights of Northeast India”	23 <sup>rd</sup> August, 2023	ICAR-NRC on Mithun
		Online training on “Application of Statistical Software for Analysis of Agricultural and Survey Data”	8 <sup>th</sup> -13 <sup>th</sup> September, 2023	ICAR-IASRI, New Delhi
		Online training on “ E-Marketing: connecting farmers with value chain linkage	20 <sup>th</sup> December, 2023	National Institute of Agricultural Extension Management-Hyderabad



Name of Scientist	Designation	Program attended	Date	Venue
		Capacity Building program under Vigilance Awareness campaign, 2023	30 <sup>th</sup> October, 2023	ICAR-NRC on Mithun, Nagaland
Dr. Vikram R	Scientist	Virtual training programme on “Impactful ICT Applications and Technologies in Agriculture”	7 <sup>th</sup> -11 <sup>th</sup> February, 2023	ICAR-NAARM, Hyderabad
		Summer school in online mode on “Emerging challenges and opportunities in biotic and abiotic stress management”	10-30 <sup>th</sup> August, 2023	Asthma Foundation, Meerut in collaboration with SAUs
		MOOC training program on “Digital Teaching Techniques”	1-31 <sup>st</sup> October, 2023	ICAR-NAARM, Hyderabad
		Capacity Building program under Vigilance Awareness campaign, 2023	30 <sup>th</sup> October, 2023	ICAR-NRC on Mithun, Nagaland
Dr. Narendra V N	Scientist	MANAGE – TNAU online Collaborative Training on Faculty Development Program	13 <sup>th</sup> -16 <sup>th</sup> June, 2023	MANAGE, Hyderabad
		The first North East FPO and Associated Investors’ Conclave	24 <sup>th</sup> – 26 <sup>th</sup> June, 2023	CPGSAS, Umiam, Shillong
		webinar on “Nourishing the Land and the People: Millet Farming and Soil Health in Arunachal Pradesh”	10 <sup>th</sup> November, 2023 (online mode)	Faculty of Agricultural Sciences, Rajiv Gandhi University (A Central University), Arunachal Pradesh
		Capacity Building program under Vigilance Awareness campaign.	30 <sup>th</sup> October, 2023	ICAR-NRC on Mithun, Nagaland
Dr Jyoti	Scientist	Capacity Building program under Vigilance Awareness campaign.	30 <sup>th</sup> October, 2023	ICAR-NRC on Mithun, Nagaland
Dr. Harshit Kumar	Scientist	FOCARS 112 Phase I	11 <sup>th</sup> April, 2023 – 19 <sup>th</sup> July, 2023	ICAR – NAARM, Hyderabad
		FOCARS 112 Phase II	1 <sup>st</sup> August, 2023 – 8 <sup>th</sup> September, 2023	ICAR-NRC on Mithun, Nagaland
		Online training on “Application of Statistical Software for Analysis of Agricultural and Survey Data”	8 <sup>th</sup> -13 <sup>th</sup> September, 2023	ICAR-IASRI, New Delhi

Name of Scientist	Designation	Program attended	Date	Venue
		Online training program on "Omics Data Analysis: Genome to Proteome"	9 <sup>th</sup> -18 <sup>th</sup> October, 2023	ICAR-IASRI, New Delhi
		Professional attachment training of FOCARS 112 (Phase III)	17 <sup>th</sup> October, 2023 – 16 <sup>th</sup> January, 2024	ICAR – NBAGR, Karnal
		Capacity Building program under Vigilance Awareness campaign, 2023	30 <sup>th</sup> October, 2023 (online)	ICAR-NRC on Mithun, Nagaland
Dr. Yallappa M Somagond	Scientist	Summer school in online mode on "Emerging challenges and opportunities in biotic and abiotic stress management"	10 <sup>th</sup> -30 <sup>th</sup> August, 2023	Astha Foundation, Meerut in collaboration with SAUs
		Capacity Building program under Vigilance Awareness campaign, 2023	30 <sup>th</sup> October, 2023	ICAR-NRC on Mithun, Nagaland

### Training/Workshop/Seminar/Conference etc. attended by Administrative staffs

Name	Designation	Program attended	Date	Venue
Mr. Th Dipal Meitei	AAO	Capacity Building program under Vigilance Awareness campaign, 2023	30 <sup>th</sup> October, 2023	ICAR-NRC on Mithun, Nagaland
Ms. Aloli Rengma	AAO	Training programme on "Technical Service Rules"	10 <sup>th</sup> -11 <sup>th</sup> July 2023	ICAR-NAARM, Hyderabad
		Capacity Building program under Vigilance Awareness campaign, 2023	30 <sup>th</sup> October, 2023	ICAR-NRC on Mithun, Nagaland
Mrs Achuno Solo	UDC	Training programme on "Technical Service Rules"	10 <sup>th</sup> -11 <sup>th</sup> July, 2023	ICAR-NAARM, Hyderabad
		Capacity Building program under Vigilance Awareness campaign, 2023	30 <sup>th</sup> October, 2023	ICAR-NRC on Mithun, Nagaland
Ms Vikhobeinuo Kiso	Personal Assistant	Capacity Building program under Vigilance Awareness campaign, 2023	30 <sup>th</sup> October, 2023	ICAR-NRC on Mithun, Nagaland
Ms Sentisangla	LDC	Capacity Building program under Vigilance Awareness campaign, 2023	30 <sup>th</sup> October, 2023	ICAR-NRC on Mithun, Nagaland
Mrs Arenla Ozukum	LDC	Capacity Building program under Vigilance Awareness campaign, 2023	30 <sup>th</sup> October, 2023	ICAR-NRC on Mithun, Nagaland
Mr. Shatrughan Verma	LDC	Capacity Building program under Vigilance Awareness campaign, 2023	30 <sup>th</sup> October, 2023	ICAR-NRC on Mithun, Nagaland
Mr. Kapil Chaudhary	SSS	Capacity Building program under Vigilance Awareness campaign, 2023	30 <sup>th</sup> October, 2023	ICAR-NRC on Mithun, Nagaland

# RESEARCH PROGRAMMES AND PROJECTS



COMMERCIAL MITHUN PRODUCTS (DRIED MEAT AND SOUP)



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## Research Programmes and Projects

### Ongoing research projects

S. No.	Title of the project	Name of PI	Name of Co-PIs	Date of start	Expected date of completion
1	Exploring the genetic architecture of unique Mithun populations in North East India (Collaborative project with ICAR-NBAGR, Karnal, Haryana)	Dr. Harshit Kumar	Dr. S. S. Hanah Dr. Vikram R. Dr. Kobu Khate Dr. K. Vupru Dr. Girish Patil S.	Oct-2023	Sep-2025
2	Determination of energy and protein requirements for Mithun	Dr. Nazrul Haque	Dr. S. S. Hanah Dr. Kezhavituo Vupru	Sept-2020	Aug-2025
3	Development of Package of practices for sustainable organic Mithun production	Dr. Nazrul Haque	Dr. Ragulraj S. Dr. S. S. Hanah Dr. Esther Longkumer Dr. Hannah K. Asangla Dr. Girish Patil S.	April 2022	April 2025
4	Deciphering sperm functional and proteomic alterations in Mithun bulls with poor sperm cryotolerance.	Dr. Vikram R. (ICAR-NRCM)	Dr. A. Kumaresan (ICAR-NDRI-SRS)	July-2021	June-2023
5	Development of portable cryopreservation set for free-range Mithun semen cryopreservation	Dr. Vikram R.	Dr. S. S. Hanah Dr. Kobu Khate Dr. Ragulraj S.	May-2023	April-2025
6	Comparative study of Mithun adaptability to diverse climatic conditions across geographical regions in the country	Dr. Yallappa M. Somagond	Dr. Vikram R. Dr. Kobu Khate Dr. Ragulraj S.	May-2023	April-2025
7	Innovative interventions for promotion of meat sector under NEH fund of ICAR-NMRI, Hyderabad)	Dr. J. K. Chamuah	Project leader: Dr. Girish Patil S. Co-PIs: Dr. Vikram R. Dr. Jyoti Dr. Kobu Khate Dr. K. Vupru		
8	Development of an Artificial Intelligence based system for the identification and diagnosis helminth parasites of Mithun and allied domestic bovines in North East region of India	Dr. J. K. Chamuah	Dr. H. Lalzampaia Dr. Kobu Khate Dr. Girish Patil S. Dr. Meena Das Dr. Arun Valan Dr. Bikash Sharma	April-2023	March-2024

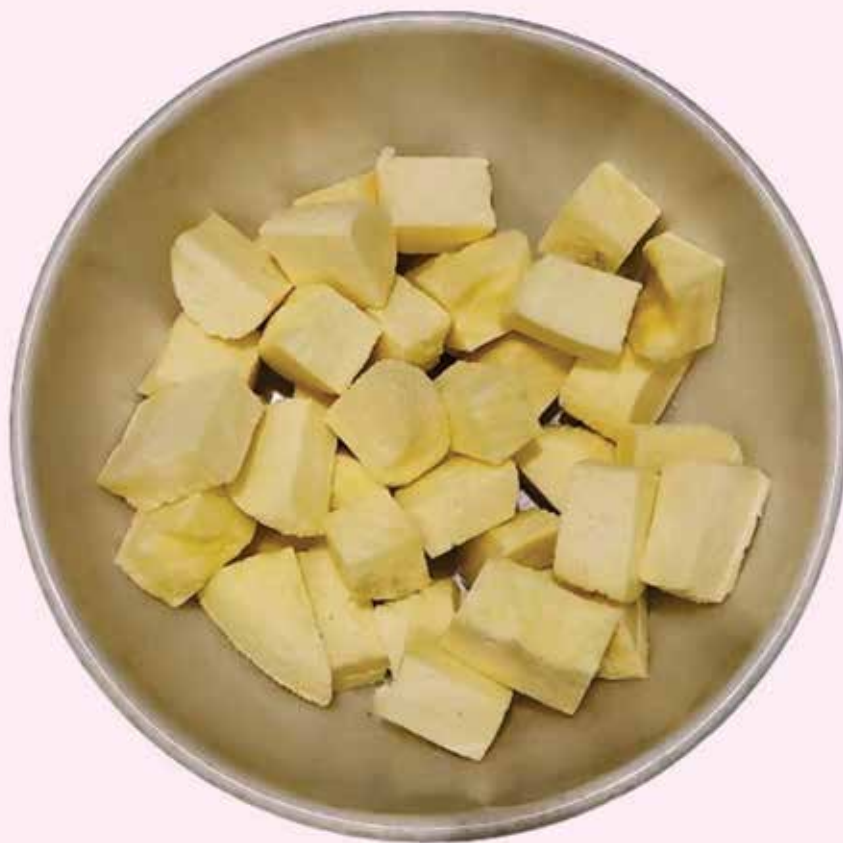




S. No.	Title of the project	Name of PI	Name of Co-PIs	Date of start	Expected date of completion
9	Molecular screening of tick vector and host Mithun ( <i>Bos frontalis</i> ) for haemoparasites in the states of Nagaland and Arunachal Pradesh.	Dr. J. K. Chamuah	Dr. Kobu Khate Dr. H. Lalzampaia	Sep-2020	March-2023
10	AICRP on FMD	Dr. H. Lalzampaia		July-2014	Continue
11	Studies on Prevalence and molecular characterization of diarrhoea causing pathogens in Mithun	Dr. H. Lalzampaia	Dr. L. Sunitibala Devi Dr. Kobu Khate Dr. J. K. Chamuah	Sep-2020	March-2023
12	Molecular basis of immune response to FMD vaccination in Mithun ( <i>Bos frontalis</i> ) (DBT collaborative Project with ICAR-IVRI, Bangalore Campus, Hebbal, Bengaluru)	Dr. H. Lalzampaia	Dr. L. Sunitibala Devi Dr. Kobu Khate Dr. J. K. Chamuah Dr. M. H. Khan Dr. Narayanan Krishnaswamy Dr. Gnanavel Venkatesan Dr. Chandra Mohan S	April-2023	March-2026
13	Assessments and documentation of the existing Mithun rearing practices under free-range system on North-Eastern India.	Dr. S. S. Hanah	Dr. M. H. Khan Dr. H. Lalzampaia Dr. L. Sunitibala Devi Dr. Kobu Khate	Jan-2021	Aug-2023
14	Designing and establishment of M-Anitra: Mithun registration, traceability & Market place system along with Biometrics and block chain based data management	Dr. S. S. Hanah	Dr. J. K. Chamuah Dr. Girish Patil S.	April-2023	March-2024
15	Artificial Intelligence based studies on estrus and parturient behaviour of Mithun	Dr. L. Sunitibala Devi	Dr. S. S. Hannah Dr. Arul Valan (NIT) Dr. M. H. Khan Dr. Vikram R Dr. Kobu Khate	Jan-2023	Dec-2024
16	Strengthening the Mithun meat and milk value chain through innovative value addition and quality assurance technique.	Dr. Jyoti	Dr. S. S. Hanah Dr. Nazrul Haque Dr. Vikram R. Dr. K. Vupru Dr. Girish Patil S.	April-2023	March-2026



# PERSONNEL



MITHUN MILK PANEER



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## Personnel

S. No.	Name of the Employees	Designation
	<b>RMP</b>	
	Dr. Girish Patil S	Director
	<b>SCIENTIFIC</b>	
	Dr. Nazrul Haque	Pr. Scientist(AN)
	Dr. Jayanta Kumar Chamuah	Senior Scientist (AH)
	Dr. Sapunii Stephen Hanah	Senior Scientist (LPM)
	Dr. H. Lalzampuia	Scientist (VM)
	Dr. Laishram Sunitibala Devi	Scientist (LPM)
	Dr. Vikram R	Scientist (AR&G)
	Dr. Jyoti	Scientist (LPT)
	Dr. Narendra V.N.	Scientist (AE)
	Dr. YM Somagond	Scientist (AP)
	Dr. Harshit Kumar	Scientist (AG&B)
	Dr. Plabita Goswami	Scientist (VM)
	<b>TECHNICAL</b>	
	Dr. Kezhavituo Vupru	Chief Technical Officer(T-9)
	Dr. Kobu Khate	Chief Technical Officer(T-9)
	Dr. Ragulraj S	Senior Technical Officer (T-6)
	Mr. Rokongulie Krose	Technical Assistant(T-3)
	Mr. Vizekrol Kikhi	Driver (T-3)
	<b>ADMINISTRATIVE</b>	
	Ms. Aloli Rengma	Assistant Admin. Officer
	Sh. Th. Dipal Meitei	Assistant Admin. Officer
	Mrs. Achuno Solo	UDC
	Ms. Vikhobeinuo Kiso	PA
	Mrs. Arenla Ozukum	LDC
	Ms. Sentisangla Pongener	LDC
	Sh. Shatrughan Verma	LDC
	<b>SUPPORTING</b>	
	Sh. Thupuvoyi	Skilled Support Staff
	Sh. Vezocho	Skilled Support Staff
	Sh. Povetso	Skilled Support Staff
	Sh. Vezato	Skilled Support Staff
	Sh. K D Choudhary	Skilled Support Staff
	Sh. Kumud Kumar	Skilled Support Staff
	Sh. Kameswar Sharma	Skilled Support Staff
	Sh. Kul Bahadur Chettri	Skilled Support Staff
	Sh. Ram Bahadur	Skilled Support Staff



S. No.	Name of the Employees	Designation
	Sh. Ganesh Dorjee	Skilled Support Staff
	Sh. Khuvotso Hiese	Skilled Support Staff
<b>Krishi Vigyan Kendra, Phek</b>		
	Scientific Dr. Sanjeev Kumar Singh	Sr. Scientist cum Head
	Technical Dr. T. Esther Longkumer	Chief Technical Officer(T-9)
	Dr. Hannah K. Asangla	Chief Technical Officer(T-9)
	Sh. Nukusa T Vadeo	Technical Officer(Computer) T-5
	Sh. Kenisetso Chucha	Farm Manager(T-5)
	Sh. Bodan Ch Kachari	Driver (T-4)
	Administrative Sh. K Mhasikolie Chusi	Assistant
	Smt. Imsennaro Longchar	PA
	Supporting Sh. Vevo Hesuh	Skilled Support Staff
	Sh. Shetsonyi Puro	Skilled Support Staff

### (Superannuated/promoted/Transferred) January 2023-December 2023

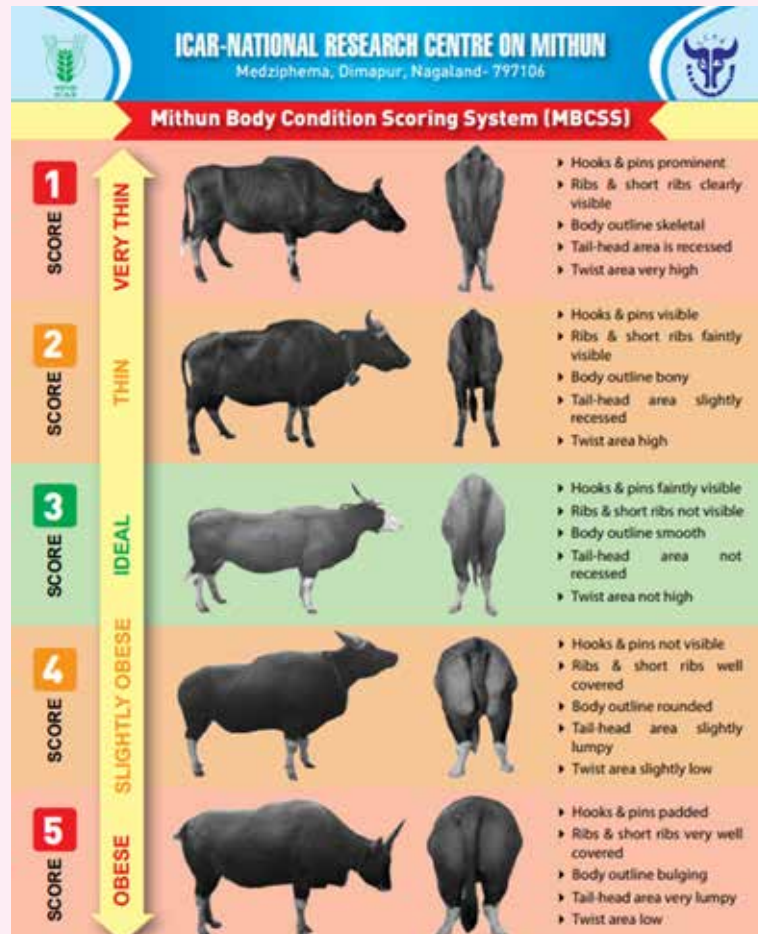
S. No.	Name & Designation	Date
<b>TRANSFERRED</b>		
	Sh. Surjit Kumar, Assistant	16.08.2023
<b>PROMOTION</b>		
	Ms Vikhobeinuo Kiso, PA	28.12.2023
<b>NEW JOINING</b>		
	Dr Jyoti, Scientist (LPT)	11.04.2023
	Dr Narendra V. N., Scientist (AE)	11.04.2023
	Dr Yallappa Somagond, Scientist (AP)	11.04.2023
	Dr Harshit Kumar, Scientist (AGB)	11.04.2023
	Dr Plabita Goswami, Scientist (VM)	18.07.2023
	Dr. Sanjeev Kumar Singh, Senior Scientist Head, KVK Phek	01.10.2023

### In-charge and members of different cells

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

D.D.O. Cell	Miss Aloli Rengma Dr. J.K. Chamuah Dr. Vikram R
Cashier	Mrs Arenla Ozukum Mrs Achuno Solo
F&AO	Sh. Th. Dipal Meitei Dr. Kezhavituo Vupru
Works & Estate	Dr. Kezhavituo Vupru Dr. Kobu Khate Miss Aloli Rengma
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 Sh. K D Choudhury
Library section including CERA	Dr. Vikram R Dr. Laishram Sunitibala Devi
ITMU/Innovation/IPR Cell	Dr. J.K. Chamuah Dr. H. Lalzampaia
AKMU Cell	Dr. Vikram R Dr. J.K. Chamuah
Bio-Safety Cell	Dr. H. Lalzampaia Dr. J.K. Chamuah
Data Cell	Dr. J.K. Chamuah Dr. Vikram R
Hindi Cell	Dr. Vikram R Dr. Laishram Sunitibala Devi
PME Cell	Dr. S.S. Hanah Dr. Vikram R
RTI Cell	Dr. Kobu Khate Miss Aloli Rengma
Sport Cell	Dr. H. Lalzampaia Dr. S.S. Hanah
TSP activities	Dr. Kobu Khate Dr. H. Lalzampaia
BIF (Bioinformatics) Cell	Dr. J.K. Chamuah Dr. H. Lalzampaia
Vehicle Cell I (All office vehicles)	Dr.Kezhavituo Vupru Sh. Th. Dipal Meitei
Vehicle Cell II (Tractors)	Dr. Kobu Khate Dr.Kezhavituo Vupru
HRD Nodal Officer	Dr. Laishram Sunitibala Devi Dr. H. Lalzampaia
Seminar & Meeting Hall	Sh. S Verma
Swachh Bharat Mission	Dr. Kobu Khate Dr. T. Esther Longkumer
Extension Cell	Dr. Kobu Khate
CIF Lab (Biotech Hub)	Dr. H. Lalzampaia Dr. Laishram Sunitibala Devi

# PUBLICATIONS



MITHUN BODY CONDITION SCORING SYSTEM (MBCSS)



## Publications

### Research Papers

Asangla, H. K. & Ao, E. (2023). Impact of front line demonstration of soybean in Phek District of Nagaland. *Journal of Krishi Vigyan*, 11(2), 265-268. <https://doi.org/10.5958/2349-4433.2023.00053.3>

Chamuah, J. K., Susan Jacob, S., Ezung, L., Awomi, L., Aier, I., Kumar, H., Goswami, P., Lalzampaia, H., Khate, K., Vupru, K., Singh, M., Hanah, S. S., & Shivanagowda, P. S. (2024). First report of Ikeda genotype of *Theileria orientalis* in Mithun (*Bos frontalis*) from northeastern hilly region of India. *Parasitology Research*, 123, 36.

Devi, L. S., Hanah, S. S., Vikram, R., Haque, N., Khan, M. H., Girish, P. S., & Mitra, A. (2023). Chemical composition, fatty acids, amino acids, minerals and vitamins profiles of Mithun (*Bos frontalis*) milk reared under semi-intensive system. *Journal of Food Composition and Analysis*, 124, 105694.

Kumar, H., Panigrahi, M., G. Strillacci, M., Sonejita Nayak, S., Rajawat, D., Ghildiyal, K., Bhushan, B., & Dutt, T. (2023). Detection of genome-wide copy number variation in Murrah buffaloes. In *Animal Biotechnology* (pp. 1–13). Informa UK Limited.

Kuotsu, N., Prasad, H., Haque, N., Varte, L., Malsawmkima, & Ratika, K. (2023). A study on micro-minerals estimation in Mithun (*Bos frontalis*) in Nagaland, India. *The Pharma Innovation Journal*, 12(5), 3898-3902.

Nayak, S. S., Panigrahi, M., Kumar, H., Rajawat, D., Sharma, A., Bhushan, B., & Dutt, T. (2023). Evidence for selective sweeps in the MHC gene repertoire of various cattle breeds. In *Animal Biotechnology* (pp. 1–7). Informa UK Limited.

Pelesinuo, K. B., Sattanathan, G., Haque, N., Al-Ghanim, K. A., Nicoletti, M., Sachivkina, N., & Govindarajan, M. (2023). Synthesis and characterization of Mithun (*Bos frontalis*) urine-based antibacterial copper oxide nanoparticles. *Biomedicines*, 11(6), 1690.

Pelesinuo, K. B., Sattanathan, G., Haque, N., Khalid, A., Ghanim, A. I., Marcello, N., Sachivkina, N., & Govindarajan, M. (2023). Synthesis and Characterization of Mithun (*Bos frontalis*) Urine-Based Antibacterial Copper Oxide Nanoparticles. *Journal of Biomedicines*, 11(6), 1690.

Perumal, P., Sunder, J., De, A. K., Alyethodi, R. R., Vikram, R., Upadhyay, V. R., ... & Bhattacharya, D. (2023). Flaxseed oil modulates testicular biometrics, hormone, libido, antioxidant and semen profiles in endangered Teressa goat of Andaman and Nicobar Islands. *Reproductive Biology*, 23(1), 100730.

Perumal, P., Sunder, J., De, A. K., Bhattacharya, D., Nahak, A. K., Vikram, R., & Chakurkar, E. B. (2023). Seasonal stress on semen quality profiles, seminal biochemical and oxidative stress attributes in endangered Teressa goat of Andaman and Nicobar Islands. *Asian Pacific Journal of Reproduction*, 12(6), 288-298.

Rajawat, D., Panigrahi, M., Nayak, S. S., Ghildiyal, K., Sharma, A., Kumar, H., Parida, S., Bhushan, B., Gaur, G. K., Mishra, B. P., & Dutt, T. (2023). Uncovering genes underlying coat color variation in indigenous cattle breeds through genome-wide positive selection. In *Animal Biotechnology* (pp. 1–14). Informa UK Limited.

Sangtam, T. Z., Savino, N., Hanah, S. S., Vidyarthi, V. K., Rutsa, M. C., Nizamuddin, R., Zuyie, R., & Rameshwar. (2023). Study of body condition score and its impact on dam body weight and calf growth rate during the transition period in Mithun (*Bos frontalis*) cows. *The Pharma Innovation*





Journal, SP-12(12), 2684-2688.

Shree, B. L., Girish, P. S., Karabasanavar, N., Reddy, S. S., Basode, V. K., Priyanka, D., Sankeerthi, P., & Vasanthi, J. (2023). Development and validation of isothermal polymerase spiral reaction assay for the specific authentication of goat (*Capra hircus*) meat. *Food Control*, 151, 109811.

Upadhyay, V. R., Roy, A. K., Pandita, S., Raval, K., Patoliya, P., Ramesh, V., & Bhakat, M. (2023). Optimized addition of nitric oxide compounds in semen extender improves post-thaw seminal attributes of Murrah buffaloes. *Tropical Animal Health and Production*, 55(1), 47.

Vikram, R., Perumal, P., Khan, M. H., & Girish, P. S. (2023). Assisted reproductive technologies (ARTs) in Mithun (*Bos frontalis*): What progress has been made so far? An overview. *Reproduction in Domestic Animals*, 58(5), 583-593.

### Newsletter:

Harshit Kumar, Vikram R, Jyoti and YM Somagond. Immunological aspects of cattlere production: nurturing fertility and productivity. *ISSRF NEWSLETTER*, A publication of the Indian Society for the Study of Reproduction and Fertility. Issue 32, September, 2023. (pp 44-45).

### Abstracts presented:

Kumar, H., Panigrahi, M., Bhushan, B., & Dutt, T. (2023). Unveiling Positive Selection in Tharparkar Cattle through Deep Neural Networks. Abstract presented at the XVII Annual Convention of Indian Society of Animal Genetics & Breeding, ICAR-NBAGR, Karnal, November 16-17, 2023.

Saravanan, K. A., Alex, R., Gowane, G. R., Khan, K. D., Yadav, A., Sahana, V. N., Chhotaray, S., Kumar, H., & Vohra, V. (2023). Unraveling the Genomic Signatures of Selection in Worldwide Cattle Populations. Abstract presented at the XVII Annual Convention of Indian Society of Animal Genetics & Breeding, ICAR-NBAGR, Karnal, November 16-17, 2023.

Kumar, H., Niranjana, S. K., Surati, U., Koul, Y., Kumar, A., Saravanan, K. A., & Girish, P. S. (2023). Genomic Clues to Mithun's Unique Qualities: Meat, Resilience, and Immunity. Abstract presented at the XVII Annual Convention of Indian Society of Animal Genetics & Breeding, ICAR-NBAGR, Karnal, November 16-17, 2023.

Saravanan, K. A., Alex, R., Gowane, G. R., Khan, K. D., Yadav, A., Sahana, V. N., Chhotaray, S., Kumar, H., & Vohra, V. (2023). Exploring Genomic Footprints of Selection in Worldwide Sheep Populations Using Medium-Density SNP Data. Abstract presented at the XVII Annual Convention of Indian Society of Animal Genetics & Breeding, ICAR-NBAGR, Karnal, November 16-17, 2023.

Kumar, H., Panigrahi, M., Bhushan, B., & Dutt, T. (2023). Deep Learning for Discerning Natural Selection in the Bovine Genome. Abstract presented at the XVII Annual Convention of Indian Society of Animal Genetics & Breeding, ICAR-NBAGR, Karnal, November 16-17, 2023.

Kumar, H., Panigrahi, M., Bhushan, B., & Dutt, T. (2023). Leveraging Machine Learning Algorithms for Indian Cattle Breed Traceability with SNP Markers. Abstract presented at the XVII Annual Convention of Indian Society of Animal Genetics & Breeding, ICAR-NBAGR, Karnal, November 16-17, 2023.

Kumar, H., Yadav, A., Hanah, S. S., Devi, L. S., Khate, K., & Girish, P. S. (2023). Genetic Parameters and Correlations of Body Weight Traits in Mithun (*Bos Frontalis*) Using Animal Model. Abstract presented at the XVII Annual Convention of Indian Society of Animal Genetics & Breeding, ICAR-NBAGR, Karnal, November 16-17, 2023.

Kumar, A., VN, M. A., N S, N., Kumar, H., Rout, A. A., & Mishra, A. (2023). Deciphering Role of Shutdown Chicken Pulmonary miRNA During Highly Pathogenic Avian Influenza (H5N1) Infection. Abstract presented at the XVII Annual Convention of Indian Society of Animal Genetics & Breeding, ICAR-NBAGR, Karnal, November 16-17, 2023.

Devi, L. S. Jyoti Jawla, S. S. Hanah, R. Vikram, N. Haque, M. H. Khan, P. S. Girish, A. Mitra(2023). Nutritional composition of Mithun (*Bos frontalis*) milk reared under semi-intensive system. XVI Agricultural Science Congress by the National Academy of Agricultural Sciences (NAAS), New Delhi and hosted by ICAR-Central Marine Fisheries Research Institute (ICAR-CMFRI), 10-13 October, 2023 at Kochi, India.

### Training manuals edited/prepared:

Jyoti, Yallappa M. Somagond, Vikram R, Harshit Kumar, C. Ramakrishna and Girish Patil, S. Training manual on “Improving the Productivity, Quality, and Profitability of Mithun Operations through Commercial Mithun Production and Value Addition”. Five days training programme for Mithun Farmers, August 28<sup>th</sup>- September 1<sup>st</sup> 2023 at ICAR-National Research Centre on Mithun, Medziphema, Nagaland.

### Books:

Chamuah, J.K. *Research Paper Compilation of ICAR – NRC on Mithun (2004-2013)*. 2023. Published by ICAR – NRC on Mithun

Chamuah, J.K. *Research Paper Compilation of ICAR – NRC on Mithun (2014-2022)*. 2023. Published by ICAR – NRC on Mithun

### Popular articles

1. Asangla H.K (2023). Zero tillage: A Resource Conserving Technology: The MorungExpress, 6<sup>th</sup> April 2023
2. Asangla H.K (2023). Success story: Boosting family income through field pea cultivation during Rabi season:The Morung Express, 6<sup>th</sup> July 2023
3. Asangla H.K (2023). Smart farming with Hydroponics in Phek district: The Morung Express, 6<sup>th</sup> October 2023
4. Longkumer T. Esther (2023). Pest and disease management in natural farming. The Morung Express, 2<sup>nd</sup> March 2023.
5. Longkumer T. Esther (2023). Mulching for soil moisture conservation, The Morung Express, 6<sup>th</sup> April 2023.

### Lead Paper presented/Invited lectures delivered:

1. Longkumer T.E. (2023). Skill Training of Rural Youth (STRY) training programme on ‘Vermicomposting’ organized by Agricultural Technology Management Agency (ATMA), Phek in association with SAMETI, Nagaland and MANAGE, Hyderabad at Meluri village from 6<sup>th</sup> to 11<sup>th</sup> February 2023.
2. Longkumer T. E. (2023). Soil preparation and transplanting in Solanaceous crops at Government High School, Porba under Vocational Education Samagra Shiksha, Nagaland on 27<sup>th</sup> July 2023.



3. Longkumer T.E. (2023). Hands on training on vermicomposting (Industrial visit) for students of Government High School, Porba under Vocational Education Samagra Shiksha, Nagaland on 9<sup>th</sup> November 2023.
4. Longkumer T.E. (2023). Hands on training on vermicomposting (Industrial visit) for students of Government High School, Sakraba under Vocational Education Samagra Shiksha, Nagaland on 23<sup>rd</sup> November 2023.
5. Asangla H.K (2023). Nutrient management in vegetable crops at Government High School, Porba under Vocational Education Samagra Shiksha, Nagaland on 14<sup>th</sup> September 2023.
6. Asangla H.K (2023). Nutrient management in vegetable crops at Government High School, Sakraba under Vocational Education Samagra Shiksha, Nagaland on 14<sup>th</sup> September 2023.

### Folders.

1. Asangla H.K. and Longkumer T.E. (2023). Zero tillage in field pea cultivation. KVK-Phek, ICAR-NRC on Mithun Medziphema 797106, Nagaland.
2. Asangla H.K. and Longkumer T.E. (2023). Zero tillage: A Resource Conserving Technology. KVK Phek, ICAR-NRC on Mithun Medziphema 797106, Nagaland
3. Asangla H.K. and Longkumer T.E. (2023). Zero-Budget Natural Farming (ZBNF) - A sustainable farming approach. KVK Phek, ICAR-NRC on Mithun, Medziphema 797106, Nagaland.
4. Asangla H.K. (2023). Tshüteinuokecie do: puosi re pevilieketuo. KVK Phek, NABARD, Dimapur, Nagaland
5. Longkumer, T.E and Asangla H.K. (2023). Natural farming for sustainable agriculture, KVK Phek, ICAR-NRC on Mithun, Medziphema 797106, Nagaland.
6. Longkumer, T.E and Asangla H.K. (2023). Soil and water conservation method in natural farming, KVK Phek, ICAR-NRC on Mithun, Medziphema 797106, Nagaland.
7. Longkumer, T.E and Asangla H.K. (2023). Pest and disease management in natural farming, KVK Phek, ICAR-NRC on Mithun, Medziphema 797106, Nagaland.
8. Longkumer, T.E and Asangla H.K. (2023). Botanical remedies: remedies from plant material in natural control, KVK Phek, ICAR-NRC on Mithun, Medziphema 797106, Nagaland.
9. Longkumer, T.E and Singh, S.K. (2023). Collection of soil samples: Techniques, procedures and storage, KVK Phek, ICAR-NRC on Mithun, Medziphema 797106, Nagaland.
10. Longkumer, T.E and Singh, S.K. (2023). Vermicomposting-as an income generation enterprise, KVK Phek, ICAR-NRC on Mithun, Medziphema 797106, Nagaland.

## Library

The Library and CeRA (Consortium for e-Resources in Agriculture) facility at ICAR-National Research Centre on Mithun plays a pivotal role in supporting research and academic endeavors related to Mithun, a unique bovine species found in Northeast India. The library serves as a knowledge hub, providing researchers, scientists, and students with access to a diverse collection of literature, journals, and reference materials on Mithun husbandry, genetics, nutrition, and related fields. The CeRA facility enhances the research capabilities by providing electronic resources, databases, and scholarly articles, fostering a conducive environment for cutting-edge research and innovation in Mithun farming and conservation. This integrated facility plays a crucial role in advancing knowledge, facilitating collaboration, and contributing to the sustainable development of Mithun farming practices.

S. No.	Particulars	Period (2023)	Total
1	Books	21	2080
2	Journals		
	a) Indian	-	55
	b) International	-	07
3	Abstract CD		
	a) Agris CD	-	13
	b) Vet CD	-	23
	c) Beast CD	-	08
	d) Resource CD	-	01
	e) Medline	-	21
	f) Miscellaneous	-	17
4	Annual Report/ Research Highlights/ Technical Bulletin	2	34
5	Otherspublications/Compendium/ Proceedings	-	63
6	Thesis	-	14
7	Annual Reports of other Institute	25	660

## Mithun Farm, Medziphema

Medziphema Mithun farm is located on a hillock at the altitude of 380 Metre MSL with an area of 54.54 acres. The farm area is well protected with MS pipes on RCC pillar structure fencing. The farm land under fodder cultivation is 10 acres whereas 32.54 acre is reserved for grazing. The Mithuns are kept under intensive as well as semi-intensive rearing systems. The male Mithuns are strictly kept under confinement for controlled breeding through Artificial Insemination. The health of each and every Mithun round the year was maintained very well with only one mortality case. The farm Mithuns were protected from all the prevalence diseases by regular vaccination and strict bio-security measures.

### Numbers of Mithun maintained in the Institute farm, Medziphema

Category	Number
Adult bull	41
Young bull (1-2 years)	04
Bull calf (Below 1 year)	09
Lactating dam	11
Non lactating dam	47
Heifer (1-2 years)	02
Female calf (Below 1 year)	03
<b>Total</b>	<b>117</b>

## Mithun Farm, Porba

The Mithun in the porba station is rearing under semi intensive system. Two hectares of farm land is under fodder cultivation system where hybrid Napier, cowpea, rice bean, broom grass and tree fodders (wild fig, wild apple and wild cherry) are grown to meet out the green fodder requirement of farmed Mithuns. With the fertility of soil and the favourable climatic condition, the growth process of fodders are impressively good. This fodder tree plantation plays a vital role in feeding the Mithuns especially during the off seasons where the scarcity of feeds arise. About 1000 *ficus* plants and 200 number of cherry plants are being nurtured in the nursery.

### Herd strength of Mithun farm, Porba:

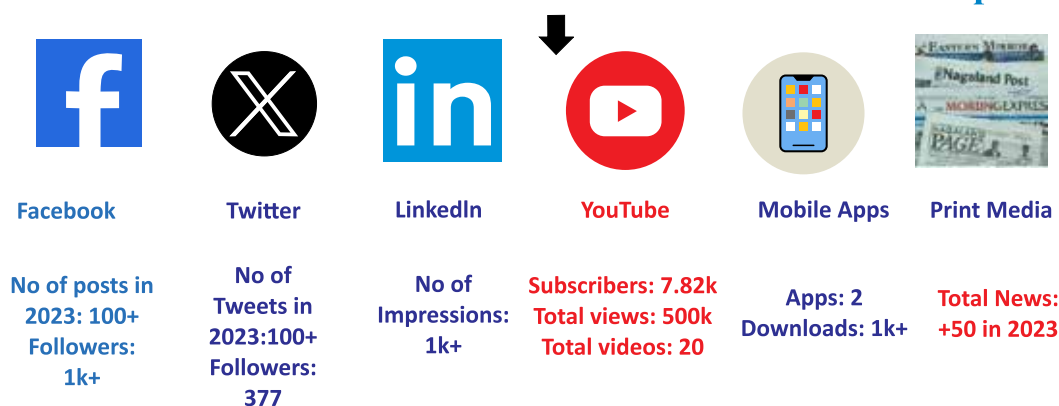
Adult above 2 years		Young stock 1-2 years		Calf 0-1 years		Total	
Male	Female	Male	Female	Male	Female	Male	Female
11	12	2	4	2	3	15	19
23		6		5		34	

## Social Media Cell

### Nodal officer/ In-charge: Dr. Harshit Kumar

ICAR – NRC on Mithun is very active on various social media platforms and is regularly circulating news and endorsing other ICAR institutes’ posts as well.

### Outreach of ICAR - NRC Mithun at different social media platforms



## Participation in Exhibitions, Festivals and Fairs

### Participation in the Hornbill festival

ICAR - NRC on Mithun participated in the Hornbill festival known as Festival of Festivals: by putting up a stall in the Hornbill festival which was celebrated from 01st to 10th December 2023 at Kisama village, Kohima, Nagaland. Live Mithuns were displayed and the scientific information was disseminated for the benefit of stakeholders. Value added Mithun meat products were sold in the festival through NEAFI, Guwahati an organization which has signed technology transfer MoU with the Institute. Mr Imna Along, Honourable Minister for Tourism and Higher Education, Govt of Nagaland launched two products Mithun meat Nuggets and Sausages which were commercialized recently to NEAFI. The products were launched in the presence of Dr Girish Patil, S, Director, Mr Bhanu Pratap Singh, MD, NEAFI and Dr Nazrul Haque, Principal Scientist.



## CAU Agri Fair

ICAR-NRC on Mithun, Medziphema Nagaland, participated in the “CAU-Regional Agri Fair 2023-24” from the 12<sup>th</sup> – 14<sup>th</sup> December, to showcase the various technology developed by the institute. The Agri-Fair was organized by the Directorate of Extension Education, CAU, Imphal, Manipur.



## North East Krishi Kumbh Mela

ICAR-NRC on Mithun participated in the exhibition at the North East Krishi Kumbh Mela, 2023 at ICAR Research Complex for NEH, Umiam, Meghalaya held from 4th January to 6th January 2023 which was formally inaugurated by Union Minister of Agriculture and Farmers Welfare, Narendra Singh Tomar. Various technologies and products developed by the institute were exhibited to dignitaries and visitors. Other dignitaries included Central Agricultural University Vice-Chancellor Dr Anupam Mishra and North Eastern Council Secretary K Moses Chalai.



## Special Outreach Cleanliness Campaign, Khonoma village

ICAR-NRC on Mithun organized a one day special outreach cleanliness campaign under Swachh Bharat Mission at Khonoma village, Kohima district, Nagaland on 22nd February 2023. It was a first of its kind outreach programme organized by the institute where all the staff of ICAR NRC on Mithun including the contractual staffs participated. A short and fun interaction session among the staff was held at Mithun conservation Unit Khonoma. All together a total of 63 staff participated in the programme.



## Initiative has been taken for the introduction of Mithun in Mungpoo in Darjeeling district of West Bengal

An initiative has been taken for the introduction of Mithun in Mungpoo in Darjeeling district of West Bengal. A meeting has been conducted in the presence of the Director of ICAR-NRC on Mithun, Medziphema, Nagaland Dr Girish Patil, Director, of the Directorate of Cinchona and other Medicinal Plants, Mungpoo, West Bengal, Dr Samuel Raj; Dr Nazrul Haque, Principal Scientist, ICAR-NRC on Mithun, Nagaland, local Veterinarians, Staff members of the Directorate of Cinchona and other Medicinal Plants and local farmers on 22.12.2023 and also celebrated 'Kisan Diwas' on 23.12.2023.











