ICAR-National Research Centre on Mithun

AT A GLANCE

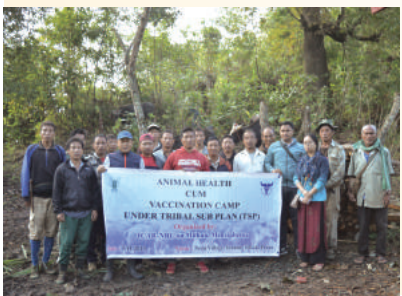
ICAR-NATIONAL RESEARCH CENTRE ON MITHUN
MEDZIPHEMA, DIMAPUR, NAGALAND -797106

ABOUT THE INSTITUTE

ICAR-National Research Centre on Mithun was established in the year 1988 under the aegis of Indian Council of Agricultural Research (Department of Agriculture Research and Education, Ministry of Agriculture and Farmers' Welfare, Government of India). The Institute has two campuses: the main campus is located at Medziphema, Dimapur district, Nagaland and the other is located at Porba village of Phek district of Nagaland which is approximately 125 km from the main campus, Medziphema, 81 km from Kohima and 150 km from Dimapur. Krishi Vigyan Kendra (KVK-Phek) of the Institute is also located at the Porba campus.

ICAR-NRC on Mithun is the only research organization in the world, exclusively working for the continual improvement and conservation of mithun (*Bos frontalis*). The Research and Development (R&D) initiatives of the Institute are accomplished by seven sections viz. Animal Genetics & Breeding, Animal Physiology & Reproduction, Animal Nutrition, Animal Health, Livestock Production & Management, Livestock Production Technology and Veterinary Extension. Over the years the Institute has developed state-of-the-art infrastructure facilities; these include Biotechnology Infrastructure Facility-cum-Central Instrumentation Facility, Molecular Genetics Laboratory, Semen Processing Laboratory and Mithun Farm. The Library with online journal search facility and Agricultural Knowledge Management Unit (AKMU) cell caters to the needs of the scientists,

Semi-intensive mithun rearing at Institute's Mithun Farm, Medziphema



research scholars and other staff members of the Institute as well as neighboring Institutes.

The Institute's Mithun Farm, located about 8 km away from the main campus on a hill-top, is housing 125-150 mithuns under semi-intensive system of rearing. The another Mithun Farm is located at Porba campus of the Institute.

विजन / VISION

टिकाऊ उत्पादन प्रणाली के लिए बेहतर गुणवत्ता वाले मिथुन जर्मप्लाज्म को संरक्षित, संरक्षित और प्रचारित करना और उसके बाद किसानों को बेहतर पोषण और सामाजिक आर्थिक सहायता के लिए उपयोग करना।

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

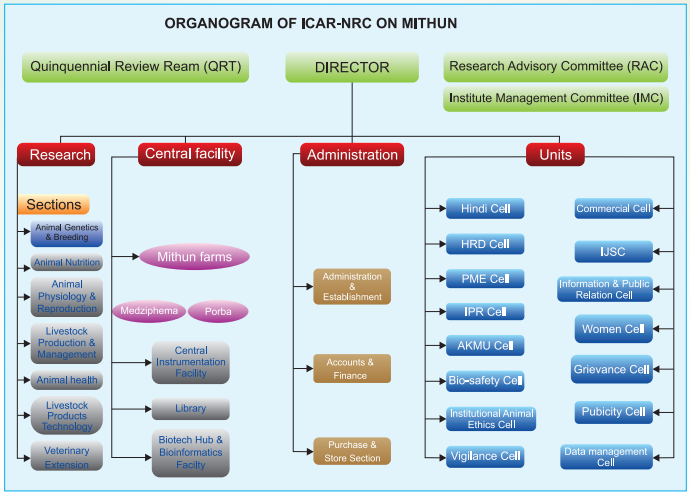
मिशन / MISSION

कृषक समुदाय के पालन पोषण के लिए आर्थिक रूप से व्यवहार्य और टिकाऊ तकनीक विकसित करने के लिए एक अंतिम उद्देश्य के साथ प्रजनन और स्वास्थ्य के लिए वैज्ञानिक प्रबंधन, खिला प्रथाओं और उन्नत जैव–तकनीकों के निर्माण और गोद लेना।

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

अधिदेश / MANDATE

- देश में उपलब्ध मिथुन जर्मप्लाज्म की पहचान, मूल्यांकन और लक्षण वर्णन
  Identification, evaluation and characterization of Mithun germplasm available in the country
- मांस और दूध के लिए मिथुन का संरक्षण और सुधार
  Conservation and improvement of mithun for meat and milk
- मिथुन पर एक जर्मप्लाज्म और सूचना केंद्र के भंडार के रूप में कार्य करना
  To act as repository of a germplasm and information centre on mithun

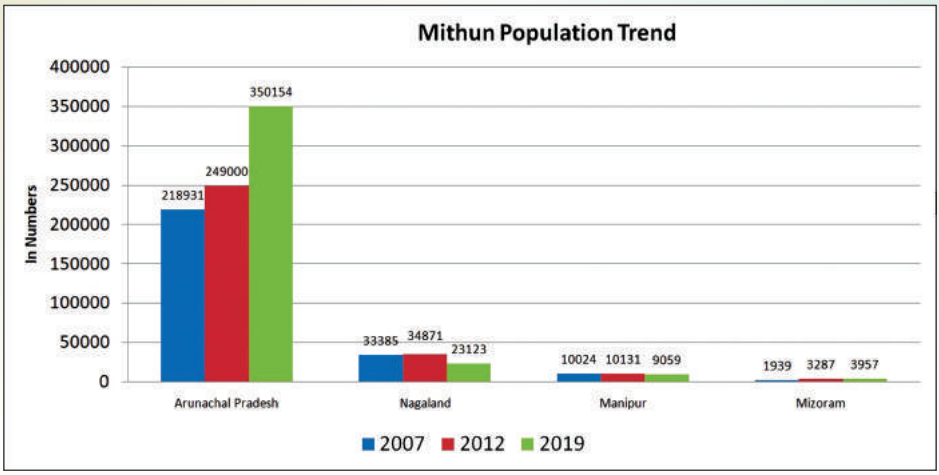


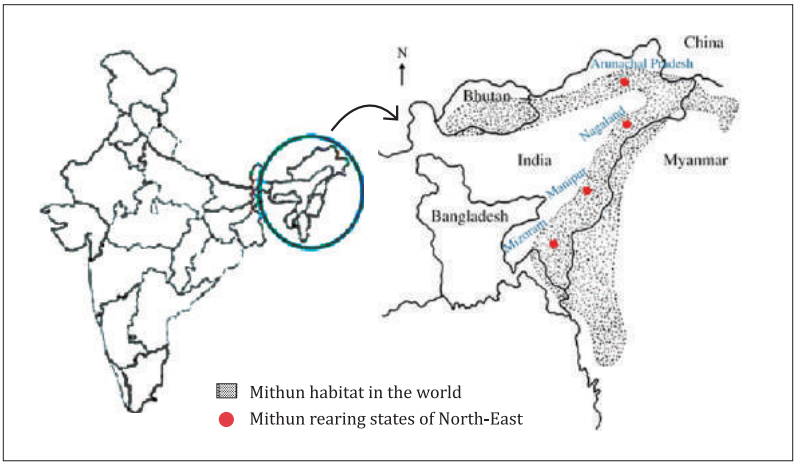
GEOGRAPHICAL DISTRIBUTION AND POPULATION TREND OF MITHUN

MITHUN *(Bos frontalis)*

Scientific classification	
Kingdom:	Animalia
Phylum:	Chordata
Class:	Mammalia
Order:	Artiodactyla
Family:	Bovidae
Genus:	Bos
Species:	*B. frontalis*

Mithun *(Bos frontalis)*, the magnificent and unique bovine species, is believed to have originated more than 8000 years ago and considered as a domesticated form of wild gaur (*Bos gaurus*). Mithun has a very restricted geographical distribution and is generally found at various altitudes ranging between 300 to 3000m MSL (mean sea level) of North-Eastern Hilly states of India, Myanmar, Bhutan, Bangladesh and Yunnan province of China. Though the actual mithun population is not yet ascertained, it is estimated that 98% of the world's mithun population is found in India. As per the latest 20th Indian Livestock Census (2019), the total mithun in the country is 3.9 lakhs, which increased by 30% over the previous census. Among the four mithun rearing North-Eastern Hilly states (viz., Arunachal Pradesh, Manipur, Mizoram, and Nagaland) of India, 89.7% of mithun is recorded in Arunachal Pradesh.



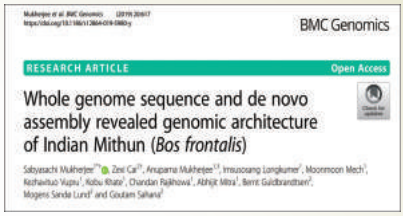


MAJOR RESEARCH ACHIEVEMENTS

Since the last three decades, the Institute has been playing a key role in conservation, breeding, nutrition and health management of mithun. The Institute has not only generated invaluable scientific data towards the understanding of this unique species but also developed several packages of practices and technologies. Conservation efforts including taming of mithun and demonstrating the semi-intensive, an alternative, system of rearing of mithun resulted in the complete domestication of the species. Popularization efforts led to the adoption of scientific rearing of mithun by the tribal communities of the North-Eastern Hilly

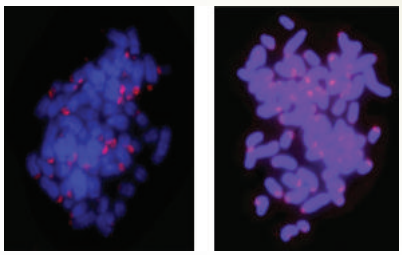
Region (NEHR) with better returns. The salient achievements are given below:

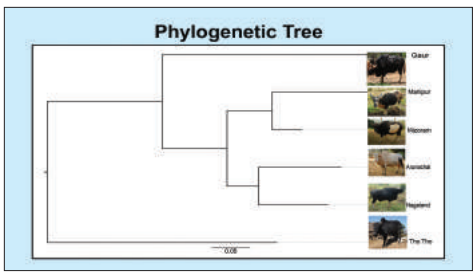
- Whole genome sequencing of mithun: Constructed a high quality de novo genome (3 Gb) assembly of Indian mithun (*Bos frontalis*) with >95% completeness, 91.5% coverage, and 28,044 annotated protein-coding genes. The genome is published in BMC Genomics (https://rdcu.be/bMnH0).
- Morphometric-cum-physical characterization of mithun populations of Nagaland, Arunachal Pradesh, Mizoram, and Manipur.
- Chromosome profiling and genetic characterization (using RAPD, Microsatellite, HdChip, and MASA) of different mithun populations and delineation of evolutionary relationship of mithun with its wild ancestors, Gaur (*Bos gaurus*)
- Mitochondrial sequencing revealed a close genetic relatedness among the mithuns from different geographical locations and a common origin of mithun and gaur (*Bos gaurus*) from an ancient and extinct Bos species.

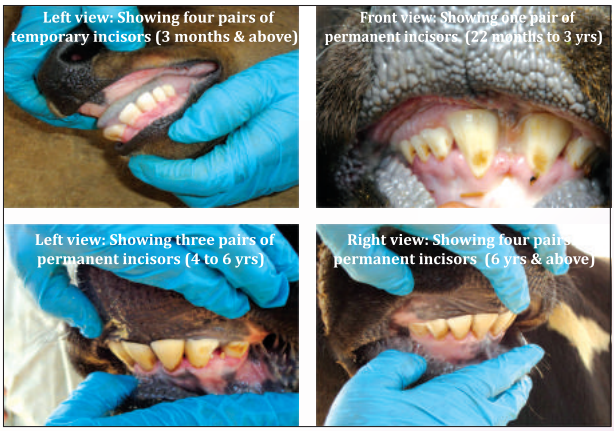

BMC Genomics

RESEARCH ARTICLE Open Access

Whole genome sequence and de novo assembly revealed genomic architecture of Indian Mithun (*Bos frontalis*)


Mithun Metaphase Chromosomes showing centromeric signals with Rhodamine as Flurochrome in Bovine Probe





Determination of age of mithun using dentition patterns

- Development of simple methodology for determination of age of mithun under field conditions using dentition patterns
- Chemical and nutritional evaluation of 260 feed resources (e.g., tree leaves/ shrubs/grasses) for incorporation in the total mixed ration (TMR).
- Formulation of area-specific mineral mixture for mithun

Area specific mineral mixture for mithun

- Low-cost complete feed block using locally available trees/shrubs and industrial by-products which improved the dry matter and gross energy intake
- Developed a method for drying high moisture content agro-industrial by-products (wet cake) for making paddy straw incorporated feed block suitable for feeding of mithun during the lean season

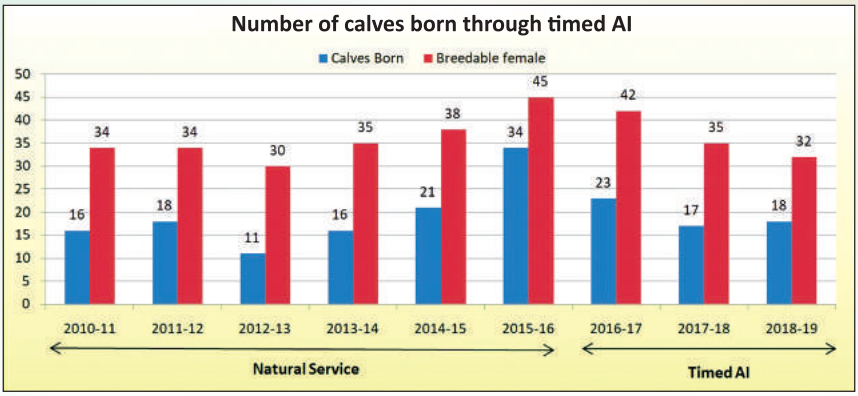

Mineral block

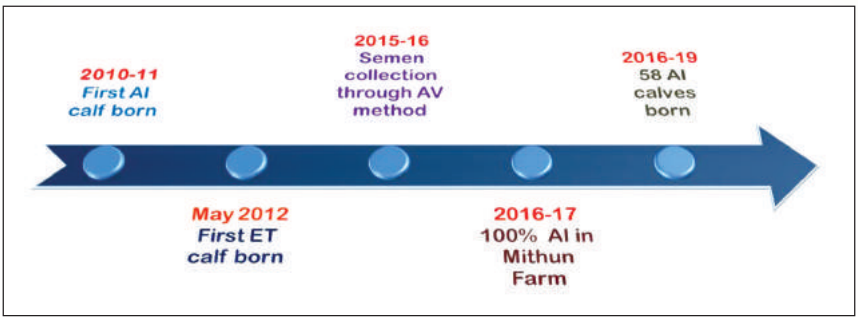

Complete feed block

- Developed and standardized a protocol for collection and freezing of semen and Artificial Insemination (AI) in mithun leading to the birth of AI calves in the farm as wells as in farmers fields
- Standardized the protocol for estrus synchronization, collection, and cryopreservation of embryo in mithun leading to the birth of first ET calf, BHARAT on May 2012


AI in Mithun


AI mithun calves





Time line of augmentation of mithun reproduction

- Surveillance and control of parasitic, bacterial, and viral diseases in mithun
- Developed a health calendar for better veterinary care and prophylaxis of mithuns.
- Diversified use of mithun:
  - value-added milk products (*paneer*, *lassi*, *dahi*, and *rasgolla*)
  - meat (patties and nuggets)
  - skins and hides (leather jacket, ladies bag, shoe, wallet and portfolio bag)

- Mithun milk composition and its comparison with other species has been characterized

Particulars (%)	Mithun	Cow	Buffalo	Goat	Sheep	Yak	Human
Fat	10.2	4.4	8.0	3.5	6.0	7.2	3.6
Protein	6.8	3.4	4.5	3.1	5.4	5.3	1.8
Lactose	4.6	4.8	4.9	4.4	5.1	5.0	6.8
Total Solids	21.6	12.6	17.4	11.0	16.5	17.5	12.2
SNF	11.4	8.2	9.4	7.5	9.5	10.3	8.6
Ash	0.9	0.7	0.8	0.8	1.0	0.9	0.1

Mithun milk & meat products

Mithun leather products

CURRENT INITIATIVES

❖ Popularization of scientific mithun rearing under semi-intensive mithun rearing system

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

Since 2016-17 to 2018-19, the Institute has established 13 semi-intensive mithun rearing model under field condition across all the mithun rearing states.

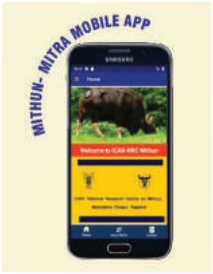
Semi-intensive mithun rearing unit at Tenning Village, Peren Dist., Nagaland

Semi-intensive mithun rearing unit at Mesoma Village, Kohima Dist., Nagaland

❖ Mithun as draught animal

Mithun can be used as a valuable draught animal in the remote hilly slopes where traditional draught animals may not be feasible. Strong well built body and sure-footedness makes it an ideal species for ploughing in the hills. However, in doing so the mithuns must be conditioned and trained at an early age (< 2years).

❖ MITHUN-MITRA Mobile App



The Mithun–Mitra Mobile App is an initiative to create awareness and promote scientific mithun husbandry for diversified use of mithun as a source of meat, milk, hide and draught power. The app serves as a single window delivery system for information on mithun.

❖ Technology transfer and livelihood security programmes under Tribal Sub-Plan (TSP)

Under the TSP, Mithun *Mela*-cum-Technology Awareness Programs and stakeholders meeting are regularly being organized for creating awareness

and educating the farmers about scientific mithun husbandry practices. Animal Health-cum-Vaccination camps, bull exchange programme, farmers training, and exposure visits are conducted from time to time in the mithun rearing states. Further, inputs like piglets, poultry, ducks, rabbits, seeds, plant saplings of litchi, kiwi, etc. are distributed to the tribal population as a means for employment generation to improve their livelihood.

A total of 7519 farmers have been benefitted from the various programmes conducted under the TSP from 2015-19 in all the mithun rearing states of NER viz. Manipur, Nagaland, Mizoram and Arunachal Pradesh

❖ Human Resource Development

The Institute organizes training and skill development porgrammes from time to time to improve the technical competency of the students, faculties and other extension personnel by imparting new skill and knowledge. Under the DBT-sponsored Biotech Hub and BTISnet programme, students and faculties of various educational institutes are given hands-on training in molecular biology technology and bioinformatics. Training programmes are organized for the farmers and unemployed youths and to attract them to take up mithun farming as an alternative livelihood.

❖ Collaborations

The Institute has developed active collaborations with the Central Agriculture University, Imphal and its constituent colleges, particularly the newly established College of Veterinary Sciences & Animal Husbandry, Jalukie, Nagaland; College of Veterinary Sciences & Animal Husbandry, Selesih, Mizoram, and College of Horticulture & Forestry, Pasighat, Arunachal Pradesh. Likewise, the Institute has developed collaboration with Assam Rifles, Directorates of Veterinary Services & Animal Husbandry of mithun rearing states, Agricultural Technology Management Agency (ATMA), ATARI-Zone II and III, NABARD, College of Veterinary Science, AAU, Khanapara and other ICAR institutes of the region.

❖ Formulation of bankable scheme for Mithun Farming

To date, no bankable scheme on mithun farming is available. Considering the fact that mithun farming is a profitable enterprise, finance by banks to support the livelihood of the farming community is the need of the hour. The Institute till date



has conducted one brainstorming session and a workshop with officials from the State Department of Science and Technology, National Bank for Agriculture and Rural Development (NABARD), Nagaland State Cooperative Bank Limited (NSCB), Nagaland Science & Technology Council (NASTEC), Department of Veterinary & Animal Husbandry of Govt. of Nagaland, School of Agricultural Sciences and Rural Development (SASRD), Nagaland Livestock Development Board (NLDB), North East Initiative Development Agency (NEIDA) and other experts for finalization of techno-economic parameters for developing bankable mithun project.

❖ Registration of mithun as a food animal

The Institute has been actively pursuing on a proposal to the Food Safety and Standards Authority of India (FSSAI) to declare mithun as a food animal considering it is reared mostly for meat and to clear the misconceptions that mithun is a wild animal and to promote it's rearing. The Nagaland cabinet in March 2017 had given its nod for taking necessary steps to register the bovine as a food animal.

Note

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