MITHUNDIGEST
मिथुन डाइजेस्ट

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The bi-annual panorama.....

Director's Desk

ICAR-NRC on Mithun, the only research Institute in the world which is exclusively working for the improvement, conservation, and propagation of mithun (*Bos frontalis*). Since 1988, the Institute has been continuously working in the field of production, management and health aspect of mithun. A concerted effort has been made to characterize the mithun population in the country and to delineate its relationship with other *Bos* species. It has been demonstrated that mithun is genetically more close to its wild ancestor Gaur (*Bos gaurus*) than cattle. In terms of feeds and fodders, the NEH region is characterized by a season of abundance during the summer & monsoon followed by a season of scarcity during the winter. The Animal Nutrition section has not only explored the alternative feed resources but has also developed an innovative method of drying and storage of wet cake, a cheap agro-industrial by-product from the distillery industry. Various microbial and parasitic diseases of mithun along with their preventive measures including vaccination schedule have been documented. The sincere efforts of Animal Physiology and Reproduction section have made possible to implement 100% AI in the Institute's Mithun Farm.

Mithun is primarily reared as a meat animal and mithun meat is being consumed as one of the most preferred meats by the inhabitants of this region since the time immemorial. We have started a dialogue with all the stakeholders including the Department of Veterinary and Animal Husbandry of all the mithun rearing states and taken initiatives for registering mithun as a food animal with FSSAI. Further, detailed studies on carcass composition including amino acid, fatty acid, vitamin and mineral profile are initiated. Besides, we are also exploring the possibilities of using mithun as a source of milk. Recently we have carried out the fatty acid analysis of mithun milk.

It is our continuous endeavor to disseminate the technologies and packages of practices developed in the Institute to the farmers' field. During this period, under Tribal Sub-Plan (TSP), later renamed as Schedule Tribe Component (STC), we have organized several activities including Farmer's Fair cum Mithun *Mela* and Farmer's Awareness programs. In order to popularize the semi-

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intensive rearing of mithun, the materials for fencing the mithun rearing area and construction of low-cost night shelter/mithun shed, water trough and salt lick are also distributed.

Any effort for mithun development will not be effective until there are participation and involvement of the stakeholders. Mizoram is one of the four mithun rearing states having the least mithun population of little more than three thousands. We have joined hands with the Department of Animal Husbandry and Veterinary, Govt of Mizoram to increase the dwindling mithun population of the state. We have been constantly engaging ourselves with the Govt of Manipur, Nagaland and Arunachal Pradesh.

Imparting training to the farmers and developing master trainers are one of our objectives. Our KVK-Phek has conducted more than 40 training programmes benefiting nearly thousands.

Having all said and done, it is important to realize that mithun farming is an economic activity and it needs support in terms of loan and financing. However, to date, mithun farming is yet to be bankable. We have recently conducted the 2nd Meeting of the stakeholders for the finalization of techno-econo parameters for developing bankable mithun projects.

Last but not the least, we are promoting semi-intensive mithun rearing as an alternative rearing system. After successful implementation in the Institute's Mithun farm since last two decades, this semi-intensive model is being further extended under field conditions in order to develop the socio-economic condition of Mithun farmer's of this hilly region.

Jai Hind!

(Abhijit Mitra)

RESEARCH HIGHLIGHTS

National mission for sustainable Himalayan ecosystem (NMSHE TF-6)

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

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

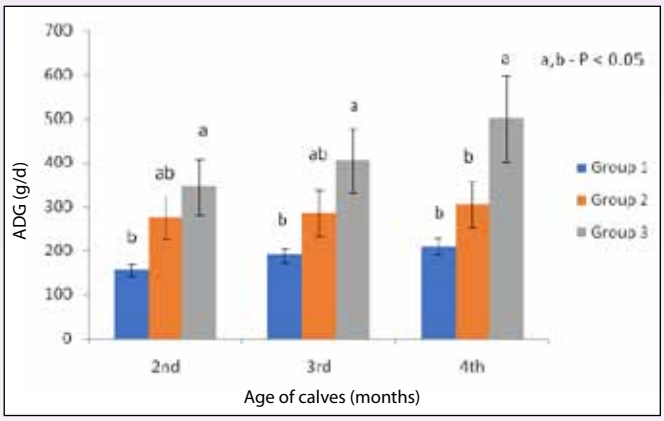
Mithuns on the road-side away from human locality after sunset

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

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

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

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



Trends in Average Daily Gain (ADG) of mithun

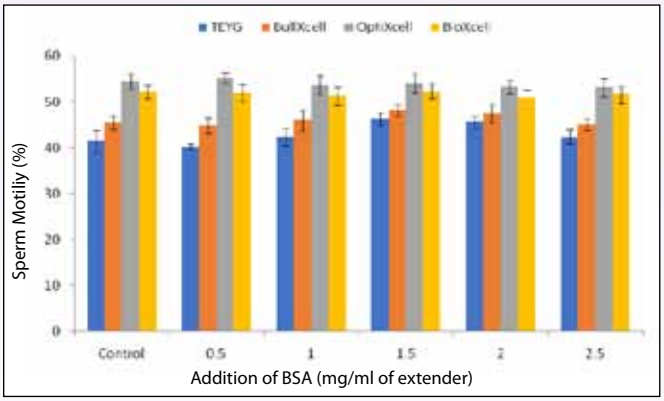
Fatty acid analysis of mithun milk

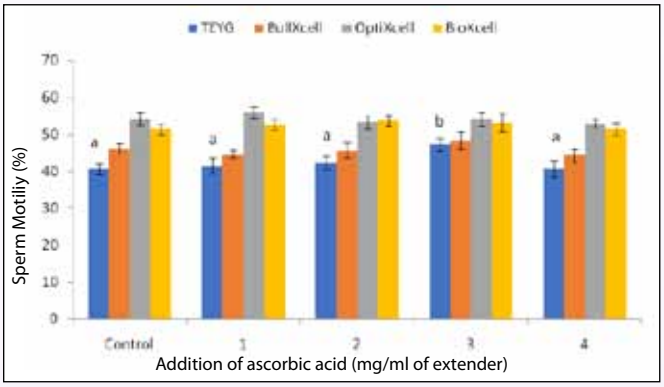
Mithuns milk samples (n=13), were collected during monsoon, post-monsoon, and winter. Milk samples were analyzed using gas chromatography to determine the levels of conjugated linoleic acid (cis-9 trans-11+trans-9 cis-11 CLA) and other fatty acids (C4 to C24 all cis and trans forms).

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

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

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





Addition of BSA and ascorbic acid on post-thaw sperm motility

Estrus synchronization and timed AI in mithun

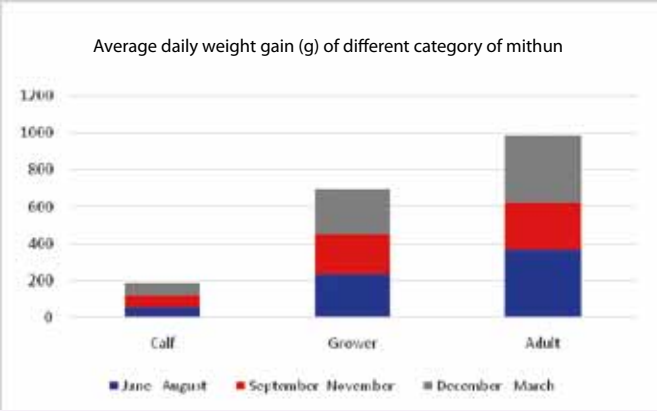
Artificial Insemination (AI) is not only a very efficient technology for rapid genetic improvement but also it helps in reducing the inbreeding. However, due to silent estrus and shy nature of mithun bull, estrus detection in mithun is a major obstacle in the implementation of AI programme in the farm as well as under field condition. In order to address this problem, estrus synchronization with timed AI was initiated. A total of 40 animals were synchronized using Co-synch protocol during the period. Out of them, 33 (82.50%) animals exhibited the estrus signs and were artificially inseminated. Pregnancy was confirmed in 24 (72.72%) animals. During the reporting period, a total of 17 calves were born.

Effect of melatonin on reproductive efficiency of mithun bulls

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

Livestock Production and Management

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



Recording of monthly live body weight of mithun

Carcass characteristics and physicochemical properties of mithun meat

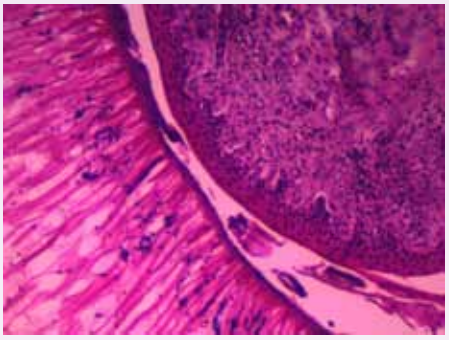
A study was undertaken to analyze the carcass composition and meat quality of mithun (*Bos frontalis*). Dressing percentage of mithun was recorded as 51.65±1.29. Among the edible offals, liver, heart, kidney, spleen consisted of 1.22±0.09, 0.416±0.01, 0.19±0.02, 0.23±0.02% of the live weight, respectively,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

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

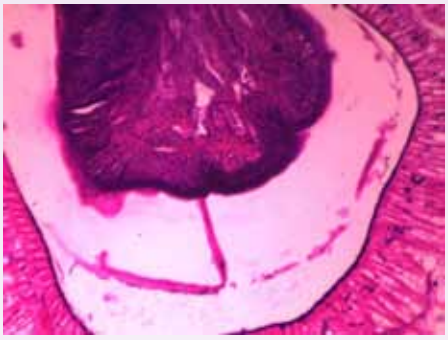
Mithun meat for judging of marbling by visual appraisal

Pathological studies of Amphistome infection in mithun

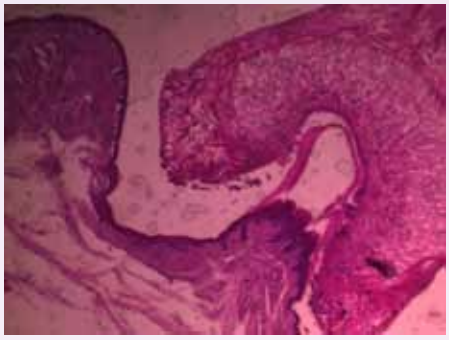
A histopathological study was carried out in order to know pathological alteration in *Amphistome* infected rumen of mithun from Arunachal Pradesh of India. There was marked infiltration of inflammatory cells in the submucosa and excess cornification of stratum corneum of ruminal papillae where fluke attached by oral sucker. There was evidence of diffuse infiltration of macrophages, lymphocytic and eosinophilic cells in the submucosa of the ruminal papilla. Marked replacement of fibrinous fibre was observed with diagnosable erythrocytes and inflammatory cells in the ruminal papillae. The villous atrophy was evidenced with the proliferation of epithelium, hypertrophy of the corneum with mild cellular reactions.



Diffuse infiltration of inflammatory cell in the submucousa of the ruminal papillae



Fibrinous fibre replacement with diagnosable erythrocytes and inflammatory cells



Villus papilla showing atrophy and proliferation of epithelium and hypertrophy of the corneum

INSTITUTIONAL ACTIVITIES

Two-day Visit of Veterinary Officials of Govt. of Mizoram

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

In the afternoon of 3rd July 2017, they visited the Mithun Farm of the Institute and the demonstration unit of semi-intensive mithun farming in the farmers' field at Molvom village. On 4th July 2017, an Interaction Meeting was held. It was informed by the visiting officials that in order to increase the dwindling mithun population in the State the department would launch a Mithun Project of Rs. 3.82 crores under the New Economic Development Policy (NEDP). Under the project, the department would like to establish one intensive Mithun Farm and five ranches, of 500 hectares each, for semi-intensive mithun farming. ICAR-NRC on Mithun would extend the technical expertise for the implementation of the project. As a first step to increase awareness of the scientific mithun rearing in the State, the Dept. of A. H. & Vety, Govt. of Mizoram and ICAR-NRC on Mithun would jointly organize a Stakeholders workshop in Aizawl. Dr. Lalhmingthanga, Deputy Director of Veterinary and Animal Husbandry, Government of Mizoram, while elaborating about the project, informed that the department intended to establish one intensive Mithun Farm and five ranches for semi-intensive mithun farming. The team also visited the semi-intensive mithun farm of the Institute. The Director, ICAR-NRC on Mithun assured all the technical help towards the successful implementation of the initiatives.

Celebrating the Independence Day

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

Distribution of prizes to the children participated in the sports event organized on Independence Day

Visit of 4th QRT

The First meeting of the QRT was held on September 5 to 7th, 2017. The team had detailed discussions with the Scientists in their laboratories on the outcomes of their research programmes and activities. The team also visited the Institute Mithun Farm and Agriculture Farm at Medziphema and inspected the farm resources including fodder storage facilities, farm equipment, irrigation, and other facilities. The Scientists and the Technical Officers provided an overview of the on-farm experimental activities.

QRT Meeting at ICAR-NRC on Mithun

The QRT tam visiting the Institute's Mithun Farm

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

Farmers' Training on Mithun Husbandry

A Farmers Training was conducted on 21 to 22nd September 2017 in the Institute to impart training on scientific mithun husbandry practices to a number of mithun owners from Nagaland, Manipur and Arunachal Pradesh.

Celebrating Hindi Week in the Institute

Hindi Saptah was celebrated from 14 to 20th September 2017 in the Institute. All the staff and children participated in various competitions during this period. The prizes were distributed on the last day of this programme.

Training to Livestock Service Providers on Scientific Rearing of Mithun

A three days training programme for Livestock Service Providers (LSP) of Tuensang and Kiphire districts was conducted by ICAR-NRC on Mithun, Medziphema in collaboration with Northeast Initiative Development Agency (NEIDA), an initiative of TATA Trusts from 11 to 13th October 2017 at NRCM, Medziphema.

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

Organizing Model Training Course

Eight days model training course on "***Small scale dairy development as a means of livelihood improvement in North-Eastern region***" was organized from 24 to 31st October 2017 with an objective to popularize small-scale dairy enterprise to improve the socio-economic status of farmers through livelihood improvement. The training programme was sponsored by Directorate of Extension, Ministry of Agriculture & Farmers' Welfare, Government of India. More than 20 Veterinary Officers and Subject Matter Specialists (SMS), KVK from Arunachal Pradesh, Manipur and Nagaland participated in the training programme.

The Chief Guest, Dr. (Capt) Dhananjaya Rao, Dean, College of Veterinary Science, Jalukie, Paren district, Nagaland, stressed upon the need of utilization of locally available resources and integration of agriculture component along with the dairy farming to make it a viable enterprise.

Vigilance Awareness Week

The Institute observed Vigilance Awareness Week from 30th October to 4th November 2017. The theme of the Vigilance Awareness Week for this year was **"My Vision-Corruption Free India"**. The programme began on 30.10.2017 at 11:00 hrs. Dr. Abhijit Mitra, Director, addressed all the staff members, highlighted the importance of Vigilance Week and also administered a pledge to the staff. He also highlighted the measures taken up by the ICAR as well as the Institute to prevent corruption. Various competitive programmes were organized during the week-long programme like essay writing, drawing competition, and slogan writing for the staff and students. The valedictory programme was organized on 3rd November 2017. Shri Ajen

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

Stakeholders' Workshop on Bankable Mithun Project

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

Constitution Day

All the Staffs of ICAR-NRC on Mithun took the pledge on the occasion of Constitution Day on 27th November 2017.

Interactive Meeting with Veterinary Officials of Manipur

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

A three-member delegation of Department of Vety & AH, Manipur led by Dr. Ng. Ibotombi Singh, Joint Director accompanied by Dr. Arun Kumar Singh and Dr. Bhubaneswar Singh attended the meeting to discuss the possible collaboration and technical backstepping from ICAR-NRC on Mithun for improving mithun husbandry system in order to increase the dwindling mithun population in Manipur.

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

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

EXTENSION ACTIVITIES

A total of 11 programmes were organized during the period of July to December 2017 under TSP. It includes the establishment of semi-intensive mithun rearing models in Gidemi and Medziphema villages and awareness programme for scientific rearing of mithun in Yangkhullen village, Senapati, Manipur.

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

(A) Establishment of Semi-Intensive Mithun Rearing Model

ICAR-NRC on Mithun has developed an alternative package of practices for mithun under semi-intensive rearing system and the same has already been practiced successfully in the Institute Mithun Farm since last two decades.

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

Fencing of the forest and construction of mithun shed

(B) Introduction of Mithun in Non-Mithun Rearing Area

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

(C) Organization of Stakeholders Worksop and Training Programme: Semi-Intensive Mithun Farming in Mizoram

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

The Chief Guest in his address highlighted that all efforts have been taken to provide proper aid to the mithun breeders of the State under the flagship program New Land Use Policy (NLUP) and New Economic Development Policy (NEDP). He also said that the State govt. is committed to giving priority to farmers and entrepreneurs and also that his government will continue to take initiatives to assist farmers in achieving sustainable development. Development would not be possible and Mizoram would not be a pleasant place to live unless farmers and entrepreneurs who are the back bone of the Mizo society are developed. He hoped that the newly launched 'Mithun Production and Development Project' of Rs. 39 crores will address these issues for productivity enhancement and betterment of mithun keepers across the state.

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

Hon'ble Chief Minister of Mizoram, Sri Lalthanhawla and his lady wife inaugurating the Exhibition

Hon'ble Chief Minister of Mizoram, Sri Lalthanhawla addressing the gathering while Dr. Trilochan Mohapatra, Secretary, DARE & DG, ICAR and other dignitaries in the dias.

There are around only 3200 mithuns in Mizoram and looking into the importance of this species, the state has launched Mizoram Mithun Production and Development Project under NEDP wherein the A.H & Vety Dept intends to establish one intensive mithun farm and five semi-intensive mithun ranches at Thenzawl in Mizoram. The potential of mithun as a multi-purpose livestock species as besides meat, mithun can also be explored as a source of milk, hide (leather) and drought purposes in various agricultural purposes as the animal can easily move on the difficult mountainous terrain. He further emphasized the need for a bankable scheme for mithun farming and promoting it as a "nature's gardener".

The Chief Guest inaugurated the stall of ICAR-NRC on Mithun wherein the technologies developed for productivity enhancement of this species along with value added products developed from milk, meat and hide were displayed.

SKILL DEVELOPMENT

Training/Conference/Workshop attended

Sl. No.	Name of Seminar/ Workshop/ Conference/ Training Programme/ Agri-Fair attended	Name of staffs
1	ICAR Foundation day, award ceremony 2017 and Directors' Conference on 16th July 2017 in New Delhi.	Dr. A. Mitra
2	National Seminar on "Smart Farming for Enhancing Input Use Efficiency, Income and Environmental Security" organized by Indian Association of Hill Farming (IAHF) held at ICAR RC for NEH Region Barapani, Meghalaya from 18-21st September, 2017.	Dr. M. H. Khan and Dr. S. Mukherjee
3	Seminar on "10th Northeastern Bioinformatics Network (NEBInet) meeting held on 16th November, 2017 at St Edmund's College, Shillong, Meghalaya	Dr. J. K. Chamuah & Dr. N. Haque
4	National Conference on "Recent Trends in Veterinary Immunology and Biotechnology for Doubling Farmers' Income through Livestock Health Production" as an Invited Speaker for 24th VIBCON, PARBHANI-2017 organized by College of Veterinary and Animal Sciences, Parbhani, Maharashtra, from 5 to 7th December 2017.	Dr. A. Mitra

Presentation in Conference/Symposium/Interface meeting/Other forum

1. Mukherjee S, Longkumar I, Jamir Y, Pongen P, Haque N, Khan M H, Chamuah J K and Mitra A. (2017). Population trend of mithun with corresponding forest coverage and climatic factors in mithun rearing districts of Nagaland. ***In:*** the Compendium of National Seminar on "Smart Farming for Enhancing Input Use Efficiency, Income and Environmental Security", Organised by Indian Association of Hill Farming and ICAR Research Complex for NEH Region, Umiam, Shillong pp 68.
2. Dutta P R, Chamuah J K, Borkotoky D, Dowerah R, Khan M H and Mitra A. (2017). Acaricidal efficacy of certain herbal and chemical ectoparasiticides against *Rhipicephalus microplus* infestation in Mithun (*Bos frontalis*). ***In:*** the Compendium of National Seminar on "Smart Farming for Enhancing Input Use Efficiency, Income and Environmental Security", Organised by Indian Association of Hill Farming and ICAR Research Complex for NEH Region, Umiam, Shillong pp 216.
3. Khan M H, Hazarika S B, Perumal P, Mukherjee S and Mitra A. (2017). Enhancement of reproductive efficiency through estrous synchronization and timed AI in mithun (*Bos frontalis*) cows under semi-intensive system. ***In:*** the Compendium of National Seminar on "Smart Farming for Enhancing Input Use Efficiency, Income and Environmental Security",

organized by Indian Association of Hill Farming and ICAR Research Complex for NEH Region, Umiam, Meghalaya-793103 pp182.

4. Mukherjee S, Longkumar I, Jamir Y, Pongen P, Haque N, Khan M H, Chamuah J K and Mitra A. (2017). Population trend of mithun with corresponding forest coverage and climatic factors in mithun rearing districts of Nagaland. ***In:*** the Compendium of National Seminar on "Smart Farming for Enhancing Input Use Efficiency, Income and Environmental Security", organized by Indian Association of Hill Farming and ICAR Research Complex for NEH Region, Umiam, Meghalaya-793103 pp68.
5. Singh R K and Borkotoky D. (2017). Mithun based farming system an alternative option for doubling farmers' income in North-Eastern Hills". ***In:*** 8th National Seminar on potential, "Prospects and Strategies for Doubling Farmers' Income: Multi-Stakeholder Convergence" Organized by Assam Agricultural University Khanapara, 9–11th November, 2017.

Invited lecture:

- Mukherjee S, Longkumer I, Jamir Y, Haque N, Khan M H, Chamuah JK, and Mitra A. (2017). Population trend of mithun with corresponding forest coverage and climatic factors in mithun rearing districts of Nagaland. ***In:*** National Seminar on "Smart Farming for Enhancing Input Use efficiency, Income and Environmental Security", organized by Indian Association of Hill Farming and ICAR Research Complex for NEH Region, Umiam, Meghalaya-793103, ICAR-ICAR Research Complex for NEH Region, Umiam, Meghalaya, 19-21st September, 2017 .

PUBLICATIONS

Papers in peer reviewed Journal

International

- Singh V, Mishra N, Kalaiyarasu S, Khetan R K, Hemadri D, Singh R K, Rajukumar K, Chamuah J K, Suresh K P, Patil S S and Singh V P. (2017). First report on serological evidence of bovine viral diarrhea virus (BVDV) infection in farmed and free ranging mithuns (*Bos frontalis*). Tropical Animal Health Production. DOI 10.1007/s11250-017-1310-z

National

- Joardar S N, Mukherjee S, Alam S K S and Mukherjee A. (2017). Native leptin protein from mithun (*Bos frontalis*) shows serodiagnostic potentiality. Indian Journal Comp Microbiology Immunol and Infectious Disease 38 (2):11-121
- Bharali R, Bhattacharyya R. K, and Das P. (2017). Bioactive compounds and total antioxidant activity of pummelo (*Citrus grandis* L.) ecotypes of Assam. Bulluetin of Environment Pharmacology Life Science 6(1): 342-347
- Bharali R, Bhattacharyya R. K, and Das, P. (2017). Comparison of fruit quality parameters among white, pink and red pulp pummelos of Assam. Bulluetin of Environment Pharmacology Life Science 6 (1): 26-28
- Bharali R, Bhattacharyya R K, Barua B L.(2017). Morpho-bio chemical studies on pummelos (*Citrus grandis* L.) of Phek district, Nagaland. Progressive Research 12 (1): 1344-1349 .
- Bharali R, Bharali, Liza, Borkotoky D and Singh, R K. (2017). Ethno medicinal plants used in traditional health care by Chakhesang tribe of Phek district. Bulletin of Environment, Pharmacology and Life Sciences 6 (1): 46-49

PERSONALIA

Transfer/Promotion/Joining/Superannuation

- Shri Ajen Lama superannuated on 30th Nov 2017

Honours, Awards and Recognitions

- **Best Oral Presentation Award** to Dr. M. H. Khan on the research work entitled "Enhancement of reproductive efficiency through estrus synchronization and Timed AI in mithun (*Bos frontalis*) under semi-intensive system presented in National Seminar on "Smart Farming for Enhancing Input Use efficiency, Income and Environmental Security (SFEIES), organized by

Indian Association of Hill Farming (IAHF) at ICAR Research Complex for NEH Region, Barapani from 19 – 21st September, 2017.

VISITING DIGNITARIES

- Dr. Saingura Sailo, Director, Dept. of A. H. & Vety, Govt. of Mizoram and Dr. Lalhmingthanga, Deputy Director, Dept. of A. H. & Vety, Govt. of Mizoram visited on 5th July 2017.
- Dr. Vishal Nath, Director, ICAR-NRC on Litchi, Muzaffarpur, Bihar visited NRCM on 5th August 2017.
- Sh. S. N. Pradhan, Joint Secretary, DONER, GoI, New Delhi visited on 19th September 2017.
- Dr. Randhir Singh, ADG (AE), ICAR, New Delhi visited on 21st November 2017.
- Dr. Ng. Ibotombi Singh, Joint Director, Dept of Vety & A. H. Govt. of Manipur, Dr. Arunkumar Singh, Dept of Vety & A. H. Govt of Manipur and Dr. Bhubaneshwar Singh, Dept of Vety & A. H. Govt of Manipur visited on 16th December 2017.
- Prof. Gaya Prasad, Vice-Chancellor, Sardar Vallabhbhai Patel University of Agriculture Technology, Modipuram, Meerut, U.P and Dr. Minakshi, Prof & Head, Animal Biotechnology, LUVAS, Hisar, Haryana visited on 29th December 2017.

KVK-PHEK ACTIVITIES

Krishi Vigyan Kendra-Phek is a grass root level organization engaged in imparting trainings, conducting on farm trials, frontline demonstrations on proven technologies in agriculture and allied sector and organizing various extension activities for the farmers, rural youth and extension personnel of the district.

During the reporting period, 43 numbers of training programmes were conducted under different discipline for farmers benefiting 385 male and 575 female participants with a total of 980 beneficiaries. 12 training programmes were organized for rural youth benefiting 247 participants and 1 training for extension personnel with 16 participants. For skill development, 3 numbers of vocational training programmes were conducted on various aspects i.e. post-harvest management in soybean, vermicomposting technology and insect-pest and disease management in important fruit crops benefiting 32 rural youths.

Under 'Mera Gaon Mera Gaurav' programme, 3 numbers of training programmes on six courses were

Training programme on management of problematic soil

imparted in three villages viz. Thetsumi, Chizami and Phugi benefitting 77 beneficiaries. Two low-cost poly-house were constructed in Phugi village for offseason vegetable production. Under the National Initiative on Climate Resilient Agriculture (NICRA) project at Thipuzumi village, nine numbers of training programme were conducted benifitting 194 practicing farmers. For the dissemination of latest technologies, on-farm trials and frontline demonstrations were conducted in farmers' filed on various crops and livestocks.

OFT on Performance of tomato var. Arka Rakshak under protected condition.

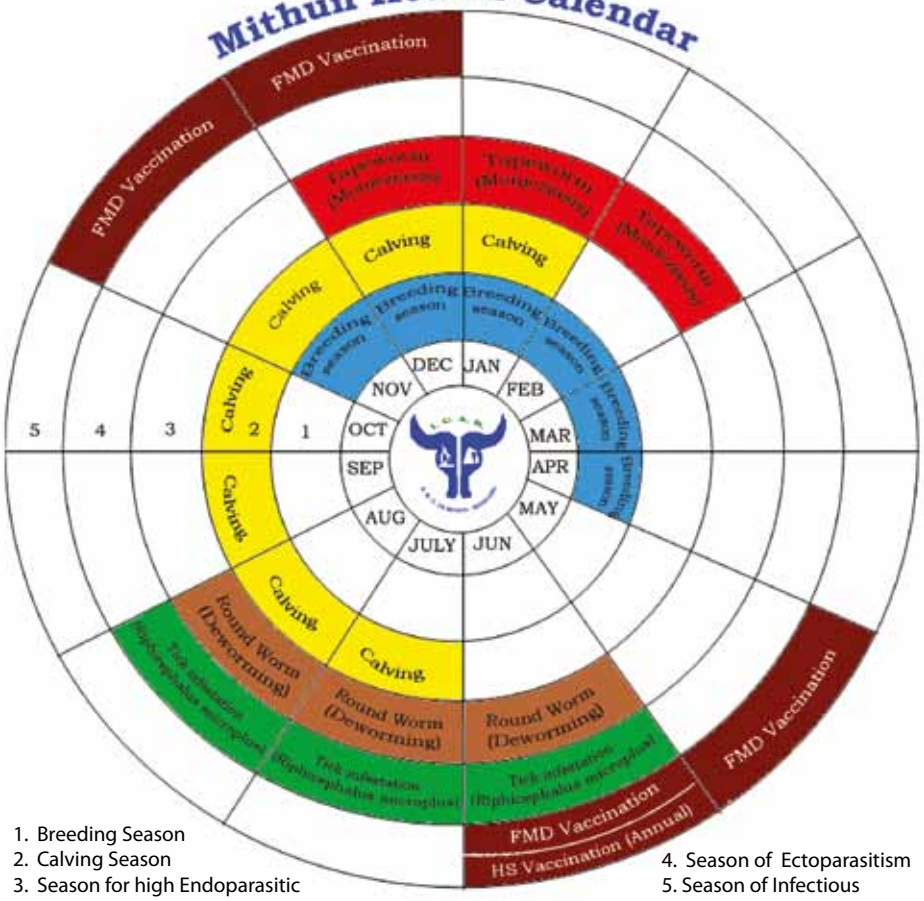
FLD on Low-cost HDPE Vermicomposting at Gidemi village

FLD on Stem borer management in paddy using *Trichogramma japonicum*

FLD on Popularization of dual purpose Srinidhi birds under backyard farming

Various extension activities were conducted during the reporting period. Field days on ten proven technologies were organized for 97 participants. Seven programmes on Swachh Abhiyan were organized with 185 participants; six lectures were delivered to 357 participants. Eight method-demonstrations on different technologies were showcased benefiting 132 farmers. One soil health and two animal health camps were organized in different villages. Important days were celebrated in the Institute i.e. Sankalp Se Siddhi, World Honey Bee Day, World Food Day and 736 persons participated during the programme. 58 numbers of mobile advisory services through SMS was sent to 530 farmers. Altogether 202 numbers of extension activities were conducted for 2468 participants.

Sankalp Se Siddhi programme organized at Porba village



1. Breeding Season
2. Calving Season
3. Season for high Endoparasitic Infestation & Deworming
4. Season of Ectoparasitism
5. Season of Infectious diseases

Semi-intensive Mithun (Bos frontalis) farming : an efficient, sustainable, environment-friendly and profitable venture

MITHUN MEAT MILK MONEY MARRIAGE





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