

# SOUVENIR

## INTERFACE & MITHUN FESTIVAL 2014



राष्ट्रीय मिथुन अनुसंधान केन्द्र

( भारतीय कृषि अनुसंधान परिषद)

झरनापानी, मेड्जीफेमा, नागालैन्ड - 797 106 भारत

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Governor of Nagaland



**RAJ BHAVAN**  
**KOHIMA**



I am happy to learn that the National Research Centre on Mithun (I.C.A.R.) has completed 25 years of its existence.

On this occasion, the Centre is organizing an interface meeting for future development of Mithun on 27<sup>th</sup> March, 2014. Mithun plays an important role in the day to day socio-economic life of our tribal people.

I extend my best wishes to all the members of this organization and wish them success in their mission.

Date January 19, 2014

**(DR. ASHWANI KUMAR)**



कृषि एवं खाद्य प्रसंस्करण उद्योग मन्त्री  
भारत सरकार

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I am glad to know that the National Research Centre on Mithun, Medziphema, Nagaland is organizing Interface Meeting and Mithun Festival on 27<sup>th</sup> – 28<sup>th</sup> March, 2014 at Jharnapani and Porba campus of Institute to venerate the completion of 25 years of founding which will be attended by scientist of repute working in Mithun rearing areas as well as various other Institutions. Mithun is a rare bovine species and has significant socio-economic association with tribal population of NEH region. Since inception, the Institute has done commendable job for welfare of Mithun (*Bos frontalis*) and its rearers. The various farmers friendly technologies generated and disseminated by the NRC on Mithun has significantly improved the rearing practices and thereby improving the economic conditions of farmers. The interface meeting and Mithun Festival which will be attended by scientific community, policy makers, state administrator and farmers will certainly help in devising future strategies for improving the package of practices and will also help to identify the gaps in Mithun farming for future refinement. It is an ideal platform being extended by NRC on Mithun to scientific community from all parts of country and various Institutions to allocate their inputs on conservation, breeding, health management and propagation of this magnificent animal of North-East.

I congratulate the NRC on Mithun for completion of twenty five years and appreciate the initiative taken by the Institute for organizing Interface Meeting and Mithun Festival and wish this programme a great success.

Dated: March 06, 2014

(SHARAD PAWAR)

तारिक अनवर  
طارق انور  
TARIQ ANWAR



राज्य मंत्री  
कृषि एवं खाद्य प्रसंस्करण उद्योग  
भारत सरकार  
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It is a matter of great pleasure to know that NRC on Mithun has completed 25 years and is organizing Interface Meeting and Mithun Festival on 27<sup>th</sup> – 28<sup>th</sup> March, 2014 at Jharnapani and Porba Campus, Nagaland. Mithun being a socio-cultural emblem of Mithun rearing states, it has got clear link with agricultural practices, environment, ecology and overall economy of NEH region. The NRC on Mithun is the only Institution fully dedicated for conservation, breeding, propagation and health care of Mithun in our country. As Mithun lives in jungles there was less information available regarding various aspects of Mithun Husbandry. However, due to incessant efforts made by scientists of NRC on Mithun, substantial information generated and improved techniques have been successfully developed and transferred to the farmers for their better economic return from meat, milk and hide of Mithun. This platform where scientists, policymakers, state animal husbandry officials and farmers will sit together for discussing the various aspects of Mithun Husbandry will definitely help the NRC on Mithun to go a long way in deciding the future course of action.

I extend my sincere congratulation to whole staff of NRC on Mithun for completing 25 years and wish this programme a grand success.

(TARIQ ANWAR)

Dated: March 04, 2014

**PARLIAMENTARY SECRETARY**

Veterinary &amp; Animal Husbandry

Nagaland : Kohima



I am happy to learn that the I.C.A.R. is conducting the interface meeting and Mithun Festival in Nagaland, on 27<sup>th</sup> and 28<sup>th</sup> March, 2014 at Porba Village, Phek, Nagaland.

The Mithun which was domesticated and rear by the Nagas since time emomaryl has been reduce to near extinction. It was in the year 1989 with the establishment of National Research Centre of Mithun I.C.A.R. Jharnapani, Medziphema, Nagaland, the revival of rearing Mithun boost the economy of the rural areas has once again strongly favoured by progressive farmers. The initiative of the I.C.A.R. is commendable and the fact that many rural Villages preferring to go for Mithun rearing instead of jhumming cultivation has directly or indirectly addressed the issue of global warming. The imparting of knowledge on the farmers through the scientific approach and conserving in rearing Mithun is bound to go in a big way particularly in the remote and rural areas of the state and I am very optimistic of the various programme of the I.C.A.R. in developing Mithun into a sustainable farming for all times to come.

I wish the interface meeting of various state holders and the Mithun festival to commemorate 25<sup>th</sup> years, a grand success.

Date 21/01/14

**(YITACHU)**



**डा. एस. अय्यप्पन**  
सचिव एवं महानिदेशक

**Dr. S. AYYAPPAN**  
SECRETARY & DIRECTOR GENERAL

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It gives me immense pleasure to know that the National Research Centre on Mithun has completed 25 years and is organizing Interface Meeting and Mithun Festival on this occasion during 27-28 March, 2014 at Jharnapani and Porba Campus, Nagaland.

Mithun is traditionally reared under forest ecosystem and geographically contained in Arunachal Pradesh, Nagaland, Manipur and Mizoram by tribal populations of these states. As the population growth of this animal is not very high due to problem of inbreeding, cross breeding with cattle and habitat destruction due to local agricultural practices ('Jhum' cultivation), therefore, this animal deserves special attention for the conservation, breeding and propagation. I am happy that NRC on Mithun is playing key role in conservation, breeding and health management of Mithun. The scientists of NRC on Mithun in the past 25 years has generated information in all aspects of Mithun production and developed many farmers' friendly technologies which have greatly helped the Mithun owners to make the Mithun husbandry a successful and economic venture.

I am sure, the Interface meeting and Mithun festival organized by NRC on Mithun will definitely help in refining the research priorities with inputs from scientist of various institutions, policy makers, state officials and Mithun farmers.

I wish the Mithun Festival a grand success.

Dated the 3rd March, 2014  
New Delhi

(S. Ayyappan)

**ASSAM AGRICULTURAL UNIVERSITY  
JORHAT – 785 013  
ASSAM (INDIA)**

**DR. K.M. BUJARBARUAH.  
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It is a matter of great pleasure to learn that NRC-Mithun is holding a three corner event covering Mithun Festival, an Interface meeting and inauguration of its KVK at Phek, Nagaland from March 27-28, 2014. One always feels happy when an Institution nurtured by him moves through transformational phases from good to great.

Over the years since I left, NRC-Mithun has progressed well in terms of scientific output and reaching the same to the unreached. My compliments to the entire team of workers and its Director, Dr. C. Rajkhowa for leading the Institute on a growth path. The KVK which I facilitated is an added advantage to embrace Mithun centric integrated farming model and Mithun Plus animal husbandry option.

My best wishes for successful completion of the three events.

Dated the 10th March, 2014

A handwritten signature in blue ink, consisting of a stylized 'K' and 'M' followed by a long horizontal stroke.

**(K.M. Bujarbaruah)**



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उपमहानिदेशक ( पशु विज्ञान )

**Prof. K. M. L. Pathak**  
**Deputy Director General**  
(Animal Science)



It gives me immense pleasure to learn that on the occasion of the Silver Jubilee Celebrations of NRC on Mithun, the Institute is organizing an Interface meeting for evolving strategies for future development of Mithun husbandry on March 27, 2014 which will be followed by a Mithun Festival at Porba, Phek, Nagaland on March 28, 2014.

It is a fact that Mithun is an animal of great importance to the people of North Eastern Hill Region which is its home tract. The animal has considerable potential for meat and milk under the special climatic and topographic conditions of the region and is intricately associated with the socio-economic, religious and cultural lives of the tribal people of these States. However, due to various biotic and abiotic factors viz. de-forestation, disease outbreak, inbreeding and shifting cultivation, the population of this animal is dwindling which is indeed a matter of serious concern.

I understand that a large numbers of scientists, state government officials and progressive farmers will be attending the interface meeting. I am confident that the deliberations of the interface will consider to evolve a road map for issues related to making Mithun farming profitable as well as enhancing its population in the region.

I wish the organizers all success for the interface meeting and silver jubilee celebrations.

Place : New Delhi

Dated the 3rd January, 2014

A handwritten signature in blue ink that reads "K. M. L. Pathak".

(K. M. L. Pathak)

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KRISHI ANUSANDHAN BHAWAN-I, PUSA, NEW DELHI-110 012Dr. K. D. Kokate  
DEPUTY DIRECTOR GENERAL  
(Agricultural Extension)

I am happy to know that National Research Centre on Mithun has completed 25 years of its existence. On this occasion, the institute is organizing Interface meeting and Mithun festival on 27<sup>th</sup>-28<sup>th</sup> of March 2014 in Medziphema and Porba Campus. During the last 25 years, it is learnt that the institute has developed many technologies in regard to Mithun husbandry and has successfully disseminated to the mithun farmers and thereby helped them to uplift their economy through mithun rearing.

I hope the Interface meeting which will be attended by Scientists, State Govt. Officials, farmers as well as policy makers will be able to draw a plan for future strategies for overall development of mithun husbandry in North Eastern Hill Region by fine tuning various research and extension programme. The Mithun festival at Porba on 28<sup>th</sup> of March 2014 will definitely help the farming community to showcase their valuable stock of this magnificent rare species of animal exclusively found in NEH region and will also be able to interact with scientific community for addressing various issues faced by them.

I congratulate the institute for organizing such events on this occasion of completion of 25 years and wish them a grand success.

(K. D. Kokate)

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**Dr. S.N.Puri, FNAAS**

Vice-Chancellor



It is indeed a matter of great pleasure to learn that an interface meeting for evolving strategies for future development of Mithun Husbandry is being organized by National Research Centre on Mithun, Nagaland on 27<sup>th</sup> March, 2014.

Even though North East Hills are the natural habitat of Mithun, they are mostly confined in some selected pockets of this region. A sustainable and financially viable Mithun family, which will generate wealth and self employment through entrepreneurship, is the need of the day. Mithun being the endemic species, which demands the timely care and attention at all levels. Over the years, the uses of Mithuns are more of commercial than cultural purposes. Hence, there is an urgent need to conserve this rare animal through appropriate conservation programmes at all levels. The need of the hour is to inculcate the Mithun rearers with suitable package of practices or scientific innovation to exploit its inbuilt potentials of milk, meat and work power in the hilly states of North East India.

I am sure that the Souvenir being published on the occasion of the interface meeting will serve as a valuable reference document particularly to Mithun rearers.

I wish the meeting a grand success.

**(S.N. Puri)**

Imphal, the 16th January, 2014.

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## The saga of my 25 years of journey – an Autobiography

*Sabyasachi Mukherjee, Anupama Mukherjee, Nazrul Haque, Kishore Baruah, Jayanta Chamuah, Perumal P., Akhilesh Kumar and Chandan Rajkhowa*

I have turned 25 this year and the first thing that comes to my mind, looking beyond the last 25 year is that of a saga of determination and perseverance of few determined lot to work under all odds to initiate a great start, to work together to develop an entity into world class – they were a tiny lot who started a great initiation, did put their contribution and then completed their journey to allow few others to take up their cause to move further. I see them all and not forgot anything – they braved difficult terrains, missing communication channels, lesser man-power and limited resources, but compensated with matchless enthusiasm and energy to turn into a potent force. I also did not forgot the day when Dr. R. M. Achchrya, the then DDG (AS) faxed a small demi-official to give the go-ahead of a new beginning. I also did not forget all those assistance and benevolence of our great visionaries, particularly Dr. M. S. Swaminathan, our visionary former Director General for his pragmatic decision and love and care of our fellow tribal villagers – simple, ordinary, yet omnipresent fellow travelers of this great journey.

I still remember my birth in the Porba village – the remotest location to a tiny shade in an obscure location of Medziphema - my first seat to my present location in Jharnapani today and see how a modest journey developed into a great leap of progress, prosperity and of course, discovering new information of a species so far unknown to the world. Their biology, genetics, physiology, their feeding habits, morphology, their unique behaviours, their status, their tryst with nature – I could see the excitement of fellow travelers – the scientists, the technical staffs, research fellows coming from all walks of life all devoted to their great cause into actions.

I could explore a unique species of livestock with in-depth studies. Let me discuss the progress in scientific research in various fields of animal genetics, nutrition, physiology, health and livestock management somewhat in details to show case those wonderful efforts put by untiring scientists in the path of their brief sojourn.

### **DNA Investigation in Mithun with RAPD markers and breeding experiment**

Initially, genetic studies of Mithun was take up using RAPD markers and utilized for estimating intergenetic diversity during 2000-02. A total of 19 random primers, were screened against all four genetic groups of Mithun. Most of the primers (17 out of 19 primers) detected polymorphism between the genetic groups of Mithun. The average number of bands per primer ranged from 8.1 to 9.3 in different genetic groups. The result also revealed that different genetic groups of Mithun differed genetically. Arunachalee mithuns showed higher genetic differences with other genetic groups in general and with Mizoram genetic group in particular in comparison to other genetic groups. The results are suggestive of genotypic differences among the strains.

At the almost same time, a systematic breeding programme within the strains of Mithun was initiated since the year 2000 and data on some the productive and reproductive traits were recorded. Among the four Mithun strains, Arunachalee strain

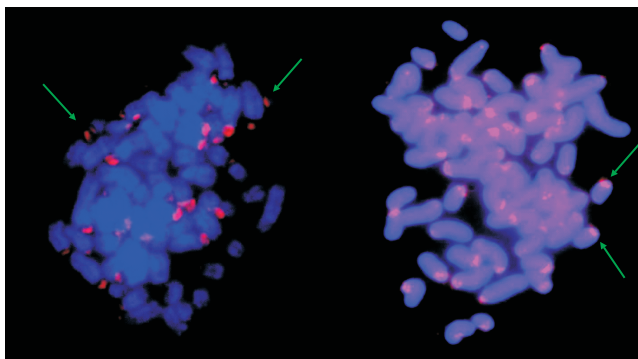
was observed to have comparatively better performance record especially in terms of growth parameters, while calving interval was lowest in Mizoram strain (349 days). The observations lead to suggest that the Arunachalee and Nagaland strains of Mithun could be explored for the purpose of meat production and the Mizoram strain for both meat and milk production as it has excelled other three strains in terms of milk yield and calving interval.

#### Measurement of Genetics Relation of Mithun at DNA level with different livestock species using RAPD and MASA Markers

A total of 21 random primers were screened against five livestock species. The RAPD profiles generated by the polymorphic primers among various livestock species were utilized for estimating the inter-population diversity. The estimates of genetic distance between the livestock species ranged from 0.58 to 1.90. The results revealed maximum genetic similarities between sheep and goat (0.56), while cattle and sheep (0.15) showed least genetic similarity. Mithun showed maximum genetic similarities with buffalo (0.45) followed by cattle (0.41) and sheep (0.32). Least genetic similarity of Mithun was observed with goat (0.25).

Three MASA primers were also screened against five livestock species. Out of them, two primers (OAT 18.2 and O33.15) produced highly reproducible amplification. The value of bands sharing between livestock species, pooled over primers ranged from 0.35 to 0.72. The genetic distances, estimates as  $-1/n$  (BS) and pooled over the primers ranged from 0.31 to 1.04. The results revealed maximum genetic similarity between sheep and goat (0.72), while goat and mithun showed least genetic similarities (0.35). Mithun had almost same genetic similarity with cattle (0.66) and buffalo (0.63).

#### Genetic characterization of mithuns – Cytogenetics, Microsatellites



*Mithun metaphase chromosome showing centromeric signals with rhodamine as a fluochrome in bovine probe*

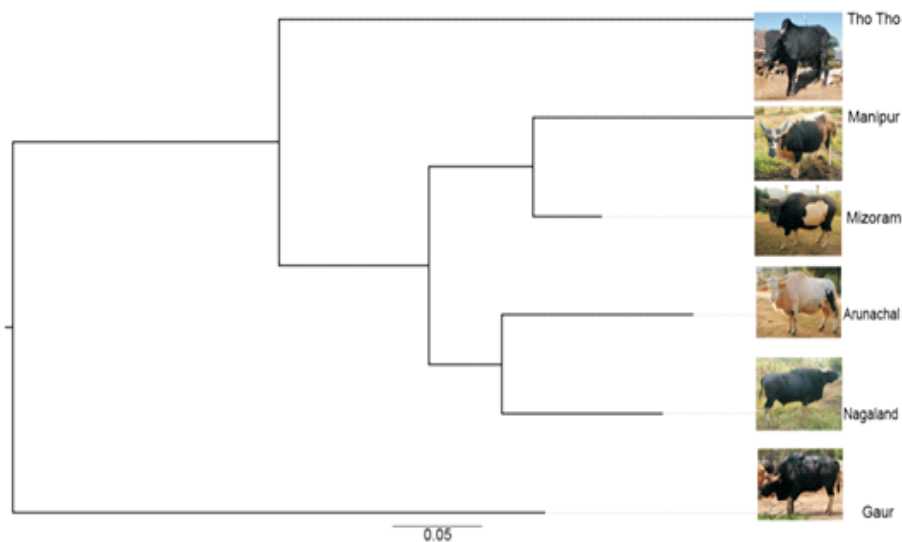
The chromosome number in Mithun was found to be 58 ( $2n=58$ ), which include 28 pairs of autosomes and one pair of sex chromosomes. This result was in agreement with the earlier reports on chromosome number of the mithun (Winter *et al.* 1984, Gupta *et al.* 1995). The

normal karyotype of mithun shows, the first pair of autosome is the largest submetacentric chromosome and the rest autosome were acrocentric. Among the sex chromosome the X-chromosome was submetacentric and Y-chromosome was the smallest metacentric chromosome like *Bos taurus*. Cytogenetic analysis was carried out for both male and female mithun based on the morphometric measurement. In our present study, various parameters such as relative length, range, centromeric index, arm ratio and morphological index were generated.



The band pattern of chromosomes were also studied by conventional G-, R- and C-banding technique. The karyotype generated based on these band patterns was first report in mithun. The R- banding confirmed that the X chromosome is the second largest submetacentric chromosomes', whereas the largest is the first pair of autosome. The C- banding highlighted the centromere position in the metaphase chromosome.

Cattle microsatellite markers were utilized for analysis genetic diversity of mithuns, gaur and tho tho cattle and 19 (63%) microsatellite markers successfully amplified the genomic DNA of mithun and wild gaur; where 15 (79%) of these loci were highly polymorphic in mithun and gaur, respectively with Polymorphic Information Content (PIC) greater than 0.50. Phylogenetic tree was prepared to show the genetic status of four mithun strains with wild gaur and Tho tho cattle:



### Animal Nutrition

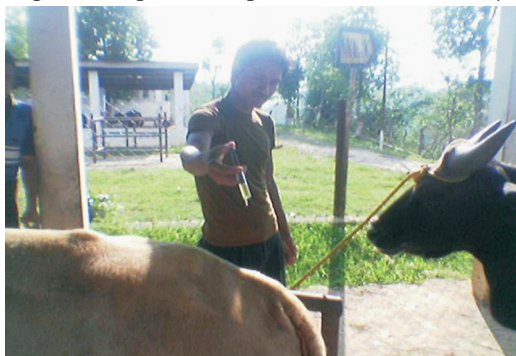
A total of 260 different forest based foliagees were collected from different pockets of mithuns rearing states Nagaland, Arunachal Pradesh, Manipur and Mizoram and they were botanically identified, chemically evaluated and nutritional parameters estimated as source of nutritious feed for mithuns. All the fodder samples were evaluated for nutritional quality and suitable propagation techniques were standardized for the important fodder trees. Voluntary feed intake and nutrient utilization on feeding locally available tree leaves based total mixed ration were investigated. Comparative nutritional evaluation of different tree lopping and concentrate based total mixed ration was done. Effect of different fodder and concentrate based total mixed rations on nutrient utilization and growth performances in calves were evaluated. In sacco degradability of forest based foliagees available in Nagaland was studied. Effect of feeding tree leaves based total mixed ration on nutrient utilization, growth performances and rumen fermentation patterns

was investigated. Nutrient utilization and nitrogen balance in adult animal fed on urea treated rice straw and concentrate based feed blocks was carried out. Important digestive enzymes in rumen fluid were estimated. The contents of different macro and micro-minerals in important locally available fodders were estimated.

Scarcity of fodders is a general scenario in the NEH region during winter season. However, during rainy season availability of naturally grown fodders is abundant and also underutilized. Underutilization of fodder during rainy season is due to its abundance as well as non-existence of preservation practices in this region. Besides silage making, the Institute has developed innovative drying method of fodders especially the thick stemmed ones which are very difficult to dry during rainy season. Processing of high moisture content thick stemmed fodders mixing with low moisture content paddy straw reduces duration of drying time by 33.33% and transforms it good ingredients for preparation of feed blocks.

### Animal Physiology and Reproduction

The progress in Animal Physiology over the years is immense. Oestrus synchronization protocols for mithun have been developed using single and double injection of prostaglandin F<sub>2α</sub>, Co-synch protocol (GnRH- prostaglandin F<sub>2α</sub> combination), OvSynch protocol (GnRH- prostaglandin F<sub>2α</sub>-GnRH), controlled intra-vaginal drug releasing device (CIDR), OvSynch + CIDR and Heat Sync (using



oestradiol cypionate; ECP). Ovsynch protocol of oestrus synchronization is observed to be very much effective for heifers, anoestrous and cyclic mithun cows to synchronize heat and fixed time insemination. CIDR and OvSynch + CIDR protocols are found to be effective in post-partum anoestrous mithun cows. Co-Synch and double injection of prostaglandin F<sub>2α</sub> protocols are effective in cyclic cows to synchronize oestrus. Heat Sync protocol of oestrus synchronization made it possible the mithun cows to manifest behavioural signs of oestrus very prominently and found to be the best method for oestrus synchronization in mithun.

*Use of urine of estrus cows for collection of semen using non-estrus cows as dummies*

- Standardisation of Innovative method of semen collection in Mithun. Urine collected from oestrus mithun, sprinkled over the perineal region of anoestrous female mithun, is observed to attract the mithun bull to mount. It has been used as a tool for collection of semen using artificial vagina (AV) method.
- Methods have been standardized for preservation of mithun semen at refrigeration temperature using tris-egg yolk diluents. Cryopreservation of semen has also been standardized using tris-egg yolk diluent and citrate-egg yolk diluent with graded levels of glycerol. Seasonal variation in quality of semen has studied.
- Artificial insemination protocol has been standardized and successfully used in the farm and field condition. In 2010 the first mithun calf was born in field condition (Khunoma village) through AI.
- Superovulation protocol was standardized in mithun by using FSH. Protocol standardized for superovulation and embryo transfer resulted in the birth of MOHAN, the first mithun calf born through embryo transfer technology (ETT) from cryopreserved embryo at the institute on May 12, 2012. The embryo was preserved in liquid nitrogen (-196°C) for 100 days. This is the third successive birth of mithun calf using embryo transfer technique. The first calf named as BHARAT was born in March 27, 2012 and the second calf (PRITHVI), which was born on May 11, 2012, could survive only for two days due to premature delivery.
- The problem of calf mortality due to weak mother-neonate bonding/attachment (called mismothering behaviour) has been addressed with encouraging results by intranasal spray of oxytocin that can induce mother-neonate bonding/attachment in mithun and it is also acclaimed to be the 'world-first' report.
- Antimicrobial effect of Mithun Lactoferrin (mLF) has been determined on different pathogenic bacteria. Mithun lactoferrin could inhibit the growth of *S. aureus* and *E. coli* by 53% and 28% respectively and was observed to be comparable to Ampicillin and Kannamycin.
- Draught capabilities of mithun bull have been evaluated. Preliminary investigation indicates that the average draught power of mithun is 0.60 KW.



*AI Calf born at Khunoma village*



*World's first ETT born mithun calf from 100 days cryopreserved embryo*



*First mithun calf, Bharat born through ETT*



*The harness fabricated for mithun bulls for pulling load/cart*



*Mithun bulls are pulling load on earthen path*

### Livestock Production and Management

Biochemical properties of mithun rumen fluid were studied. Total and differential counts of mithun rumen ciliates were established and fourteen different species of rumen ciliates were identified. Changes in milk production and different milk constituents during the different lactation stages were established. Levels of different macro and micro-elements in mithun plasma and locally available fodders were estimated, Absorption efficiency of colostral immunoglobulins in neonatal mithun calves was investigated. Profiles of different immunoglobulins in serum during first three months of age in mithun calves were established. Endocrine control of natural estrous cycle and estrous behavior was established. Methods for preserving mithun semen at 4°C and ultra-low temperature (-196°C in liquid nitrogen) were developed. Artificial insemination (AI) technique using cryopreserved semen was standardized and birth of the AI mithun calves could be achieved for the first time in our country during 2006.

### Animal Health

Mithuns reared under intensive system of rearing were surveyed, sampled for IBR, TB and brucellosis using ELISA and virus neutralization test. Antibiotic sensitivity pattern of clinically important bacteria isolated from mithun calves has been established. Various serogroups of *E. coli* have been isolated from different types of samples of mithun calves. Virulent genes have been detected from *E. coli* (isolated from diarrhoeic faecal samples as well as cases of fibrinous pericarditis) through polymerase chain reaction (PCR). A total of 650 animals have been surveyed in eight villages in Nagaland and Mizoram and about 250 serum/blood samples were collected from mithuns reared under free range condition for sero-monitoring of different diseases. 150 mithuns reared under intensive system of rearing were surveyed, sampled and screened for various diseases of bovine. Bacterial flora of the lower reproductive tract of mithuns was studied and 16 different bacteria were isolated by culture and were studied for their antibioticogram.

Screening of faecal sample of mithun from free-range and farm condition revealed

*Trichostrongylus sp.*, *Haemonchus contortus*, *Oesophagostomum sp.* *Trichostrongylus sp.*, *Moniezia expansa*, *M. benedeni*, *Cooperia sp.* and *Trichuris sp.* The species of *Toxocara vitulorum*, *Strongyloides papillosus* and *Bunostomum phlebotomum* and *Haemonchus contortus* were the major parasites causing anaemia and mortality. Herbal and chemical drugs have been identified. Standardization of dose of these formulations has been done for the prevention and treatment of GI parasites as well as tick infestation.

Genetic characterization of *Fasciola gigantica* was done based on two nuclear spacer sequences (ITS-1 & ITS-2), mitochondrial gene (NadH1) and ribosomal genes 18S and 28S. Likewise, molecular identification of *Mecistocirrus digitatus* was carried out based on two marker genes namely of beta tubulin gene iso type 1 and internal transcribed spacer 2 .

I am still young and in the process of developing new technology – for the benefits of those who most needed them – the unique creatures called mithuns and their owners to make their lives comfortable, to bring some sort of economy, a sense of furthering their otherwise mundane existence. In this process, the list of patent applications filed so far are -

#### List of patent application (complete specification) filed

Sl No.	Application. Nos	Filing date	Title
1	1402/Kol/2012	13.12.2012	A method for bio-preservation of mithun hides
2	1334/ Kol /2012	20.11.2012	A method for processing rabbit pelts and fur
3	1277/ Kol /2012	07.11.2012	An energy efficient post tanning process for mithun hides
4	1276/ Kol /2012	07.11.2012	A novel method of chrome tannage of mithun hides with glyoxalic acid
5	1197/ Kol /2012	17.10.2012	An improved method for chrome tanning mithun hides
6	360/ Kol /2012	30.03.2012	A process of making leather without any large machinery
7	183/ Kol /2013	18.02.2013	A method of removal of chromium from chrome liquor obtained after processing of mithun hides
8	192/ Kol /2013	19.02.2013	A method of processing rabbit fur on leather

#### B. Details of trademarks licensed out

1.	10/01/2012	2264166	National Research Centre on Mithun, Nagaland	μLEDER (Class 18) Leather product Jacket, Shoes, Wallet, Hand Bags, Suitcase, Belt and Key Ring included in class 18	National Research Centre on Mithun, Nagaland	Pending	Provisional
2.	13/01/2012	2265996	National Research Centre on Mithun, Nagaland	μthimin (Class 5) Mineral Mixer under class 5	National Research Centre on Mithun Nagaland	Pending	Provisional

3.	17/01/2012	2267656	National Research Centre on Mithun, Nagaland	meef (Class 29) Meat of Mithun	National Research Centre on Mithun, Nagaland	Pending	Provisional
4.	17/01/2012	2267657	National Research Centre on Mithun, Nagaland	µlk ( Class 29) Lassi, Barfi, Rasgulla, Paneer	National Research Centre on Mithun, Nagaland	Pending	Provisional
5.	25/01/2012	2272255	National Research Centre on Mithun, Nagaland	µyum (Class 29) Meat Patties, Smoke meat, Meat Sauces, Meat Block, Seasoned dried mithun meat	National Research Centre on Mithun, Nagaland	Pending	Provisional

### C. Technologies ready for commercialization

#### Area-specific Mineral Mixture of Mithun



In an analytical study of mineral content of fodder, tree leaves showed that the levels of calcium, magnesium and iron contents were higher whereas, concentration of phosphorous, copper and zinc were found to be lower than the standard levels. Based on this study, an area specific mineral mixture has been formulated. Field study reveals enhancement of growth and reproductive performance in Mithun.

#### Low-cost high-nutritious feed block for Mithun

Scarcity of fodders is a general scenario in the NEH region during winter season. However, during rainy season availability of naturally grown fodders is abundant and also underutilized. Underutilization of fodder during rainy season is due to its abundance as well as non-existence of preservation practices in this region. Besides silage making, the Institute has developed innovative drying method of fodders especially the thick stemmed ones which are very difficult to dry during rainy season. Processing of high moisture content thick stemmed fodders mixing with low moisture content paddy straw reduces duration of drying time by 33.33% and transforms it good ingredients for preparation of feed blocks.

The feed blocks were made from locally available feed ingredients. Tree leaves, straw and concentrate feeds were mixed together and pressed by using feed block making machine. Similarly, feed blocks were also made from paddy straw and spent grains (a breweries industry by-product) with high moisture content (75-80%). Simultaneously, methods have also been developed for drying high moisture content by products (spent grain) more efficiently during rainy season. Performance of Mithun was found to be good with average daily growth (ADG) of 500 gm in tree leaves based feed blocks and 553.6 g from spent grain based feed blocks as against ADG of 396.2 g in control feeding.



*Feed block machine with feed mixer*



*Preparation of feed block and a Mithun feeding on a feed block prepared at Institute.*

In the course, I wonder if you still thinking about my identity or guessing who am I? And I think you could guess it right, yes, myself National Research Centre on Mithun – the only specialized research Institute in mithun whom all of you fondly nick-named NRCM ! I am, myself a traveler yet writing my own travelogue; I am having a tribal entity yet harbouring all those who are willing to be a part of this great journey and keeping with fond memories who once played with great gusto on my soil and then make way for others. Generations passed this way and I am sure I will be great witness to astounding future. I care, I keep and I assimilate past into present and transform present hopes into future reality. I have seen them all and come a long way during last 25 years. I am like the great river of Tennyson – Man may come and man may go, but I go on for ever ! Or should I say, I go on for your own and unique mithuns in this mithuns country? Times will only prove my prediction.

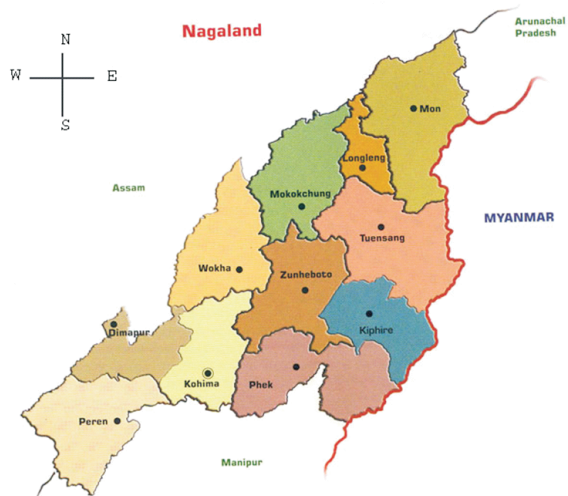
## Nagaland – magnificent with all its natural beauties and Traditional Knowledge

*Sabyasachi Mukherjee, Anupama Mukherjee, Kobu Khate and Kezhavituo Vuprü*

### Introduction

Knowledge, as it is said have always been generated by Human communities, refined in course of time and passed on from generation to generation as “Traditional System” and part of culture of the tribes. Such “traditional knowledge” is often an important part of their cultural identities. This traditional knowledge has helped them to prepare various products, which, in part has played, and still plays, a vital role in the daily lives of the vast majority of people. Traditional products manifest various food items, items of daily use and daily core of life of these people.

The Northeastern India, with various ethnic groups, offers an excellent opportunity for anthropological and cultural studies. Food habits which are distinct for each of these ethnic groups are unique and forms good study materials. The Nagas are one of the Mongolian racial groups making up the population of North East India hill states. The people called, Naga lie in the present state of Nagaland, in the hills of Manipur, in North Cachar and Mikir hills, Lakhimpur, Sibsagar and Nowgong in Assam, in the two districts (Changlan and Tirap) of Arunachal Pradesh, in the Somrat tract and across the border into Myanmar. The Naga tribes consist of 31 different tribes, viz *Angami, Chakhesang, Ao, Sema, Rengma, Lotha, Chang, Konyak, Sangtam, Phom, Zeliang, Mao, Maram, Tangkhul, Maring, Anal, Mayao-Monsang, Lamkang, Nockte, Haimi, Htangun, Ranpan, Kolyo, Kenyu, Kacha, Yachimi, Kabui, Uchongpok, Makaoro, Jeru, and Somra*. However, it is believed that there are 16 major Naga tribes (*Angami, Ao, Chakhesang, Chang, Khiamniungan, Kuki, Konyak, Lotha, Phom, Pochury, Rengma, Sumi, Sangtam, Sema, Yimchungru, Zeliang*) living in present day Nagaland states, one in approximately each district while Kohima being the capital and Dimapur the centre for commerce are cosmopolitan in nature with almost all types of Naga tribes living there.



*Present day Nagaland with 11 districts*



The Nagas are basically cultivators. They grow rice crop, which is their staple food. They also grow maize, millet and fruits such as pears, plums, oranges, lemon, pineapple, passion fruit, etc. on the hills by clearing the forest patches.

Naga people, who are the habitants of present day Nagaland in the North Eastern fringe of our country has developed a number of such traditional products since time immemorial. Such traditional knowledge is a long standing tradition of Naga people. They inherit this knowledge, innovation and teaching from their ancestors, and pass on it on from generation to generation.

However, with the globalization and development of modern technologies which is more technology invasive and economics based market oriented; these age-old traditional products are on the decline. Hence, this is the right time to document these traditional knowledge and products, create awareness regarding their usefulness and to register them so that the benefit of these traditional products reached to the rightful owners.

### Geography of Nagaland

The State of Nagaland, with a total geographical area of 16579 sq. km is the 16<sup>th</sup> state of the Indian Union was born on 1<sup>st</sup> Dec 1963 and ranked 25<sup>th</sup> in terms of its area. It is bounded by Assam in the west and north Tirap district of Arunachal Pradesh in the north east, and Manipur in the south. On the east it shares India's international boundary with Myanmar (erstwhile Burma). The state is divided into eleven districts: Kohima, Phek, Mokokchung, Wokha, Zunheboto, Twensang, Mon, Dimapur, Peren, Kiphre, Longleng. The terrain is hilly, rugged and mountainous. The highest peak is Saramati in the Twensang district which is 3840 metres above sea-level. The average height of the other peaks is between 900 and 1200 metres.



*Rice cultivation in Khonoma, an Angami region*

The main rivers that flow through the state are Dhansiri, Doyang, Dikhu, Tizu and Melak. The state of Nagaland encompasses the geographical coordinates of 25 degrees 6 minutes North to 27 degrees 4 minutes North latitude and 93 degrees 20 minutes East to 95 degrees 15 minutes East longitude. On the eastern boundary of Nagaland lies the international border that India shares with Myanmar. The southern end of the state is bordered by the state of Manipur. The state of Assam borders Nagaland in the western and the north western sides. The state of Arunachal Pradesh borders Nagaland on the north. 16 different tribes inhabit the state of Nagaland. The tradition of the tribal inhabitants is revealed through the different customs, dialect, attires and habits. The capital of the state is Kohima which is located at an elevated altitude of 1444.12 meters above sea level.

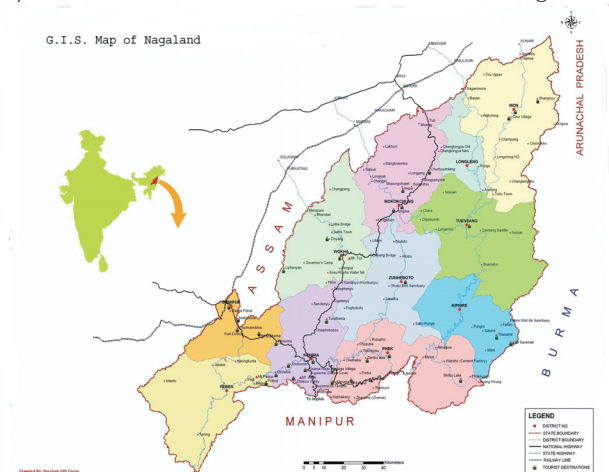
### Climate of Nagaland

Rains are heavy in Nagaland. The average rainfall is between 2000 mm and 2500 mm. Most of the heavy rainfall is during the rainy seasons starting from late May to September, sometimes even in early part of October. The rains during April to May are low. Strong winds blow from the north west in February and March. The climate is mostly salubrious and pleasant.

### Earlier History of Nagaland

The early history of Nagaland is mostly undocumented and unknown till the Burmese invasion in 1750s and until the first Anglo-Burmese War in 1824-26 with the arrival of the Britishers in this region.

Bareh (2001) reported that in the 12<sup>th</sup> and 13<sup>th</sup> centuries, gradual contact with the Ahoms of present day Assam was established but this did not have any significant impact on the traditional Naga way of life. However, in the 19<sup>th</sup> century the British appeared on the scene and ultimately the area was brought under British administration. After Independence this territory was made a centrally administered area in 1957, administered by the Governor of Assam. It was known as the Naga Hills Tuensang Area. This quells popular aspirations and unrest began. Hence, in 1961 this renamed as Nagaland and given the status of State of the Indian Union which was formally inaugurated on 1<sup>st</sup> December 1963.



### Irrigation Facility

Minor irrigation works are mostly meant to divert small hill streamlets; to irrigate valleys used for rice cultivation, Under minor irrigation, surface minor irrigation covered 1,290 hectare and ground water covered 39 hectare during 1994-95. Number of electrified villages stands at 1,200. Nagaland has achieved cent per cent electrification of rural areas. A 24 megawatt hydroelectric project is under erection at Likimro.

### Political History of Nagaland

The present Nagaland was only a district called "Naga Hills" within the State of Assam till 1957. It was put under the administration of the Ministry of External Affairs with the nomenclature of Naga Hills Tuensang Area (NHTA) from 1<sup>st</sup> December, 1957 to 18<sup>th</sup> February, 1961.

In July, 1960, the discussion between the Prime Minister of India and the leaders of the Naga People Convention resulted in a 16-point Agreement whereby the Government of India recognized the formation of Nagaland as a full-fledged State within the Union of India. Accordingly, the State of Nagaland was placed under the Nagaland (Transitional Provisions) Regulation, 1961 which provided for an Interim Body consisting of 45 members to be elected by various tribes according to the customs, traditions and usage of the respective tribes. The Interim Body was dissolved on 30 November, 1963. The people of Nagaland for the first time went for General Election in the month of January, 1964 and the first Nagaland Legislative Assembly was formally constituted on 11<sup>th</sup> February, 1964.

Nagaland is one of the seven states in the northeastern region of India. It comprises a part of the hill ranges which separate the basins of three major rivers – the Brahmaputra, the Chindwin and the Barak.

Nagaland has a total land area of 1,657,900 hectares of which about 1,450,000 is owned by the people in the villages. This means that a village which on an average has two hundred households has about 1,400 hectares of land that is about 7 hectares of land per household. Half of the land belonging to the villages is under cultivation, including the fallow land under the slash and bum method of cultivation. The degraded and accessible forested land amounting forest land works out to an average of 350 hectares per village. Within the village, some of the forest land is owned by the villages and some land by the various clans. The cultivated and the cultivable land are owned generally by individual families. Hence only about 5 percent of the families in the village may be landless.

There are sixteen major tribes and sub-tribes living in Nagaland each occupying a distinct area. A tribe is distinguished by its language, mores and customs. Each tribe tends to treat itself as a race apart. Socially, a tribe consists of subdivisions called clans. These are strictly exogamous. As a rule, all villages are mono-tribe, though some new settlements in the foothills bordering Assam are multi-tribe, while all cities

and towns are certainly so. The aforementioned social structure also has its special ethical and moral values which enjoin a member to clearly recognize what is one's own, what belongs to the neighbour and what belongs to the village as a whole.

Every village of Nagaland has mostly two bodies – the village council and the village development board. The former was a perpetual body and the latter was appointed by it to manage the village common fund. In the past, the village council had the following duties: (a) to function as the highest court in the village, (b) to function as the custodian and manager of the village common property; and (c) to function as the war council of the village.

### Food Habits of Naga Tribes

The basic style of preparation of Naga food is through boiling. Rice is the principal food of the Naga tribes and they like plain rice. Rice is consumed generally with meat and vegetables. In general, the Nagas are very fond of chillies, the famous Naga chilly “*Raja Mircha*” and it is believed that the people belonging to the Sema tribes like to eat Naga chilly the most. It is said that the Nagas “eat anything that moves”. True to this feelings, Nagas are voracious meat eaters and consume the flesh of all kind of animals, insects etc including beef, pork, chicken, Mithun, dogs, cats, fish, spiders, birds, crabs - in fact almost any living thing that he can lay his hands on. Nagas are fond of hunting since antiquity and hunt any kind of wild animals in the forests - even the elephant is eaten and is considered a delicacy.



*Naga-dal and Naga-rice belonging to local varieties*

The native population of Naga tribes loves spicy food and adds spices and chillies in their daily diet. However, the spices mostly include salt, pepper, garlic and they don't prefer turmeric. The food habits reflect the unique cultural traits and traditional legacy of the local indigenous inhabitants of Nagaland and usually no part of the animal is wasted. The intestines and skins of the animals are considered to be a delicious dish among the native population of the state.

The skin is spared only if needed for making a shield. Sometimes the meat is smoke dried or sun dried for long term preservation. Meat and vegetables are usually cooked together which is basically boiling with little salt. Use of oil for frying is almost negligible.

Certain items are considered taboo by the Nagas either because they are not clean or because they are suspected to transmit their qualities to the consumer. Most of the restrictions relate to women, and in case of items which are 'Genna' for men to take, the restriction is relaxed in respect of old people. Women are not allowed to eat monkeys lest they became extravagant. Pregnant woman was not allowed to eat a bear, as it is regarded as a stupid animal. The tiger and the leopard are not taken because of an old belief that man, tiger and spirit were all brothers at beginning of creation.

Nagaland is a dry state presently and factory made liquor is banned. However, Nagas are preparing various kind of indigenous drinks, particularly rice beer traditionally and that is the main drink of Naga tribes. It is generally of three kinds, *Zutho*, *Ruhi*, and *Dzutse* and may be taken at any time. It is nutritive in content and if hygienically prepared is a desirable drink. It is taken by all, including the very young.



*Snails for sale in a market place*



*Famous "Naga Mircha" – world's hottest chilly*



*Frog collected from field for sale*



*Pumpkins and Banana – common vegetable and fruit for Naga people*

All the inhabitants of Nagaland savor the drinks irrespective of age and sex. It is believed that the drinks relieve the native population of Nagaland from the stress and strains of daily living and rejuvenate with a fresh bout of energy and vigor.

### Traditional Naga Products – Age Old Traditions

The information on few of the traditional products being used by different major Naga tribes was collected through interactions with the Naga communities. These were classified into two major categories as Food products and weaving products and were enumerated below.

### Various Traditional products of Naga people

Sl. No.	Tribe	Products Name (Meaning)	Description
<b>Food Products</b>			
1.	Ao	Anishi Var. Anūshi Moya (Colocasia/Yam)	It is a special curry prepared from dried leaves of colocasia/yam along with rice gruel, meat and dried fish to prepare a curry used for energy support for debilitated/ill health people
2	Sema	Akhuni (Fermented Soybeans)	Soybean is fermented and used as food.
3	Sema	Akhuthu (Bamboo shoot) Var. Etsū, Rhūchuk	Local bamboo products used for cooking.
4	Angami / Rengma	Tsūtocie	Local cucumber leaves fermented and used as condiment
<b>Weaving Products</b>			
1	Sema/Ao	Ameni ( <i>Mekhela</i> )	Wool/Cotton based woven handmade textile products.
2	Angami	Mekho: Khoshie, Khorū, Khodi (Baskets)	Bamboo/Cane is used to prepare these baskets for carrying products for daily use



*Angami men and women in traditional attire*



*Ao women with Anishi (left). Few Anishi cakes on display (right)*



*A Sema woman with a basketful of Akhuni (Left view). Akhuni in original shape (Right view)*



*Packed Akhuni for sale in market*



*Three forms of bamboo shoot products – Pulp (left), dried (middle) and liquid form (right)*





*An Ao woman with her loom weaving Ameni (left). Ameni in display (right)*



*An Angami girl with a Khoshie on her back (left). A Khorú with water vessel (right).*



*A pair of Khodi*

## Conclusion

The Naga people are basically agrarian since the ages and almost 90% of the Nagas are dependent on agriculture. Obviously, some of the food products which the tribes prepare are developed with the aim of long term preservation as there was no availability of refrigeration facilities in the olden period. The Anishi or the Akhuni are the best examples of this preservation process of some of the locally available agricultural commodities. Inventions of bio-preservation methods by the Naga women for transforming of the availability of raw materials at a particular season to those of deficit are quite amazing.

It is also an amazing fact that chemical preservatives were neither known nor added by the Nagas during storage in their fermented vegetable foods. These are the native skills of the Naga people, especially the women folk on use of indigenous knowledge for storage and long term preservation needs mostly for their domestic consumptions.

# Krishi Vigyan Kendra Phek: Beacon for the People of Phek

*R K Singh, C Rajkhowa and K K Baruah*

## Introduction

Krishi Vigyan Kendra's were initially conceptualized as Agricultural Polytechnics to impart vocational education in agriculture by Education Commission (1964-66). Indian Council of Agricultural Research (ICAR) mooted the idea of Krishi Vigyan Kendra and appointed Dr. Mohan Singh Mehta Committee in 1973 for formulating the institutional design. The Committee suggested establishment of Farm Science Centres, later named as Krishi Vigyan Kendra (KVK). The first KVK was established in 1974 at Pondicherry under the administrative control of Tamilnadu Agricultural University, Coimbatore. In 1976-77 Planning Commission approved the proposal of ICAR to establish 18 new KVK in Fifth Five Year Plan. Looking into its success in Tenth Five Year Plan it was decided to establish this unique institution in every rural district of the country. At present 637 Krishi Vigyan Kendra are functioning in the country.

Krishi Vigyan Kendra (Farm Science Center) is a noble concept developed by Indian Council of Agricultural Research (ICAR) as primary links for the farmers to know about the agricultural technologies being generated by National Agricultural Research System. Krishi Vigyan Kendra works at the grass-root level as vocational training institution to bridge the gap between the available technologies at the one end and to their application for increased production at the other. The activities of the KVK include on-farm testing to assess and refine the technologies to develop location specific agricultural technologies, frontline demonstrations to exhibit production potentials of the technologies on the farmers' fields, training of farmers to update their knowledge and skills in improved agricultural technology, and training of extension personnel to orient them in the frontier areas technology development.

Krishi Vigyan Kendra in Phek district was established by the ICAR under the aegis of NRC on Mithun, Jharnapani, Nagaland in 2003 to augment the farmers with latest technological knowledge at Porba village in Pfutsero subdivision of the district with the aim of reducing the time lag between technology generation and it's transfer to the farmer's field for increasing production and achieving sustainability. Phek district falls under Eastern Himalayan agro-climatic zone with temperate climate. Phek is the home of the Chakhesang tribe and about 84.0 % of the total population depends upon farming. Production and productivity of the district is too low than national average so technological intervention in farming holds great promise to enhance the income of the farmers.



### Mandate

Enhancing production and productivity; addressing equity and uneven development; sustainability and enhancing profitability in agriculture are major challenges in Indian agriculture. These challenges have to face by both the researchers and extension professionals. They have to identify the constraints and opportunities, test innovations, seek responses and help in adaptation and adoption of technologies. To meet these challenges the specific mandates of the KVKs are as follows:

1. Collaborate with the subject matter specialists of the state Agricultural University/ Scientist of the Regional Research Station (NARP) and the state extension Personnel in "On-farming testing", refining and documenting technologies for developing region specific sustainable land use systems.
2. Organize training to update the extension personnel within the areas of operation with emerging advances in agricultural research on regular basis.
3. Organize long-term vocational training courses in agriculture and allied vocations for the rural youths with emphasis on "learning by doing" for generating self-employment through institutional financing.
4. Organize front-line demonstrations in various crops to generate production

data and feedback information.

### Human Resources

As per the manspecific requirement of that particular area core disciplines are decided and these disciplines are manned by Subject Matter Specialists. There are six posts of Subject Matter Specialists i. e. (i) Subject Matter Specialists (Crop Production) to look after the experiment on field crops as well as provide training and advice on different field crops. (ii) Subject Matter Specialists (Horticulture) looks after the training and demonstration on horticultural crops such as vegetables, fruits and flowers. (iii) Subject Matter Specialists (Plant Protection) Provides training and demonstration on control of different pests and diseases in different crops. He also imparts training and advice on different types of pesticides and insecticides, their methods and time of application. (iv) Subject Matter Specialists (Animal Science) looks after over all growth and management of animal resource of that particular area. He also imparts training and advices on broiler farming, dog rearing as well as rabbit rearing etc. (v) Subject Matter Specialists (Agricultural Engineering) looks after the use of different agricultural implements in the field for different agricultural operations through training, demonstrations and on farm testing. (vi) Subject Matter Specialists (Soil Science) helps the farmers in identifying nutritional deficiencies in soil by testing the soil and suggest the measure how to manage soil health.

Computer programmer, Farm manager and a Programme assistant are also there to support the activities of the KVK. Computer programmer manages the data and records and provides assistance in developing softwares for various disciplines. Farm manager manages demonstration units and farm and Programme assistant (Home Science) is involved in the management and improvement of skill and attitude of the farmers and farm women. She also provides advices and training on kitchen gardening preparation of nutritional food and different handicrafts and imparts training regarding the preservation and storage of fruits and vegetables to rural youths.

### Objectives of the KVK:

1. To identify the important problems of that area as per the need of the farmers and prioritization of the identified problems as per their importance.
2. Planning & conducting on farm trial to assess the technologies in farmer's situation in the district and refine it, if required.
3. Demonstrating new and improved technologies to the farmers as well as to the extension agencies directly in the farmer's field with their active participation for promotion and large scale adoption.
4. Planning & conducting production oriented need based long and shorts duration on campus and off campus training.

5. Providing training and information about latest developments in agricultural technologies to extension personnel to orient and update their knowledge.
6. Developing and organizing non-formal education programs by way of field days, farm visits, farmers fair, radio talk, film shows etc.
7. Organizing Farm Science Clubs in Rural Schools and Villages to induce liking and interest for Agricultural & Allied sciences in younger generation.
8. Developing and promoting small village organizations like Self Help Groups (SHGs), Farmer Interest Groups (FIGs), Kisan Clubs etc.
9. Developing and maintaining farms and Demonstration Units on scientific lines to facilitate work experience to the trainees and also to put a show case of latest technical know how.
10. Imparting some basic education to rural illiterates and school drop-outs in order to make them not only good farmers but also better citizens.
11. Providing added training facilities in the areas of rural home science and nutritional education for community.
12. Collecting feed back from the farmers and extension agencies and communicating these messages to research scientists for modification of technology.

### Thrust areas identified for Phek

Rank	Thrust area
1.	Introduction of quality livestock germplasm.
2.	Vaccination and health coverage measures of pig and poultry.
3.	Introduction of high yielding varieties of cereals, pulses and grains.
4.	Introduction of high yielding varieties of fruits and vegetables
5.	Introduction of biofertilizers e.g. Rhizobium, Azotobacter, Azospirillum, Blue green algae, Azolla for nutrient management
6.	Use of suitable plant protection measures against pest and diseases of crops
7.	Feeding of compounded mineral mixture instead of common salt in Mithun
8.	Deworming in regular intervals in Mithun
9.	Proper design of terrace, water harvesting and diversion, irrigation and drainage system for proper management of watershed area
10.	Introduction of improved storage structure for cereals and pulses
11.	Improved production technology of fruits and vegetables
12.	Development capabilities of rural youth and women in the field of fruits and vegetables processing and value addition.
13.	Control of weeds
14.	Soil and seed treatment and proper storage of finished products
15.	Adequate and hygienic shelter/housing
16.	Introduction of common carps and other exotic carps in paddy cum fish farming and fish ponds.

## Activities

K.V.K. has to adopt economically and technologically backward villages situated within 10-20 Kms radius. Before adoption a detailed study of the village is conducted to find out problems and perspective of farmers and to assess the socio-economic and cultural status of that village. Participatory Rural Appraisal (PRA) tool is used to conduct the study with active participation of the villagers. PRA helps in identifying the gaps and accordingly action plan is prepared. K.V.K. undertakes following types of activities in the adopted villages to achieve the above mentioned objectives:

1. On Farm Testing (OFT)
2. Front Line Demonstration (FLD)
3. Training programme for different categories of people
4. Farm Advisory Services

### 1. On Farm Testing (OFT)

On-farm testing is carried out to test and establish the location specificity of agricultural technologies under various farming situations. The testing of any new or improved technology is carried with the active participation of farmers in his field under the management of scientist of concerned discipline. In this method two to three improved technologies are tested in the same field so as to compare the results of these treatments. As per the location specific soil and climatic conditions the improved technology may slightly be refined by the scientists of K.V.K. to get maximum return.



## 2. Front Line demonstration

Front Line Demonstration (FLD) is the field demonstration conducted under the close supervision of the scientists because the technologies are demonstrated for the first time by the scientist themselves before being used into the main extension system of the state department of Agriculture in that particular area. In this method newly released crop production and protection technologies and its management practices are adopted in a block of two to four hectares in the farmers' field. Only critical inputs and training for this demonstration are provided by Krishi Vigyan Kendra. In FLD both farmers and extension functionaries are target audience. From the FLD, it is possible to generate some data related to factors contributing to higher yield and also constraints of production under various farming situations. Generally a field day is organized in the demonstration field when the crop is at maturity stage and interaction between the scientists, farmers and extension functionaries takes place in the field. The crop is harvested in the presence of the interested group of farmers so that they can visualize the importance and effectiveness of new technology.



## 3. Training programme for different categories of people

Training is one of the most important activities of Krishi Vigyan Kendra. It is a planned and systematic effort to enhance the knowledge improves the skill and change the attitude of a person towards a particular subject. Training need assessment is the first and foremost factor to be considered before conducting any training programme. Depending upon the need and categories of trainees, K.V.K. imparts mainly following three types of training:



### (a) Training to the practicing farmers and farm women

Training on different subjects were conducted by the scientists of the K.V.K. as per the need of the local farmers of particular area. Different kind of audio visual and training aids can be used to increase the efficiency of the training. As the trainees are practicing farmers and farmwomen, more emphasis is given on the practical than theory to improve their skill to change their attitude and increase their knowledge for the particular topic.

### (b) Training to the Rural Youth

Training to the rural youth (Both male and female) imparted mostly to those who have left their education in midway i.e. school dropouts. The main objective of this training is to provide sufficient knowledge and skill regarding a new entrepreneurship so that they can start their own business singly or collectively and generate some income for their livelihood. In this training more emphasis was given on the practical aspects and trainees were do the practical themselves to get more confidence.



### (c) Training programme for the extension functionaries

In this category mostly government employees of agriculture along with extension functionaries of the line department and members of different NGOs operating in the locality are trained in different aspects. The main objective of this type of training is to refresh the memory and up grade the knowledge and skill of the extension functionaries by providing recent and new information regarding new techniques as well as new approach to solve different problems faced by farmers of that locality. As the extension functionaries of different department act like a bridge between the

scientists and villagers, the refinement of the knowledge is highly essential and quite helpful for effective and efficient transfer of the technology.



#### 4. Farm Advisory Services

Providing solution to any problems related to agriculture and allied as and when faced by farmers is an important role of the KVK so this way KVK act as a Farm Advisory Center. Any interested person or farmer can get proper advices regarding the establishment of new enterprise on non traditional sector. The objectives of the Farm Advisory Center are as follows:

- (a) To study the socio economic status of the farmers
- (b) To build confidence and close relationship between K.V.K. and farmers.
- (c) To develop model farms in adopted villages.
- (d) To provide technical advices so that the farmers can take part in the agricultural planning of the village, blocks as well as district.
- (e) Formation of Self Help Groups (SHGs), Farmer Interest Groups (FIGs), Kisan Clubs, Farm center or village committees etc. for easy and faster transfer of agricultural technologies to the villagers.
- (f) Providing various information by using internet.



Programmes conducted during 2012-13 Trainings

Area	Courses	Participants
Crop Production	15	328
Horticulture	17	476
Plant Protection	11	241
Home Science	9	160
Animal Science	17	376
Soil Science	18	446
Agril Engineering	9	153
<b>Total</b>	<b>96</b>	<b>2480</b>

### On Farm Trails

Subject	Thematic area/Technology
Soil Science	1. Soil Management-Nutrient management using Vermicompost, NADEP Compost and Azolla compost in French bean Var.sel-9
	2. Soil Amendment with Lime+ Vermicompost in Rice var.Shahsarang-1
	3. Soil Biology - Biofertilizer in Rice Var.RCM -11
	4. Soil microbes-Biofertilizer in Naga Local bean var. Kelelu
Agronomy	1. Varietal evaluation of Lentil var.DPL 62
	2. Integrated nutrient Management in Soyabean var., PS 1042
	3. SRI Paddy var. IET 16313
Horticulture	1. Varietal performance of Red Cabbage
	2. Varietal performance of Kiwi var. Allison, Hayward, Bruno, Monty
	3. Orchard Rejuvenation in declining Khasi mandarin orchards
	4. Canopy management in Khasi mandarin plant
	5. Mechanization using Foot sprayer in Khasi mandarin

Plant protection	1. Integrated Pest Management in Rice
	2. Effect of Derison on Cut worm management in Cabbage
	3. Performance of Sulphur powder on Powdery mildew in Pea
Animal Science	1. Breed introduction-Large Black breed
	2. Concentrated pellet feeding in Rabbit
	3. Effect of QPM feeding in Poultry
	4. Introduction of creep box in pig units
	5. Introduction of LDPE polyethene base silo for Dairy cattle
	6. Introduction of Stylosanthes and Guinea grass in goat raising area
Home Science	1. Nutritional Gardening (NG)
	2. Preparation of mushroom pickle
Agril.Engg.	1. Use of women friendly tools winnower
	2. Drudgery reduction by using Paddy transplanter in paddy
	3. Water management in vegetable through micro irrigation system

### Front Line Demonstration

Subject	Thematic area/Technology
SoilScience	Soil Biology-Azolla in Paddy Var. Megha rice-2
	Soil microbes-Biofertilizer in Potato variety.Kufri Girdhari
Agronomy	Varietal performance of Ground nut var., JL 24
	Varietal performance of Soybean var., PS 1042
	Integrated Nutrient Management in Paddy var., Shasarang
	Effect of Liming in Pea var. Rachna
Home Science	Nutritional Gardening
Horticulture	Varietal performance in Cauliflower
	Integrated Nutrient Management in Cauliflower var. Snowball
	Mechanization using Jab planter in Garden Pea var.AP1
	Popularization of Mushroom var. Oyster mushroom
Plant Protection	Product performance by using tobacco leaf extract for aphid management in Cauliflower
Animal Science	Health and clinic-Foot and Mouth disease vaccination in Mithun
	Health and clinic-Anthelmintic medication in Naga local pigs
	Health and clinic-Vaccination of poultry birds against Pox disease
Agril. Engg.	Drudgery reduction by Mould board plough
	Water management by using treadle pump for irrigation

### Extension activities conducted

Extension Activity	Activities (Nos.)	Beneficiaries (Nos.)
Field Day	7	79
Kisan Mela	-	-
Exhibition	1	243
Film Show	-	-
Method Demonstrations	6	119
Group meetings	-	-
Lectures delivered as resource persons	5	125
Newspaper coverage	40	
Radio talks	20	
Popular articles	3	
Extension Literature	17	
Advisory Services/Mobile AS	20	230

Scientific visit to farmers field	78	194
Farmers visit to KVK	22	22
Diagnostic visits	154	267
Exposure visits	3	65
Animal Health Camp	6	234
Technology week	1	243
Celebration of important days (specify)	3	120
<b>Total</b>	<b>386</b>	<b>1941</b>



## Conclusion

Krishi Vigyan Kendra provides inspiration, constructive and constant advice to the people of the area to start new entrepreneurship for their livelihood and show them proper way when there is need they can get actual help as the light house help the sailor in the sea. So we can say that Krishi Vigyan Kendra NRCM will prove a light house for the people of Phek and a model for the hill region agriculture.

## Community Rearing of Mithun for Livelihood and Forest Conservation

*Neichute Doulo*

*CEO and Coordinator, Entrepreneurs Associates, Kohima*

### The Magnificent Mithun

Mithun is the domesticated form of wild gaur (*Bos frontalis*). It is a large mammal with, when fully grown, an average body length varying between 8.2 to 10.8 feet, excluding a tail of between 28 to 41 inches in length. The average weight of an adult Mithun usually varies between 650 to 1000 kilos. Research has indicated that Mithuns and Gaurs both possess 29 pairs of chromosomes, while at the same time many physiological parameters of Mithun are different from that of cattle. This strongly suggests that Mithun is the domesticated form of wild gaur, rather than a form of cattle. Conventional knowledge now has it that Mithuns were first domesticated around 8000 years ago. The latest taxonomical classification of both Mithun and wild gaur classify them both under the species *Bos*.

The International Union for Conservation of Nature has listed the gaur as vulnerable on its Red List since 1986. Its population has diminished significantly with estimations of their dwindling numbers up to a loss of 70%. Its population is stable only in well protected areas. Gaurs predominantly live in hilly forested areas, and require relatively large forests tracts to scrape out their sustenance. Earlier they also lived in low-lying areas, but due to their enclosure into croplands and pastures they might have been driven to more scarcely populated upland areas.

In India, Mithuns have a limited geographical distribution and are mainly found in the forest areas of the hilly Northeastern states of Arunachal Pradesh, Nagaland, Manipur and Mizoram. They are also reported in Jammu and Kashmir. Mithuns prefer a moderate climate, dense forests and steep slopes and Northeast India, therefore, is a suitable habitat for them. Among Northeastern hill communities Mithuns invoke significant social and cultural appreciation, and they have locally been domesticated from long ago. They are also known as the "Cattle of the mountains", and, over the ages, Mithuns have turned into a valued half domesticated animal among a number of Northeastern hill tribes.

### Importance

The Mithun is important for a host of reasons. The foremost reason that would catch the eye of an *economist* would be the monetary return/cash it offers to the farmer. An adult Mithun of five years old in Nagaland would fetch its seller at the least Rs.80,000/-, while the same incurs about Rs 40,000/- in Arunachal Pradesh and Rs.50,000/- in Manipur. A *health and food scientist*, in turn, would point out that a Mithun holds a huge potential for protein supplements and that it can cater to the needs of Nagaland's

growing meat requirements. In a way, the Mithun is a 'natural wonder' able, as it is, to gain 500 gram of body weight a day, and so to deliver large amounts of meat. For the *conservationist*, Mithun is the best bait for protecting forests amidst the need for economic opportunities, as Mithuns thrive in evergreen forest and its rearing, therefore, entails the protection and regeneration of forests. Research has validated these findings. As the National Research Centre on Mithun (NRCM-ICAR 2009: 8) found out: 'Consumption of vegetation as feed by Mithuns also reduces the number of plants per unit and thus facilitates the growth of other species of forest trees.'

Besides its meat, Mithun rearing provides multiple other economic opportunities. For instance, the semi-intensification of Mithun has led to the opportunity of marketing its milk as well. Mithun milk contains about 12% fat, which is significantly more than cattle milk, which has only about 4% fat content. For any *development actor* interested in enhancing grassroot livelihoods, Mithun rearing has the potential to provide significant additional income to a household. In a situation where a part of community forest is fenced off for Mithuns to graze and grow, a farmer need only spend fifteen to twenty days a year for overseeing his Mithuns, while his economic returns might, as the market prices mentioned above indicates, be very high. Unlike piggery, poultry, dairy or vegetable farms, Mithun rearing appears as a 'passive' additional income for rural households.



*Mithuns at the project site in Thetsumi Village*

### **Mithun And Forests- A Correlated Existence**

NRCM-ICAR has done extensive and important research on Mithuns through the National Research Centre on Mithun, the only Mithun research centre in the world and located in Nagaland. Since Mithuns are reared mostly for meat purposes and raised in free range environments, it is regarded as a free ranging bovine. The Krishi Vigyan Kendra (KVK), Porba, Phek, Nagaland report reads: "They rarely need man's

control. In forest they aggregate into small herds and browse for a few weeks unattended and come back to the owners. The quick growing shrubs, grasses and leaves of trees serve as feed resources for Mithuns. Consumption of vegetation (fodder trees) as feed by Mithun also reduces the number of plants per unit of area and thus facilitates the growth of other species of forest trees. This animal basically thrives on the jungle forages, tree fodders, shrubs, herbs and other natural vegetation and farmers do not provide any supplementary feeding. Nevertheless farmers occasionally provide common salt, especially at the time of restraining Mithun for some purposes. The farmers generally keep Mithun herd in a fenced hilly jungles and village council assigns Mithun grazers to take care of the animals" (KVK Porba, Phek, Nagland, 2008).

Another report explains: "Mithun prefers a moderate climate, dense forest and steep slopes. Mithun cannot withstand hot sun, particularly at mid-day, so they retire to the deep forest, near small ponds, water springs or streams. Mithun is considered to be an efficient convertor of forest biomass into valuable beef with a daily body weight gain of 496 to 548g. The evergreen forest of the region is a potential source of tree fodders throughout the year. In the Mithun inhabited states, the grazing pockets are mostly under the control of community land owning system. The consumption of buds, leaves and twigs of forest-based plants is an important part of the annual feed supply to Mithun. Many fodder trees of this region (NER) are leguminous and their associated symbiotic nitrogen fixation capability contributes to increased soil fertility" (NRCM-ICAR 2009).

Thus, one can conclude from the above reports that "Rearing Mithuns in the traditional free-way range automatically entails the conservation and protection of forests; Without forests, Mithuns cannot thrive. Therefore, Mithun Rearing is a 'green industry'"

The NRCM-ICAR has interviewed 200 Mithun farmers, selected by random-sampling, to investigate the relationship between Mithun and forests in Nagaland during the year 2010-2011. Some of their findings were:

- i) Mithun fencing has the additional value of also benefitting the growth of other livestock in the area with 57.19%. It also helps to manure the forest and to spread the seeds of many plants and trees, which, in turn, accelerates plant growth with 42.90%.
- ii) Regarding the role of Mithun in forest ecosystem, it showed that where Mithuns were raised, plant population (including medicinal plants, orchids) increased with 57% and that the manure of Mithun helped in sustaining a better growth (72%).

Mithun is therefore a gift of nature to mankind. Its life supplements and compliments the vitality of forests.

### **Community Rearing of Mithun leads to forest conservation and profitable livelihood**

In 2010, the Sir Ratan Tata Trust/ Navajbhai Ratan Tata Trust , Mumbai, in association



with the Entrepreneurs Associates (EA), Kohima undertook a pilot project to support community rearing of Mithun for forest conservation and profitable livelihood at Thetsumi village, Phek district, Nagaland. It was the first project of its kind. The pilot project provided barbed wire fencing to the villagers to fence 7 kilometres of evergreen community-owned forest area. In return, the community provided free labour to put up the fence and also declared the fenced forest area and its periphery as Mithun forest. The community then concluded that to enable more community members to own Mithuns, more forest had to be created, and about 800 hectares of jhum land was subsequently turned into forest cover. The community also declared the Mithun forest as community protected forest for the next 15 years. EA then provided a well-tailored credit package to farmers to purchase Mithuns and to rear them in the now protected forest area. In addition, NRCM-ICAR, Jharnapani, Nagaland provided vaccination and health camps to ensure the good health of the Mithuns.

One of the immediate benefits of the initiative is that tens of thousands of trees have been saved from being felled every year, which farmers did to use the wood to construct 'natural fences' to keep straying animals away from their crops. A baseline study before the project showed that the community cut 80000 to 100000 trees every year to protect their crops from grazing animals. Such a colossal loss of trees stopped due to keeping Mithuns in a protected area fenced by barbed wire instead of natural fences. Within 12 months, the population of Mithun in the project area grew from 64 to 102 in number as more farmers opted to purchase a Mithun. The pilot project resulted in wealth creation among the farmers. In the first year, farmers netted about Rs 5 lakhs. This financial benefit will only triple up in the second year and will increase five times up in the third year as Mithuns are growing in number and size.

The success of the pilot project has inspired surrounding villages and has extended to four more villages in Phek District; Losami, Pholami, Porba and Enhulumi with the support of Sir Ratan Tata Trust/ Navajbhai Ratan Tata Trust. The communities are now convinced that if barbed wire fencing, a well-tailored credit package for purchasing Mithuns and scientific health care are ensured, both horizontal and vertical scaling up of Mithun rearing is feasible and desirable. When Mithun rearing is promoted, it becomes only natural for communities to conserve their forests, as without them Mithuns cannot thrive. This incentive to communities in conserving their forest serves all stake-holders. For policy makers it kills two birds with one stone, as forest is conserved while grassroots poverty is reduced. For bankers, the returns of Mithun rearing are more lucrative than normal livelihood interventions with provisions of basic health care and vaccination for the animals, and hence they may be easier convinced to distribute loans. For green-activists, it is the immediate conservation of forest by community stakeholders that ensures their support.

Mithun rearing can generate eco-tourism too as the Mithun is a half-wild half-domesticated animal which may arouse significant interest among visitors. In

Nagaland, there are, as it stands, already some tourist spots created out of Mithun areas.

### Conclusion

Since fencing of forest areas are in the domain of public welfare, it is only fair for the government to take it up as public schemes. And it is only proper that such policy is put in place for Mithun rearing as it also leads to forest conservation. The fact that "Mithun is still not a part of livestock production system can be easily identified from the fact that there is no State owned Mithun farm in Nagaland or elsewhere in the country" (Rajkhowa et al 2011). Promotion of Mithun with the same zeal like that of cattle by policy makers will create wealth at the bottom of the pyramid as it stimulates multiple economic pursuits. For instance, leather products from Mithun hide are found to be far superior than cattle's and Mithun meat is considered far tender with less fat and more proteins. The gift of Mithun for the 21st century is its habitat; an evergreen forest. It is nature's own very benevolence. Can nature be more kind to Northeast India by providing a mammal which, at once, generates wealth and protects the forest? It will be only humane for the 21st century policy makers to humbly thank Mother Nature by appreciating her gift by conserving Mithuns and its habitat, and make this world a greener, wealthier and healthier place to live in.



*Vaccination Camps with NRCM*



*Sapling of Cherry Tree for BIOFENCING of conserved areas*



*EA Distributing Barbed Wires in Enhulumi Village*



*EA Signing MOU for Conservation of Forest for Mithun Rearing with Community Leaders*



*EA raising money for the Mithun Project by hosting buffet*

## Initiatives of Nabard In The State of Nagaland With Special Focus On Animal Husbandry.

*V. Chelladurai*

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Livestock has been an integral part of the life of people in Nagaland since time immemorial and is symbolic of their status in society. It also provides supplementary income to the farmers. High consumption of meat by Nagas and increasing population has provided very good scope for growth of animal husbandry sector in the state. Further the challenges faced by the state in ensuring the food security and employment generation for its fast growing population can be countered with an integrated approach for livestock farming.

NABARD has been taking several initiatives as part of its mission and commitment towards developing agriculture and bringing rural prosperity. One of such initiative is the preparation of Potential Linked Credit Plans for each district and the same is aggregated into the State Focus Paper for each State. The State Focus Paper provides an insight on the potential for development in different sectors of rural economy, a road map to banks for extending credit to important sectors/sub-sectors/activities including Animal Husbandry in the State and for Government Departments and various developmental agencies to provide necessary infrastructure and linkage support for the development of various sectors thereby facilitating increased credit flow and overall development. Under Animal Husbandry sector, Dairy, poultry, piggery and goat rearing activities have been focused in our State Focus Paper as these activities provide avenues for income generation and employment opportunity in rural areas. The potential for Dairy sector, Poultry and Piggery & Goatery for the year 2014-15 has been estimated at Rs 1313.63 lakh. Rs 1889.93 lakh Rs 5526.23 lakh. respectively in our State Focus Paper.

Another initiative of NABARD is to provide refinance to eligible financial institutions with a view to provide supplementary resources to banks to promote asset creation and direct the flow of credit to the desired sectors. With the objective of creating income generating assets, long term refinance is provided to Banks for financing under Animal Husbandry sector, viz., dairy, poultry, piggery, sheep/goat rearing, etc. The refinance facility is provided for a period of 3 to 15 years to Commercial Banks, Regional Rural Banks and State Cooperative Bank for the State of Nagaland.

NABARD, Nagaland Regional Office has been administering the Govt. of India subsidy schemes for development of Animal Husbandry Sector in the state. The Centrally Sponsored schemes implemented in the State include:

(1) Integrated Development of Small Ruminants and Rabbit.

(2) Pig Development.

(3) Establishing Poultry Estates and Mother Units for Rural Backyard Poultry.

(4) Dairy Entrepreneurship Development Scheme.

Under these schemes, identified beneficiaries (e.g. Producer Companies, partnership firms, corporations, NGOs, SHGs, JLGs, cooperatives, farmers and individual entrepreneurs/farmers) can avail bank loan for the specified activities and they will be provided Back-ended Capital Subsidy by Govt. of India @ 33.33 % in North Eastern States including Nagaland. Under the GoI Credit Linked Capital Subsidy Schemes, subsidy of Rs 342.29 lakhs for Pig Development, Rs 11.57 lakhs under Dairy Entrepreneurship Development Scheme and Rs0.72 lakhs under Integrated Development of Small Ruminants and Rabbit have been released. State level Workshops have been organized to sensitize the bankers for implementation of Govt. of India subsidy schemes for development of Animal Husbandry Sector.

Under the Agri-Clinics Agri-Business Centre Scheme of the Govt of India, agriculture graduates are provided training for 2 months in the approved nodal training institute. For the State of Nagaland, a Nodal Training Institute in Dimapur has been set up to train agri-graduates for providing extension services to farmers at a reasonable cost while providing gainful employment to them. 12 agri-graduates with veterinary degrees have been assisted under the scheme in Nagaland.

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