Anthology Of Technical

Published by Krishi Vigya

R.K Singh
Chitrasen Lairenjam
A. Dhali
C. Rajkhowa

Anthology of Technical Articles Published by KVK Phek

A Compilation of Articles Published in Newspapers

Editors:

R K Singh,

Chitrasen Lairenjam

A Dhali and C Rajkhowa,

Published by

Krishi Vigyan Kendra-NRC on Mithun

Porba, Phek, Nagaland

Correct citation:

Singh R.K., Lairenjam Chitrasen, Dhali A. and Rajkhowa, C. (Eds). 2009. Anthology of Technical Articles published by Krishi Vigyan Kendra. Krishi Vigyan Kendra Phek, National Research Centre on Mithun, Jharnapani, Medziphema, Nagaland.

October, 2009
No. of Copies: 500
For Private Circulation only

Editors: ***R K Singh, Chitrasen Lairenjam, A Dhali and C Rajkhowa,***

Published by

Krishi Vigyan Kendra-NRC on Mithun
Porba, Pfutsero, Phek, Nagaland
Web: kvkphek.nic.in
***e*mail: kvkphek@gmail.com**

Printed at : saraighat offset press, Bamunimaidan, Guwahati - 21

Preface

Krishi Vigyan Kendra 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 trail to assess and refine the technologies in order 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 with the latest technological development.

Krishi Vigyan Kendra-NRCM, Phek established by the ICAR under the aegis of NRC on Mithun, Jharnapani, Nagaland, with the aim of reducing the time lag between technology generation and it's transfer to the farmer's field for increasing production and sustainability. The KVK is trying hard to fulfill the expectations of the farming community of the Phek district.

Mass media like Newspaper, Radio, TV etc. plays very important role in disseminating the technologies and they increases the outreach of the technologies. The present book is an attempt to compile the publications made by the KVK, Phek during the past three years. This compilation will help the farmer to find all the relevant technologies at one place.

- Editors

Content

Soil Erosion: Your Farm can run away with it!!

Er. Chitrasen Lairenjam, SMS-Agril. Engg, KVK- Phek NRC on Mithun (ICAR)

Farmer has a land to cultivate, he has man to work, tools and implements to operate, seeds to sow, manure to add, conveyance to transport, technology for planting, but the upper layer of soil which supports the crop growth is gradually washed away by surface flowing water, wind and other mechanical activities. It is a big problem of soil erosion: Without soil, you won't have crops....without crops you won't have a farm ….Don't you think so???

Erosion is a process that removes soil layers and carries them away from farmer's fields to bodies of water or to other land. It is the detachment or breaking of the soil aggregates by some sort of physical action or some sort of beating action and then transport the broken soil by wind, by flowing water or by other human activities and deposited at another places.

Soil is the uppermost layer of the earth's crust and consists of weathered and disintegrated minerals mixed with organic substances. The depth of soil varies from place to place. However, on an average, 30 cm of top soil directly or indirectly support all human and animal life. This thin layer is largely responsible for both physical and nutrition of plants growth. The very existence of mankind depends on conserving this vital natural resource. Erosion carries away this valuable soil and its nutrients that are necessary for crops to grow. It also reduces the ability of soil to store water, thereby reducing its ability to support biodiversity. Soil erosion in agricultural system is a very important problem to manage.

It may be mentioned that soil erosion has been responsible for the fall of various ancient civilization. Mesopotamia, a land well developed in the time of Babylonians, Assyrians, Chaldeans and Persians is now virtually a desert. The removal of forest in hill area in the places of Egypt, Israel, Syria etc, made the flow of water in barren area and carries the soil along with it. Today, treeless slope with bare rock exposure form one of the most characteristic features of the landscape in this region. There are hundreds of dead city in Syria, where 1 to 2 meter of top soil has been washed off in most of the hill sides. The city remains dead because the soil can no longer support the agriculture.

Soil can be eroded away by wind and water. High wind speed can blow away loose soils from flat or hilly terrain. Water erosion generally occurs only on slopes, and its severity increases with the severity of the slope. In Nagaland, the hills are high steep slope and are highly prone to water erosion. Land slides occurring in the road side are also one of the forms of soil erosion. Most of stream water turns to muddy color which shows that the soil has been scoured and carried along with the stream. Nagaland falls under high rainfall area and one should understand the effect of rainfall to erosion. It can be mentioned that one rainstorm can wash away 1 mm (.04 inches) of soil. It does not sound like much, but when a hectare (2.5 acres) of area is considered, it would take away13 tons of topsoil and it will take 20 years to replace by natural process .And that kind of loss occurs year after year by wind and rain around the world.

There are three primary kinds of erosion: **wind erosion, water erosion, and tillage erosion**. In areas where the land is especially flat or dry, **wind erosion** is a problem: As wind blows it spreads soil particles

can also happen suddenly during floods. **Tillage erosion** is mostly caused by the way a farmer tills the land. The kind of equipment a farmer uses, how often the farmer tills the fields, and how the farmer manages the fields during the winter months affects how much soil may be lost. Heavy machinery, frequent tilling, and lack of soil cover during winter months contributes to soil erosion If the slope of the land is steep, all three kinds of erosion become more of a problem

Basis of soil erosion

There are three basic process involve in soil erosion i.e. detachment of soil, transport and deposition of soil. Detachment basically happens when the forces of rainfall drop impact or when flowing water or the wind velocity exceeds the resistivity of the soil to erode. Detached particles are transported by flowing water. Deposition occurs when the soil load of eroded particles exceeds the carrying capacity of the transport media.

Controlling soil erosion involves - firstly, protection of soil from breaking or detachment and secondly, restricting the soil from transporting or moving away. To overcome this, different techniques and best management practices (BMP) are suggested. Some of them are listed below.

Crop rotation:

Extended crop rotation and permanent cover crops effectively protect the soil from the impact of raindrops. The thick, fibrous root systems associated with cover crops also bind the soil particles together

Residue management:

Plant residue controls soil erosion by intercepting raindrops, blocking wind erosion, reducing surface water runoff, and preventing soil detachment. When using a combination of conservation tillage practices and surface residue management, it is critical to maintain the highest amount of residue cover possible

Tillage practices:

Whether using no-till, conservation tillage, or conventional tillage systems, harvest is the best time to begin the next year's residue management. For effective soil erosion control, try to maintain residue cover of 30 percent or more during the off-season and at planting time.

Grassed waterways:

Wide, shallow, sod-lined waterways reduces the speed of water by providing a grass cushion and preventing gully formation. They also act as a filter by trapping sediment and protecting covered soil from being detached and transported

Terraces:

Terraces break up slope lengths and reduce steepness to reduce surface flow and sediment transport.

Conservation buffers:

Buffers (areas or strips of land in which permanent vegetation is established near row crops) are designed to intercept sediment flow and protect the soil from detachment

Contour farming:

Planting rows on the contour helps channel small runoff streams across, rather than down, the slope and creates a speed bump for larger flows

Soil erosion control techniques are theoretically simple and easy but practically tedious and costly. It is very much location specific that one technique can be implemented successfully to reduce soil erosion in a particular location but the same may not be effective for other location. Understanding the soil erosion mechanism is very important to decide and develop the soil erosion control techniques. It also depends on overall participatory from all the corner i.e. farmer, govt. agency, NGO, technical experts etc. When the general public gives importance and interest on conserving soil erosion and water quality, a decision maker can easily adopt the techniques and implement it. Other important variables for the successful implementation of sediment and muddy runoff reduction policies are the farmers and landowners. Unless they are willing to accept the soil erosion control techniques on their lands and in their agricultural management practices, no policies and techniques can be successful. Farmers can voluntarily accept the techniques only when they understand the impacts of sediment and muddy runoff from their lands on a receiving water body, when they feel a strong responsibility for the degradation of soil and water quality, and when they are sincerely motivated to stop soil erosion in their lands. So let us not let our valuable resources to skip from our hand and conserve our soil.

Conservation Of Soil By Biological Measures

T. Esther Longkumer, SMS (Soil Science), KVK-NRCM, ICAR, Porba, Phek.

Soil erosion, which is a gradual process of soil deterioration have become a severe problem worldwide for productive agricultural land and for water quality concerns. A permanent vegetative cover is the best protection for soil from erosion. The moment vegetation is destroyed; the condition becomes favorable for soil erosion. Erosion is the detachment and movement of soil by moving water, wind or ice. Erosion is a natural process that cannot be stopped, however, human activity such planting permanent vegetative cover, earthmoving and tillage can control the process. Farming system should also be considered and improper cultivation leads to severe soil erosion. So, land use system should be properly implemented. The main principle of biological control is to prevent high speed of water and conserve water within the soil.

Types of Soil Erosion:

i) *Raindrop or Splash Erosion* is the detachment and transport resulting from the impact of water drops directly on soil particles or on thin water surfaces. Raindrop impact on bare soil not only causes splash but also decreases aggregation and causes deterioration of soil erosion.

ii) *Sheet Erosion* is the removal of a fairly uniform layer of soil from the soil surface by shallow overland flow.

iii) *Rill Erosion* occurs as shallow sheet flow concentrates into small channels. Flow in these channels causes further erosion and carries soil particles away.

iv) *Gully Erosion* is an accelerated form of rill erosion where the channels are much deeper and carry away larger quantities of soil.

The following methods can be adopted in biological control:-

1. *Mulching*: Mulching is the covering of the soil with crop residues such as straw, maize, stalks etc. these cover protects the soil from the rain drop impact and reduces the velocity of run off, wind. Later on, they decay to form humus which improves the physical condition of soil. Straw mulching before sowing is best followed by grass mulch.

2. *Multiple Cropping*: The aim of multiple cropping is to increase the production from the land while providing protection of the soil against erosion. It includes:-

a) *Crop Rotation:* Growing different crops consequently in rotation reduces erosion. So, rotational cropping is necessary. In this system, one crop is followed by next crop usually legume which makes the soil fertile. E.g., legumes with cereal.

b) *Strip Cropping:* It consists of growing erosion permitting crop e.g. Jowar, Bajra, Maize etc in alternate strips with erosion checking close crops e.g. Grasses, pulses

etc. Strip cropping employs several farming practices such as crop rotation, contour cultivation, proper tillage, stubbles mulching, cover cropping etc. This practice is very effective in controlling erosion especially for gentle slope.

3. *Mixed Cropping:* In this system, two or more than two crops are raised in the same land and in the same time. The benefit is that due to different kind of roots, soil is protected more perfectly. E.g, wheat+gram, cow pea+ maize etc.

4. *Inter Cropping:* In this method, the spaces among the tree species are covered with agriculture crops, which help in soil and water conservation.

5. *Crop Management*: It includes;

a). *Sowing Date:* Sowing date should be adjusted so that by the time rainfall takes place, there should be enough of ground cover.

b). *Crop Geometry:* Denser the plant population is the better.

6. *Soil Management*: It maintains and improves fertility and structure of soils. High fertile soil results in high crop yield, good plant cover and therefore minimizes the affect of erosion. It includes;

Organic Manure: Organic manure improves the soil structure, cohesiveness and water retention capacity. Consequently, soil erosion decreases. Green manure, straw etc should be added as organic substance in agriculture lands

7. *Agro Forestry*: Trees can be incorporated within a farming system by planting them on terraces, contour bunds and as ornamental around the homestead. This reduces soil erosion and provides additional needs to the farmers. Example:-Pine, Eucalyptus, Broom , maize etc.

8. ***Control of Grazing:*** Grazing increases the soil erosion. As grazing cannot be completely stopped in all areas, so, restricted and rotational grazing will be helpful in checking soil erosion to some extent. The area open to grazing should be closed for the following year to facilitate regeneration of forests and to maintain thick ground vegetation.

Soil conservation measures should be adopted in order to:-

1. Increase water infiltration into the soil surface.
2. Reduce run-off and soil particle transport in runoff.
3. Increase plant growth and soil cover.
4. Surface accumulation of organic matter increases water holding capacity of underground soil which reduces runoff.
5. Alleviate soil compaction by increasing soil structure.

Therefore, erosion should be controlled because it removes top soil rich in nutrients and organic matter, which reduces the ability of plants to establish, grow and remain healthy in the soil. A reduction in plant growth and subsequent plant residue causes less soil cover, allowing the erosion process to perpetuate and become worse leading to infertile land void of top soil. Erosion not only causes loss of soil productivity but also affects water quality when the sediment is transported and enters surface water.

Composting-An Enrichment Technology

T. Esther Longkumer, SMS (Soil Science), KVK-NRCM, ICAR, Porba, Phek.

Composting is a natural and safe method of taking care of organic wastes. In nature, all the dead materials are gradually acted upon by the forces of nature i.e. sun, wind, rain and microbes and breakdown complex materials into simpler molecules. If such materials are left on road sides, backyard, or market places to decay, it begins to decompose and stink and also invites insects, rodents and bacteria which are one of the prime causes of spreading diseases. Instead, these waste materials which we generate everyday produce rich organic compost and helps us to keep our surrounding clean and green. All organic matter can be composted. Raw organic matter such as crop residues, animal wastes, food garbage, municipal wastes and suitable industrial wastes enhance their suitability for application to the soil as a fertilizing resource after having undergone composting. Animal excreta like cow dung, poultry droppings, sheep, goat, rabbit dung etc are added to hasten the composting process.

Why Composting:

Few decades ago, people preferred chemical fertilizers as it was once considered a magical ingredient in agricultural production when it increased agricultural produce by leaps and bounds. But, now it is known that application of chemical fertilizers have an adverse effect on the soil fertility as well as plant growth in the long run and chemical fertilizers are responsible for the deterioration of soil fertility and destruction of beneficial soil life such as earthworms, bacteria etc. The most harmful impact is on the subsoil which is leached down by chemical fertilizers and then permanently contaminates the soil and the ground water. Hence, in order to maintain the soil health and fertility status and to sustain plant growth productivity, organic manure plays a great role as they not only supply balanced nutrient but also retain substantial amount of moisture. Compost is a rich source of organic matter. Soil organic matter plays an important role in sustaining soil fertility and thereby sustain agricultural production.

Materials To Be Used For Composting:

Do's	Don'ts
Fruit and vegetable scraps, lawn clippings, shredded newspapers, small twigs, uncooked vegetables, crushed egg shell, tea bags, coffee grounds, farm waste e.g. straw, Stover etc.	Meat, fish, cooked food, cat and dog excreta, disposable nappies, hard objects, plastic wraps etc

Methods:

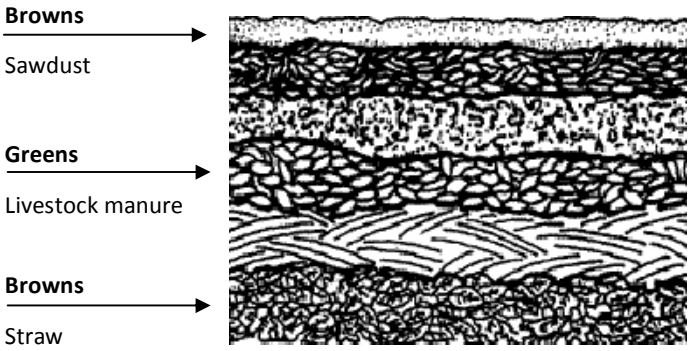
Composting comprises mainly of two methods:

1. **Anaerobic Method:** In an anaerobic method of obtaining organic manure, the organic materials are collected in pits of convenient size and covered with a thick layer of soil and left undisturbed for 6-8 months. Here, the organic matter is decomposed in the absence of air.
2. **Aerobic Method:** Aerobic composting is a process in which organic waste materials are converted to compost in the presence of air. In this method, it is important to ensure proper movement of air through the mass by turning and raking. Under aerobic composting, there are different methods which can be categorized as under:-
   a. *Heap method*: In this method, all hardy stalks and woody biomass of 15-20 cm are spread as a thick base for the heap. This is covered with alternate layer of carbon rich biomass e.g. rice straw, saw dust etc of 20cm and nitrogen rich biomass e.g. fresh grass, weeds, animal feeds, kitchen wastes etc of 10 cm thickness are

spread till a height of 1.5m is reached. The heap is covered with a thin layer of soil or dry leaves and then given a thorough turning after every 7-10 days.

b. *Pit Method*: In this method, layers of materials are used as in the heap method and are placed in a pit of 1m depth, where length and breadth of the pit may vary with the availability of the composting materials. The pit is then covered with soil. The contents are mixed after every 15 days until the compost is ready.

c. *Berkley Method*: Berkley method is highly labor intensive but it is fast as compared to other method of composting. Easily biodegradable materials such as grass clippings, waste green vegetable materials are mixed with dry matter in the ratio of 2:1 and is piled up to a height of 1.5m and after moistening, it is left for 3 days. On the 4^{th} day, the heap is thoroughly mixed. This is repeated on the 7^{th} and 10^{th} day. The compost is ready in 2 weeks.



Uses Of Compost:

Compost serves as an excellent soil conditioner and adds essential nutrient to soil. It can be used:-

a) As a soil amendment: Mix two to five inches of compost into vegetables and flower gardens each year before planting.

b) As a potting mixture: To enrich soil in the pot, add one part of compost to two parts of soil.

c) As a mulch: Spreading compost around trees and shrubs help to keep roots moist, control weeds, prevent soil compaction and control large temperature variations.

Benefits Of Using Compost:

i) It helps in reducing the adverse effects of excessive alkalinity, acidity or the excessive use of chemical fertilizers.

ii) It helps keep the soil cool in summer and warm in winter.

iii) It aids in preventing soil erosion by keeping the soil covered.

iv) It helps in controlling the growth of weeds in the garden.

v) Control soil borne diseases, improves soil health and increases yield.

vi) Helps in recycling of organic wastes, thereby reducing pollution and ensures sustainability in agriculture.

Thus, organic manures play a great role in supplying balanced nutrients besides retaining substantial amount of moisture. A good quality compost free from weeds, pathogens and rich in nutrients is a prerequisite for adopting organic farming practice. Composting is a nature's way of recycling and is a rich source of organic matter. Composting yard waste and kitchen scraps is one of the best and easiest things we can do to reduce waste and grow a healthy, sustainable garden.

AZOLLA-A Boon To Organic Agriculture

T. Esther Longkumer, SMS (Soil Science), KVK-NRCM, ICAR, Porba, Phek.

According to the National Organic Standard Board (NOSB, 1995), Organic Agriculture is defined as 'An ecological production management system that promotes and enhances biodiversity, biological cycles and soil biological activity'. It avoids the use of chemical fertilizers, pesticides, growth regulators and livestock feed additives but favours the use of organic materials (crop residues, animal manures, on-farm wastes etc) for maintaining soil productivity and fertility. There is an immense scope of organic agriculture in the North East Region as the use of inorganic fertilizers and chemicals is meager and almost all the households are maintaining livestock producing sufficient quantity of on-farm wastes which could be efficiently used for organic agriculture. The region is having a potential of about 47 million tonnes of organic manures which includes 37 million tonnes of animal dung and 9 million tonnes of crop residues.

Azolla is one of the potential components available for nutrient management in organic agriculture. *Azolla*, a small free floating water fern belonging to the family Azollaceae, is available naturally on moist soils, water surface of flooded rice fields, small ponds and canals. Its size is about 1.5-3.0 cm in length and 1.0-2.0 cm in breadth. The locally found *Azolla* is *Azolla pinnata*, while some better species like *A. caroliniana* and other *Azolla* hybrid can be obtained from research institutes. *Azolla* supplements nitrogen to rice crop by fixing atmospheric nitrogen in the soil for crop growth, crop production and thereby maintaining of soil fertility. Besides these, *Azolla* is also used as a feed for pig, duck and fish.

Favourable Condition For *Azolla* **Growth**

Water **:** 10-15 cm depth fresh water is necessary for multiplication.

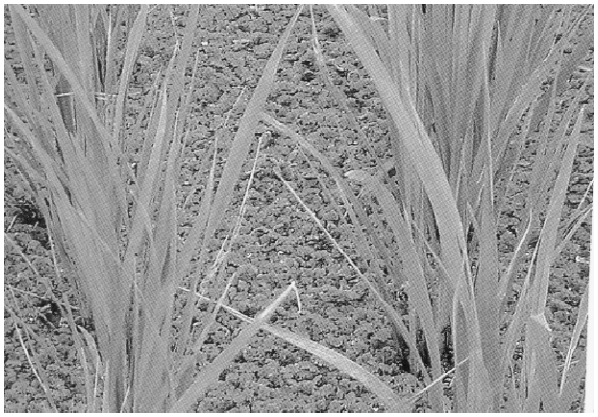
Temperature **:** *Azolla* multiplies at the daily mean temperature of 15-30°C.

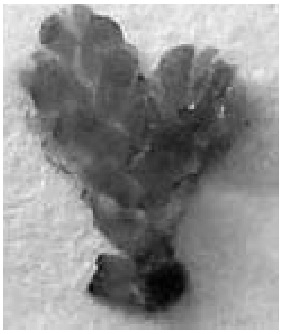
Light **:** *Azolla* prefers to grow well under partial shade, so as dual cropping with rice gets partial shade from rice plant.

Soil pH **:** *Azolla* grows well in slightly acidic soil having 5.2 to5.8 pH .

Method Of Cultivation And Incorporation Of *Azolla* For Rice Cultivation

In lowland field, small beds of the size 2x1x2 m is made and only 10-15 cm standing water is allowed in the ponds. Fresh *Azolla* of about 400gm and dry cowdung @ 100gm are mixed and spread in the beds for further growth and multiplication. *Azolla* multiplies rapidly and form a thick mat in just 2 weeks (10-15 days). This *Azolla* is harvested and transferred in the transplanted rice field as dual cropping for fixing nitrogen to rice crop. During summer, *Azolla* is harvested at an interval of 15-20 days but during winter, growth of *Azolla* becomes slow due to moisture stress and low winter temperature. Hence, *Azolla* can be harvested at an interval of 25-30 days





Azolla in rice field

Rice-Duck-*Azolla* System

Rice-duck-*Azolla* culture is widely practiced in organic rice farming system, where duck is introduced in paddy field primarily for weeding purpose by disturbing the soil surface. *Azolla* provides nitrogen nutrient to rice and protein for duck and contributes to the suppression of weeds as well. Duck, on the other hand, contributes to *Azolla* insect pest and spreading *Azolla* by its movement. The excreta of duck also supply phosphorus to *Azolla*..

Multiple Effects Of Rice-Duck-*Azolla* Farming

Components	**Effects**	**Artificials**
Duck	-Disturbs and tillage	Cultivator
	-Eat young weeds	Herbicides
	-Eat rice pests i.e. Brown hoppers etc.	Insecticides
	-Eat *Azolla* pests i.e. Pyraids	Insecticides
	-Provides nutrients to rice and *Azolla* from excreta	Fertilizers
Azolla	-Fixes Nitrogen	Nitrogen fertilizers
	-Feeds to duck	Artificial feeds
	-Depress weeds	Herbicides

Azolla can also be converted into a compost by composting in pits for a month which can then be used in kitchen gardens and other crops grown in upland situation. *Azolla* compost contains Nitrogen-3.33-4.00%, Phosphorus-0.57-0.69% and Potassium-3.50-4.00%.

With its immense potentialities, the developing of *Azolla* culture has a number of benefits, some of which is enumerated below:-

1 Use of *Azolla* increases rice yield by 20-30 %.

2. Under lowland condition, a thick *Azolla* mat does not allow the aquatic weeds to grow in rice field thus, *Azolla* suppresses the weed growth and creates a congenial condition for rice production.

3. *Azolla* is used as a feed for pig, duck and fish. It has high protein content. On dry weight basis, *Azolla* can be mixed up to 10 % of the purchased animal feed.

4. *Azolla* reduces evaporation from water surface and increases water use efficiency in rice.
5. Nutrients in flood water cannot be directly absorbed by rice. So, *Azolla* can accumulate nutrients from floodwater and provide nutrients after *Azolla*'s decomposition
6. Physico-chemical properties of wetland rice soil is significantly improved by these integration system.

From time immemorial, farmers all over the world had used compost, green manure and other organic residues as a major source of nitrogen to promote plant nutrients and crop production. As *Azolla* has the potential to maintain soil organic matter status by fixation of nitrogen and integration of rice-fish-*Azolla*-duck, it is most beneficial for farmers over conventional rice mono-cropping for sustainable rice farming.

Agricultural Mechanization

Chitrsen Lairenjam, SMS (Agri. Engg.), KVK-NRCM, ICAR, Porba, Phek.

Mechanization is simply the substitution of human labour /activities with machines or tools/implements to enhance the efficiency and timeliness of working. Farm mechanization has become an integral and major component of modern agriculture. Different types of farm operation starting from land preparation to harvesting are involved in Agriculture. All these operation are labour intensive and time consuming. Failure to complete an operation in stipulated time may sharply decline the production of the crop. In order to reduce drudgery of farming operation, various types of tools and implements are developed for various farm operations. However, maximum of the development has been limited in plain areas prior to the development of power tiller and other small machineries which are suitable for hilly areas.

The main objective of mechanization is to increase the production by timely operation and increasing the efficiency of work. Sometimes, due to lack of labour, particular operation can not be done at the stipulated time, which in turn affects the growth and ultimately declines the production. The use of machines and implements saves labour and reduces the time of operation. It helps in performing the operation timely and also increases the area under cultivation. Mechanization will not only make agriculture easier but will also provide opportunities to the farmers to use their intelligence, skill and to take up new initiatives.

Mechanization of hill agriculture requires unique sets of machine, which are small in size, light in weight and capability to do maximum possible operation. Thus, machines/implements should be such that it would be taken uphill or down the slope by two-three persons. It must be able to operate in the narrow terraces and deep valley where other bigger machinery is unable to reach and perform. It should have more field capacity and efficiency of working.

Mechanization is concerned with effective application and management of machines, systems and structures in agricultural production. Most of the farm operations are labour intensive and are performed with the use of small tools made of wood and steel. These are modified by using more durable material and considering ergonomic factor (Human Engg.). Various improved farm implements for hill area were developed at ICAR (Indian Council of Agricultural Research) with consideration of local area needs and condition. Numbers of the new tools and implements were also developed to suit the agro climatic and socio- economic condition of the region, namely, mould board plough, ridge plough, wheel hoe with attachment for Earthing- sowing- planting, pedal Paddy thresher and tubular maize Sheller.

Mould board plough is an effective implement, use for primary tillage operation and helps to the dig soil and inverts it for quick decaying surface trash and stubble under terraces and valley land condition. The inversion percentage of this plough is as high as 80% to that of local plough which can invert 37.25% only. This plough can be pulled by single bull or by attaching to power tiller. Wheel hoe is manually operated walking type device and can be used for various operation right from the opening of furrow for sowing seed to interculture and earthing up operation and weeding of unwanted grasses under terrace land condition where line sowing of crop is done.

One of the most interesting implement is paddy thresher. Generally Paddy threshing is done by beating bundles of crops manually on wooden log/ stone or bamboo platform. In Nagaland, paddy threshing is done by stepping onto the harvested Paddy and rubbed which is quite labour intensive and time consuming. Usually during threshing period i.e. in the month of November and December, rain is observed in the state. Due to which drying of harvested crop become difficult and farmers want to complete threshing of the crop as early as possible to avoid the

damage due to bad weather. In this case mechanical paddy thresher can be employed which is manually/power operated. Manually operated paddy thresher consists of a rotating wooden drum with spike at regular interval in staggered fashion and get rotates from the pedal which is operated by one person. Threshing of paddy crop can be done by holding paddy bundles against moving cylinder. It can thresh 30-50 kg/hr of grain.(Paddy). It saves 20% labour and 40% operating time. Another type is operated with motor and consists of blower which helps to throw the broken chaff at some distance away from grain. Thus grain obtained has less chaff and broken straw than pedal type thresher. Threshing efficiency is quite high in this case and labour saving of 60%.

Power tiller is a useful power source for the NEH region since it can be used for ploughing puddling, interculture, basin making, spraying and transportation in paddy cultivation. The power tiller, reaper, paddy transplanter and auger digger have great potential in the region. Recently entrepreneurs have started manufacture of lightweight power tillers in the reduced hp range of 3- 5 hp. All these seem to be suitable for small terraces in hilly areas.

Mechanization of farm operations like tillage, sowing, interculture, irrigation, harvesting and threshing results in increasing the crop production. However, mechanization in hill area has many constraints. Steepness of the land results in erosion, sedimentation and flooding, low soil fertility causing low productivity. Due to lack of proper transportation the supply of farm machines and farm machineries are difficult thus limiting the process of mechanization. The major constraints of the agricultural mechanization include unawareness, less exposure, inadequate capital and lack of effective policy. Proper training, demonstration, motivation and financial support to the farmers may bring out success of mechanization in agriculture

Bioenergy And Agriculture

Hannah K Asangla, SMS (Agro.), KVK-NRCM, ICAR, Porba, Phek.

The rising world fuel prices, growing demand for energy and concerns about global warming are the key factors for increased interests in renewable energy sources particularly in biofuels.

Bioenergy and biofuels:

Bioenergy is energy generated through biofuels. Biofuels are fuels of biological and renewable sources such as fuel wood, charcoal, livestock manure, biogas, bioalcohol, microbial biomass, agricultural waste and by-products and energy crops. The main sources of bioenergy are:

- Agricultural residues and wastes
- Purpose grown crops
- Wild vegetation.

In their raw form, these sources are usually called biomass, however, the term "energy feedback" is also used mostly for purpose grown energy crops. Bioenergy accounts for nearly 10 per cent of total world energy supplies. It accounts for 33 per cent of energy use in developing countries and only 3-4 per cent in industrial countries. Liquid biofuels (bioethanol/ethanol or biodiesel) for transporting are relatively minor sources of energy use and are produced in few countries at present. Brazil and the United States are the largest producers of ethanol for transport, accounting for 90 per cent of world production. The primary feedstock for ethanol is sugarcane in Brazil and maize in the United States. France and Germany are the largest producers in the European Union and rapeseed is the primary feedstock for biodiesel. The other developing countries having sizeable biofuel programmes are China, India, Colombia and Thialand.

Bioenergy and Agricultural Development:

As petroleum reserves fall and fuel prices rise, converting agriculture to produce energy as well as food has become an important area of global research. Production of energy with sustainable food production and the sustainable use of resources could result in higher incomes for farmers and added energy services for the community. With an oversupply of most agricultural commodities in the world, diverting some of the agricultural resources towards production of bioenergy offers an attractive way of helping farmers, especially in industrial countries. Certain energy crops like trees and grasses require limited inputs and can be grown in unproductive land such as, degraded land.

Bioenergy and Technology Options:

A large number of technologies and systems are available to provide biomass based energy services, but many of them are still under development or in early stages of implementation. However, there is considerable scope for exploiting small scale options for growing and processing biomass to meet local energy needs in the developing countries.

Alternative Crops with Potential for Biofuel Production:

Many developing countries cannot afford to use edible oils as an energy source due to their short supply and cost factor. Thus, non edible oils such as *Jatropha, Pongamia, Neem, Kusum* and *Pilu* are being considered for biofuel production. *Jatropha carcus* ans *Pongamia pinnata* could be used to supplement traditional, highly polluting fuels and provide employment to landless and marginal people. Both *Jatropha* and *Pongamia* grow in low rainfall areas and on problematic soils and wastelands. They are easy to establish, fast growing and hardy and are not browsed by

cattle and goats. *Jatropha* and *Pongamia* seeds contain 25-40 per cent oil and after extraction of oil it is rich in macro and micro nutrients which serve as an excellent organic fertilizer.

Bioenergy and food security:

Although biofuel production is expected to provide overall benefits for the agricultural sector, the net impact on poverty and food insecurity in developing countries has been an issue. However, there are several ways to reduce the "food versus fuel" trade - off between bioenergy and food production:

- Developing biomass crops that yield much higher amounts of energy per hectare thereby reducing the resource needs of bioenergy crops.
- Focus on food crops generating by-products that can be used for bioenergy and breeding varieties that produce larger amounts of by-products.
- Develop and grow biomass in less favoured areas rather than in prime agricultural lands.
- Invest in increasing the productivity of the food crops.
- To remove barriers of international trade in biofuels while enabling the countries to focus on growing the kinds of food, feed or energy crops for which they are most competitive. Trade would allow bioenergy production patterns to change in the most effective way.

Indigenous Technical Knowledge in Agriculture

Hannah K Asangla, SMS (Agro.), KVK-NRCM, ICAR, Porba, Phek.

India has been nurturing a tradition of rich civilization over a period of 5000 years. India's ancient scriptures, teachings of sages as well as innumerable sayings and proverbs contain profound store house of ideas, concepts and practices that are designed for harmonious relationship among man, animal and nature. The literature is mostly based on indigenous technical knowledge (ITK) experiences that gathered momentum through generations and are being developed and standardized through experimentation and practices. Indigenous technical knowledge is the knowledge that people in a given community have developed over time and continue to develop which is based on experience often tested over a long period of use, adopted to local culture and environment, dynamic and lays emphasis on minimizing risks rather than maximizing profits. The ITK covers a wide spectrum viz., soil, water and nutrient management, pasture and fodder management, crop cultivation, plant protection, farm power, post harvest preservation and management, agro - forestry, animal rearing and health, fisheries and fish preservation and ethnic foods and homestead management.

Sources of Indigenous technical knowledge:

1. Farmers and the community members especially elders are the best sources of ITK, but it is important to find out who knows what to tap the right sources otherwise data will not truly reflect the ITK in the community
2. Folk-lore, songs, poetry and theatre can reveal a great deal about people's values, history and practices. These are often recited from generations and not written down, hence need to be recorded.
3. Although ITK is generally transmitted verbally there do exist some prove through writings, paintings and carvings
4. Village extension workers can be a valuable source of ITK. Other resource persons are school head master, credit co-operative society officials, village milk co-operative members, men and women labourers and village Panchayat Sarpanch
5. Secondary sources include published and unpublished documents, databases, videos, photographs, museums and exhibits

Practices based on Indigenous technical knowledge

Indigenous technical knowledge – based practices have been documented under Mission Mode National Agricultural Technology Project on collection, documentation and validation of Indigenous technical knowledge. Some of the ITK's for agronomical crop are as follows:

1. **Lodging of rice in water logged conditions** – Farmers of Khalisha and Udwaninagar village of Bhojpur district in Bihar use this practice for preventing lodging of rice during maturity period in water logged conditions. In this condition, after two months of transplanting the upper portion of the rice plant is cut with the help of sickle. Excess growth of the rice plants is checked due to pruning of upper portion of the plant hence, lower part of the plant becomes strong.
2. **Mixed cropping of maize and soybean** – Maize is sown in April and May and then soybean is broadcast to minimize insect pest attack, increase crop production and maintain soil fertility.
3. **Control of pod borer in chickpea by mixed cropping with coriander** – To reduce the attack of pod borer in chick pea mixed cropping with coriander is followed by farmers of Senduria village in Ballia district of Uttar Pradesh.
4. **Sunflower seed hardening with buttermilk (diluted curd)** – The hard impermeable seed coat of sunflower is softened by soaking the seed in the sour buttermilk, this act as growth activator and accelerates germination besides it ensures uniform germination or crop stand of sunflower.
5. **Intercropping of maize and groundnut** – Farmers sow two lines of maize after every four lines of groundnut in rainy season (Kharif). Maize is harvested earlier since it matures early; the furrows made after harvesting

of maize are used to collect the rain water. It is sprinkled in the adjoining four lines of groundnut. Farmers also assume that this practice facilitates early harvesting of groundnut. Harvesting and recycling are done in different ways according to local conditions.

6. **Control of leaf folder and stem borer in paddy** – To control leaf folder and stem borer in paddy, spraying of kerosene is practiced. Kerosene @ 1 litre/ha mixed with soap water is sprayed.
7. **Use of extract of neem and *Parthenium* leaves to check infestation of *Helicoverpa sp***. - In Shirpur and Sindhkheda tehsils of Dhule district in Maharashtra, farmers use extract of neem and *Parthenium* leaves to check infestation of *Helicoverpa sp*. Neem and *Parthenium* leaves are taken in equal quantity, crushed and dipped in water for 24 hr. the extract solution @ 20 ml is sprayed in dilution with water in 10 litres of water.
8. **Trap crop of marigold with pigeon pea and groundnut** – The practice of taking groundnut as trap crop is in vogue in Rotarypuram and Venkatampalli in Anantapur district of Andhra Pradesh since time immemorial. In this practice, 45 days old seedlings of marigold are planted in pigeon or groundnut as intercrop. Marigold act as trap crop for *Helicoverpa armigera*. Adults lay eggs in the flowers of marigold which are controlled by spraying on marigold.
9. **Use of dried leaves of *Lantana* and *Eucalyptus* to control insects in stored grains** – *Lantana* and *Eucalyptus* leaves has insecticidal effect. Dried leaves of *Lantana and Eucalyptus* are mixed with dried grains (paddy) @ 1 kg/100kg grain and kept in closed bins. Fresh leaves of both can also be spread over potato tubers which are meant for seed purpose to protect against potato tuber moth.

Hence, ITK based practices will help to furthering the concept of biodynamic and natural farming where the soil health building process is left to the nature, as the inputs for ITK are drawn from the products of soil and are returned to the soil in the form of compost or manure or soil and plant health protecting agent. Integration of ITK and scientific knowledge will help develop technologies that would be more need-based, better problem solving, locally applicable, easily acceptable, economically friendly and more credible and convincing to the farmers.

Weed management in paddy

Hannah K Asangla, SMS (Agro.), KVK-NRCM, ICAR, Porba, Phek.

Introduction:

Water is the life blood of plant life and is indispensable to any living system. Water produces turgidity of the cells and thereby gives mechanical strength to the plant. It also plays a major role in the mineral nutrition of the plant by solubilizing the inorganic minerals and organic substances present in the soil. Among all cereal crops rice has the lowest productivity per unit of water use. Continuous deep flooding of the water practiced in rice cultivation consumes huge quantities of water.

Water requirement of lowland rice:

The total water requirement of rice cultivation is several folds higher than the upland crops of similar duration. The water requirement includes water needed to raise seedlings in nursery, preparation of land for transplanting and to grow crop from transplanting to harvest. The water requirement varies with several factors such as soil texture, topography of land, water table depth, proximity to main irrigation source, area of contiguous rice fields, field duration of crop, method of land preparation and growing season etc. Water is lost from flooded rice field through transpiration, evaporation and percolation. Although evapo-transpiration losses are more or less constant but percolation losses are variable. It is observed that most of the water losses in rice crop range from 6 to 10 mm/day. On an average the water requirement of rice crop per month varies from 180-300 mm to produce good harvest. It is estimated that 150-200 mm of water is required for nursery preparation and 250-400 mm for raising nursery for a period of 30-40 days. The water required for soaking, ploughing and puddling of main field is about 200-300 mm. Water requirement in the field from transplanting to harvest is between 800-1200 mm with a daily consumption of 6-10 mm.

Fish culture associated with rice cultivation:

Fish production in rice field needs adjustments in the depth, continuation of irrigation and drainage systems before and after rice has been harvested. Water depth should not be below 10 cm and deep water rice varieties should be encouraged in this situation. The field bunds should be high and strong to maintain the water level continuously. Refuge areas should be 4 percent of the plot area (10000 m^2 plot must possess a 400 m^2 refuge trench). After transplanting rice, water depth reaches about 10 cm during active tillering and young fingerlings are broadcasted in the field. Young fish are introduced at the rate of 2000 numbers per hectare. The fingerlings must be about 8 cm long or weigh about 10 gm. When water is drained for harvest, the fish enter the refuge trench. Rice is harvested leaving stubble 40 cm high. Soon after the crop is harvested, the fish are allowed to leave the refuge and return to the rice plots where they remain until the land is prepared for the next season crop. The fish production under this system can reach upto 300 kg/ha under favourable conditions. It is also observed that rice yields enhance by about 10 % as a result of fish culture. The pest incidence particularly brown plant hoppers are low in these plots.

Irrigation practices for rice culture:

The entire country cannot adopt common flooding in rice cultivation. Irrigation practices vary from region to region and one specific water management practice recommended to one location may not hold good in another location. These irrigation methods mainly vary with soil, climate, topography, water source and supply, cultivar, type of culture and local customs etc.

Static flooding:

Continuous static flooding is usually practiced in areas where adequate water supplies are available. Minimum efforts are required for the static flooding of rice. This practice can be divided into 3 categories i.e., shallow flooding (2.5 to 5 cm depth), medium flooding (5 to 8 cm) and deep flooding (15 cm or more).

Advantages of shallow flooding:

- Shallow flooding is an optimum water regime to produce higher yields
- Evapo-transpiration losses are optimum, seepage and percolation losses are relatively small
- The total water requirement for early duration variety in this system ranges from 600 to 800 mm per crop season
- Tillering activity of crop is maximum and the crop is less to lodging
- Management of crop is minimum
- Weed control is minimum, grassy weeds are effectively controlled in shallow water regime

Disadvantages:

- The land leveling should be perfect so that the water distribution is uniform in every corner of the field
- Sedges and broad leaved weeds are less susceptible for shallow flooding
- Crop may be prone to drought stress if the water supply is uncertain

Water requirement varies with stage of plant growth:

The stage of plant development determines the water management in rice cultivation. In ideal conditions a thin film of water (2 cm depth) is sufficient during early vegetative phase. In direct seeded rice, flooding should be started 20 days after sprouting or sooner if weeds grow vigorously. Weed competition is critical upto 20-40 days after transplanting. Water depth should be increased gradually to follow plant growth, avoiding depths below 5 cm or above 7 cm and making adjustments for water and soil temperatures and the abundance of weeds. High water levels inhibit tiller formation at vegetative phase and grain formation at reproductive phase. It also reduces water and soil temperatures and causes more water losses through infiltration as a result of high hydraulic pressure. The water level should be highest when the crop is ready to flower stage to milky stage of grain. The plots should be drained when 90 % grains reach dough stage.

Factors affecting water management:

a) **Leveling of plot** – The leveling of plots is the most important factor for rice cultivation. Perfect leveling of land has its effect on the height if the shoots, weed control and irrigation water consumption. It avoids losses caused by drowning of rice in low parts of insufficiently leveled plots

b) **Weed infestation** – Better water management helps to limit weed competition. The emerged weeds are incorporated in the soil during puddling.

Critical stages for crop water stress:

Water stress of any crop stage may reduce the growth, development and biomass production. The most common symptoms of water stress are leaf rolling, leaf scorching, impaired tillering, stunting, leaf drooping, withering of leaves, delayed flowering, spikelet sterility and partial grain filling etc. However the rice plant is most sensitive to water deficit at certain growth stages only. Water stress during these stages upset the metabolic activities of plant and resulted in severe biological and economical yield as well. Sufficient water supply during sensitive stages and moisture stress during the rest of the tolerant growth stages gives normal yield without any significant reduction in growth.

1. **Seed sprouting stage** – Although the seeds absorb plenty of moisture for germination, the water requirement is low. If the seeds are submerged under water the development of radial is adversely affected due to lack of oxygen.
2. **Rooting stage** – At the time of transplanting, saturation condition of soil is most ideal for the initiation of new roots and establishment. The seedling may float without anchorage if the field is flooded at the time of transplanting. This saturation condition should be maintained upto 3 days for the consolidation of soil.
3. **Early tillering** – Sufficient shallow flooding may be provided to facilitate root production. Flooding with medium cold water helps in the quick establishment of seedlings in hot areas. Water stress during the period results in death of hills and more gap filling is needed later.
4. **Tillering stage** – Following the rooting stage, shallow flooding continuously facilitates tiller bud formation and production of roots profusely. Shallow flooding with fresh water promotes the formation of root mat and anchorage in the soil due to oxygen supply. Excess water at active tillering seriously hampers the rooting activity, mineral uptake and decreases tiller production tremendously. Leaf blades and sheaths become light green, brittle and weak and prone to susceptible to pests and diseases in deep water areas.
5. **Reproductive growth stage** – The plant enters the reproductive phase after maximum tillering stage is completed. The phase starts from panicle primordial development to flowering stage. Booting and heading are intermediate stages in reproductive phase. The rice plant is most sensitive to water deficit from reduction division stage to heading. Water stress during vegetative stage may reduce plant height, biomass, leaf area and tillers but the yield may not be affected if the irrigation is supplied to permit the plants recovery. A large amount of water is consumed in the major part of reproductive period i.e., from panicle initiation to flowering. Impeded panicle formation and improper fertilization are the major drawbacks when sufficient moisture is not available. Excess water during reproductive stage causes decrease in culm strength and increases lodging after flowering or at the booting stage.
6. **Grain filling stage** – This is the last phase of crop growth in which fertilized embryo develops into matured grain. This phase is also most important but comparatively less susceptible than reproductive phase. The grain has to pass milk, dough, yellowish dough and full ripening stages. The milk stage is more important than the rest. Draining of water 1 week before harvest allows the panicles to ripen uniformly and facilitate easy harvest.

Integrated pest management in paddy

Hannah K Asangla, SMS (Agro.), KVK-NRCM, ICAR, Porba, Phek.

Introduction:

Rice is the major food crop of this region and is grown extensively in plains to higher altitudes. The crop is grown in valleys, terraces, uplands, on hill slopes in Jhum. Under rainfed condition in upland only one crop is taken which is sown in the month of June - July and harvested in October-November. In wet land cultivation three crops are taken which are locally known as *Ahu* (March-April), *Aman* / *Sali* (July - August) and *Boro* or winder crop (December - January). The rainfed lowlands and uplands constitute about 70 % of rice acreages in India. Rice insect pest continue to be one of the major constraints to rice production and cause about 20 % losses. The climate of the region, with high rainfall and high humidity is ideal for population built up and survival of rice insect pests. Pest management is an ecological based strategy of regulating pest populations below the ETL by use of the most appropriate control techniques available. Control tactics including cultural, mechanical, chemical, and genetic and biological control agents play an important role in the management of rice pests. To manage pest populations so that economic losses are avoided and adverse effects on the environment minimized, these control tactics must be integrated into a unified system as based on sound ecological knowledge. Integrated pest management (IPM) is a pest management system associated with the environment and the population dynamics of pest species, utilizing all suitable techniques and methods and maintains the pest populations at levels below those causing economic injury to crops. Some of the techniques for IPM in rice are given below:

1. IPM for rice stem borers

- Hot weather cultivation and destruction of stubbles
- Clipping the tips of the seedlings at the time of transplanting removes the egg masses
- Use of resistant / tolerant varieties
- Planting flowering crop on bunds, which may provide nectar to wasps / predating insects
- Check seedlings and if infested soak them for 3-4 hours in 0.02% chloropyriphos + 1 % urea solution for 3 – 4 hours
- Collect egg masses and put them in parasite release bamboo trap
- Setting light traps may collect the moths
- Rouging of infested plants
- Harvesting just above the ground level helps to remove the hibernating larvae
- Conserve natural enemies such as spiders, damsel fly, tiger beetle, ladybird beetles
- Release of *Trichogramma sp*. Egg parasitoids @ 50000/ha after 30 days after transplanting
- Avoid use of broad spectrum pesticides which kill the natural enemies.

2. IPM for plant and leaf hoppers

- Clean cultivation – timely weeding
- Optimum spacing of 20 X 15 or 20 X 20 cm
- Use of resistant / tolerant varieties
- Draining the fields during the early stage of infestation can check the pest to some extend
- Conserve defenders by putting straw on bunds
- Use of selective insecticides which are safe to bio agents in strips/ patches
- Give targeted to basal portion of plant, spray should not be directed to upper surface

- Use of balanced fertilizer avoiding high nitrogen
- Conservation of natural enemies

3. IPM for rice gall midge

- Use of resistant / tolerant varieties
- Uprooting affected tillers while weeding
- Wider spacing is recommended as the infestation is more in closed spaced fields
- Draining of the fields is also useful
- Late planting should be avoided
- Removal of alternate host and weeds also reduces the pest population
- Soaking seedlings in 0.02 % chloropyriphos + 1 % urea solution for 3 – 4 hours
- Conservation of natural enemies

4. IPM for rice bug

- Manage weed on bunds, nearby and in field
- Collection of egg masses and put in parasite release bamboo trap
- Collection of nymphs found congregating on the panicles in the early morning or late afternoon hours and putting them into kerosene water
- Use of light traps
- Use of rotten crab during milking stage will attract and control the bug
- Short duration and early sown crop escape the infestation
- Destruction of stubbles is recommended
- Conserve natural enemies such as spiders, damsel fly, tiger beetle, ladybird beetles

5. IPM for army worm

- Flooding the field may reduce the pest population
- Give insecticidal band for unaffected fields or barrier to marching population
- Conserve natural enemies such as spiders, damsel fly, tiger beetle, ladybird beetles
- Duck herding in affected field is very effective

6. IPM for rice hispa

- At nursery stage clipping and burying the shoot tips can reduce grub population
- Use resistant / tolerant varieties
- Hand nets can be used to trap the pest
- Excess nitrogen application should be avoided as highly fertilized crops seem to favour the development of this pest
- Avoid use of broad spectrum insecticide. Only need based, selective and safe insecticide should be used

7. IPM for rice leaf folder / roller

- Install light traps in the central place of the field to reduce the adults
- Wider spacing is recommended
- Collection and destruction of folded leaves with the larvae inside
- Removal of grasses from the field bunds

8. IPM for rice caseworm

- Collection and destruction of cases along with the larvae inside
- Application of kerosene in standing water and lodging the caseworm with the help of ropes swiped through the fields and draining the water after 5 – 6 hours
- Clipping the tips of the seedlings at the time of transplanting removes the egg masses
- Conservation of natural enemies
- Release of Trichogramma sp. Egg parasitoids @ 50000/ha after 30 days after transplanting

Integrated pest management schedule

Although the cultural, mechanical, use of resistant varieties and biocontrol agents augmentation is recommended, the use of insecticides in a limited form would continue as one of the component of IPM.

- Dip the roots of seedlings before transplanting for about 12 hours in Chloropyriphos 0.02 %. Apply Carbofuran 3G 0.5 – 1 kg a.i./ha at 20 and 40 days after transplanting (DAT) and even if the pests appear, spray the crop with Endosulfan 0.1 % or Carbaryl 0.1 % or Quinolphos 0.05 %
- Application of Carbofuran 3G @33.33 kg/ha in two doses, 1^{st} as soil incorporation before planting at last puddling and 2^{nd} at 60 DAT in 2 – 3 cm standing water followed by spraying on Monocrotophos 0.05 % concentration at milky stage of the crop against gundhi bug gave effective protection and also higher production.
- During epidemic of hairy caterpillar spray Quinolphos 0.05 %
- Application of Carbofuran 3G @ 3.33 g/ sqmt as soil incorporation before sowing was found effective in controlling insect pests in nursery beds.

Prospects of Ouality Protien Maize (QPM) production in Nagaland

R. K. Singh and Hannah, K., Krishi Vigyan Kendra - NRCM, Porba, Phek, Nagaland

Introduction:

Maize (Zea mays) plays an important role in human and animal nutrition. It is the major cereal crop which is used for livestock feeding. Maize has acquired a well deserved reputation as poor man's nutricerea, with its high content of carbohydrates, fats, proteins, some of the important vitamins and minerals. It is the second most important cereal crop of Nagaland after rice. Currently it is being cultivated in 64700 ha with 108.30 thousands tonnes production with an average productivity of about 1.66 tonnes/ha. However, countrywide maize has third place in area with an average productivity of 2.35 tonnes/ha. Nagaland has maximum area, production and productivity among North Eastern Region states (Table 1). QPM production has significance in this region because of its higher productivity over normal maize and its amino acid value particularly lysine and tryptophan. The normal maize contains 8.92% CP, 0.24% lysine and 0.06% tryptophan whereas QPM contains 9.11%, 0.32% and 0.08% CP, lysine and tryptophan, respectively.

Table -1: Estimates of area, production and productivity of maize in NER states

State	2004-2005			2005-2006			2006-2007		
	Area	Prod.	Yield	Area	Prod.	Yield	Area	Prod.	Yield
Arunachal Pradesh	37.8	55.0	1455	41.9	57.9	1373	46.3	63.5	1363
Assam	19.2	13.9	724	19	13.7	721	18	14.0	778
Manipur	3.2	8.9	2781	2.9	7.9	2724	2.9	7.9	2724
Meghalaya	16.9	24.0	1420	16.9	24.1	1426	17.0	25.0	1471
Mizoram	7.5	15.7	2132	11.7	20.7	1917	10.7	21.0	1942
Nagaland	46.4	83.5	1607	51.6	92.9	1587	64.7	108.3	1655
Sikkim	36.7	58.2	1586	37.9	56.5	1491	37.9	56.5	1491
Tripura	2.8	3.0	1071	2.2	2.2	1000	2.5	2.4	960

*Area in 000 ha, Prod. in 000 tonnes and yield in kg/ha

Majority of the people being non-vegetarian in food habit, livestock plays vital role in socio-economic life of Nagaland. People rear domestic animals – pig, poultry, cattle, buffalo, goat etc. They also keep Mithun but in

semi-wild condition. The demand of the meat and egg is very high. This provides ample scope for the growth of maize cultivation in the state. The crop is uniformly distributed in all the districts of Nagaland (Table 2).

Table -2: Estimates of area, production and productivity of maize in different districts of Nagaland (2007)

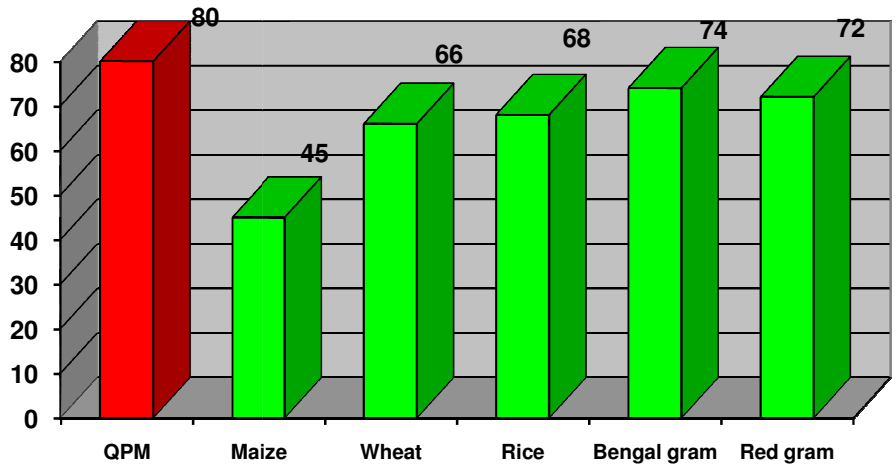
District	Area (000 ha)	Production (000 Tonnes)	Productivity (kg/ha)
Kohima	6.58	10.97	1667
Phek	9.55	15.99	1674
Zunheboto	8.01	13.04	1668
Wokha	6.64	10.76	1665
Mokokchung	6.38	10.60	1661
Tuensang	9.37	15.69	1674
Mon	7.53	12.62	1675
Dimapur	10.82	18.04	1668
Total	**64.70**	**108.31**	**1669**

The area, production and productivity of the crop is also increasing continuously in the state which is evident from the table-2. Introduction of QPM will further boost the productivity of maize as it has production potential of 4.5 – 7.5 tonnes/ha. Same time it will increase the nutritive value of human and livestock food as it has better quality protein with almost twice of lysine and tryptophan amino acids than normal maize. The biological value of QPM is also higher than normal maize, making it more efficient over normal maize.

Quality Protein Maize (QPM):

Maize is a good source of carbohydrate, fats, proteins, some important vitamins and minerals. This constitutes major part of the feed for poultry and pigs in the state. The normal maize has an in-built drawback of being deficient in two amino acids, viz., lysine and tryptophan. But this problem has been overcome by breeders through incorporating opaque-2 mutant gene in normal maize. This gene is particularly responsible for enhancing the lysine and tryptophan content of maize endosperm protein. The modified maize produces grains with higher lysine and tryptophane content, hence improving the quality of the maize. Thus it is called as Quality Protein Maize (QPM).

Protein quality of normal maize is poor because of the presence of higher concentration of alcohol soluble protein fraction prolamine also known as zein in endosperm. This fraction contributes about 50 % in normal maize and is low in lysine and tryptophane content. On other hand zein fraction has higher concentration if leucine and isoleucine amino acids. This imbalanced proportion of amino acids results into the poor quality of the normal maize protein. The poor quality of the protein directly affects the biological value of the normal maize. On other hand in QPM this defect has been overcome by introducing opaque-2 gene. The zein fraction in QPM has been lowered to 30% so the biological value has increased to 80%, which is highest among all the cereals and pulses.



Biological value (%)of QPM, Cereals and pulses

Production Technology:

The production technology in general is same as normal maize. However some important considerations must be kept in mind during cultivation of QPM for achieving higher productivity. Maize being highly cross pollinated crop, there is every chance for contamination of QPM with normal maize in traditional maize growing area. To avoid the contamination it is advised to adopt the practice for larger area in one cluster. Time isolation may also work, as sowing time for normal maize is March-April in the state, so QPM sowing may be advanced by a month or may be delayed to avoid pollen contamination.

HQPM-1, HQPM-5, HPQM-7 and Shaktiman-3 are the suitable cultivars for the region. About 20 kg/ha seed will be required with 60-70 cm row to row and 20-25 cm plant to plant spacing. Though maize is cultivated here in rain fed condition but providing 1 to 2 irrigation at the critical stages (flowering and grain filling) ensures better yield. 1-2 intercultural operations are essential to control the weeds and intercultural operations should be followed with earthing up. Earthing up promotes better root growth and it should be done before tasseling stage to save the crop from lodging.

Maize stalk borer (*Chilo partellus*) is the major pest and can be controlled by release of 8 Trichocards (*Trichogramma chilonis*) per ha at 10 and 15 days after germination. Stalk rots, root rots and ear rots are main cause of yield losses in maize but proper seed treatment with *Trichoderma virdie* helps in checking the rots.

Harvesting of the crop should be done at 20% moisture level in grain to avoid post harvest loss. The harvested cobs should be sun dried and shelling can be done manually or mechanically at 12-13% moisture level. Grain should be further dried up to 8-10% moisture level before storing it in aerated jute bags.

Scope of QPM in Nagaland:

Maize can be grown in any season, but because of the paucity of irrigation water during rabi and zaid seasons, most of the crop is cultivated in kharif season only. Rabi maize is cultivated in Zunheboto and Dimapur districts of the state but the area under the rabi maize is only 2000 ha. Total area under maize in the state is 64700 ha and the productivity is 1.66 tonnes/ha, where as the productivity potential of QPM is 4.5 – 7.5 tonnes. The biological value of the QPM is almost double of the normal maize, so the requirement of the QPM grain as livestock

feed will be approximately half than the normal maize. So on one hand it has higher producing ability and on other hand the quality of the protein is two times better than normal maize. Poultry and pigs are the most common livestock raised in Nagaland for meat and both are monogastric animal. They require quality protein as they are unable to synthesize sufficient quantities of essential amino acids in their digestive tract. QPM holds the promise of providing desired amino acids in sufficient quantity. Following table (Table 3) clearly indicates the value of QPM as only shifting from normal maize to QPM can take care of protein demand of livestock in Nagaland.

Table 3: Projected human population and requirement of various livestock and products:

Year	Human popul-ation	Per annum requirement of various livestock product			Quantity of Maize or QPM to produce desired quantity of livestock products	
		Meat* (000MT)	Milk** (000MT)	Egg*** (000,nos.)	Normal Maize# (000MT)	QPM ## (000MT)
2008	2816521	87382.55	128503.70	257007.50	194.31	109.29
2009	2960103	91837.20	135054.70	270109.42	204.21	114.86
2010	3111006	96518.95	141939.60	283879.27	214.62	120.72
2011	3269601	101439.40	149175.50	298351.09	225.57	126.88
2012	3436281	106610.60	156780.30	313560.66	237.07	133.35
2013	3611459	112045.50	164772.80	329545.60	249.15	140.14
2014	3795566	117757.40	173172.70	346345.44	261.85	147.29
2015	3989060	123760.60	182000.90	364001.70	275.20	154.80
2016	4192417	130069.70	191279.00	382558.06	289.23	162.69
2017	4406141	136700.50	201030.20	402060.41	303.98	170.98
2018	4630761	143669.40	211278.50	422556.95	319.47	179.70
2019	4866832	150993.50	222049.20	444098.39	335.76	188.86
2020	5114937	158690.90	233369.00	466737.98	352.88	198.49

* 85 g/capita/day, ** 125 g/capita/day, *** 0.25 eggs/capita/day

considering 3 kg feed for every kg of meat/milk produced and feed has 30% maize grain

QPM requirement is calculate on the basis of biological value of the maize and QPM

Conclusion: The social, nutritional and health security of all people are the vital prerequisites for the development of societies. Protein is an important component of the food and normally the root cause of malnutrition. Cereal proteins, however, have poor nutritional value for monogastric animals, including humans, because of reduced content of essential amino acids such as lysine, tryptophan and threonine. Cereal proteins contain on an average about 2% lysine, which is less than one-half of the concentration recommended for human nutrition. Therefore, healthy diets for human and other monogastric animals must include alternate sources of lysine and tryptophan. From the human nutritional viewpoint, lysine is the most important limiting amino acid in the maize endosperm protein, followed by tryptophan. The problem of low lysine and tryptophane content have been solved in QPM thus making it best feed for monogastric animals. Majority of the people being non-vegetarian in food habit, livestock plays vital role in providing food security of the people of Nagaland and introduction of high yielding QPM varieties may help in meeting the demand for quality food at affordable price.

Cobs in QPM plant

Tips For Higher And Quality Production

Rinku Bharali, SMS (Hort.), Krishi Vigyan Kendra - NRCM, Porba, Phek, Nagaland

Agriculture plays an important in the economy our country. About 70 % of the country's population are rural and are engaged in cultivation but still the production is much lower to feed the growing population. Crops are the rich source of carbohydrate, fats, protein, minerals, vitamins and dietary fibres. Due to various constraints such as illiteracy of farmers, lack of capital for investment, lack of high yielding and high quality varieties, lack of technologies based on the farmers field, lack of dissemination of the technologies developed , lack of storage and marketing facilities, we are far behind the developed nations. In order to keep pace with the developed nation there should be better linkage and commitments amongst various stakeholders on food production and security, food safety and quality, and the environmental sustainability. These stake holders include governments, scientific institution, food processing and retailing industries, farmers and consumers. Some tips for higher and quality crop production are given below:

Pre-planting measures:

Site selection:

Land or site for agricultural production should be selected on the basis of land history, previous manure application and crop rotation. It should be away from animal housing, pastures or barnyards. Farmers should make sure that livestock waste should not enter the produce via runoff or drift. Steep slopes should not be selected for cultivation.

Manure handling and field application:

Proper and thorough composting of manure, incorporating it into soil prior to planting and avoiding top dressing of plants are important steps towards reducing the risks of microbial contamination. Manure should be applied at the end of the season preferably when soils are dry should be spread two weeks before planting, preferably to grain or forage crops.

Selection of appropriate crop/ variety:

High yielding variety, resistance to pest and diseases and suitable to the agro climatic situation should be selected. Selection of crop/variety also depends upon the consumer's choice and marketability of the produce. Farmers should avoid growing root and leafy crops in the year in which manure is applied to the field. Manures should be applied to the perennial crops in the planting year only. The long period between application and harvest will reduce risks.

Production measures:

Irrigation methods:

There are various irrigation methods. Amongst those, drip irrigation is the most efficient method of irrigation. This method not only reduces water loss but also increases water use efficiency and suppresses weed growth. As the initial cost of this method is high it cannot be afforded by the marginal farmers. However, irrigation should be done in such a manner that there is no water loss and thus can be conserved for further use.

Field sanitation and animal exclusion:

Farms should free from weeds, insect pests and diseases. Preferably integrated pest management (IPM) approach using both organic and inorganic pesticides should be used for management of insect and diseases. Farmers should stay out of wet fields to reduce the spread of plant or human pathogen. Machines and implements used for manure handling should be cleaned prior to entering produce fields. Animals, including poultry or pets should not be allowed to roam in crop areas, especially close to harvest time.

Harvest:

Time of harvest and cleanliness:

Bins and all crop storage containers have to be washed before use. It should be properly covered when not used to avoid contamination by insect pest and animals. Crop should be harvested depending upon the use of the produce. If the produce is to be marketed at far distance then it should be harvested before ripening, but for home consumption or local market it should be harvested at ripening stage.

Good personal hygiene is particularly important during the harvest of crops. Training and awareness programme will increase knowledge of the farmers towards hygiene and sanitation.

Post- harvest handling:

Worker hygiene:

Hands can contaminate fresh fruits and vegetables with harmful microbes. Packing area should be cleaned and sanitized. After harvesting the produce should be sorted, graded and packed. Workers should be properly educated about the importance of packaging and quality. Encourage proper use of disposable gloves on packing lines.

Pre-cooling and cold storage:

Harvested produce should be quickly cooled in cold water to minimize the growth of pathogen and maintain good quality. Produce can be stored in refrigerator, cold storage etc. Low-cost storage structure such as zero energy cold storage structure can be used for storing the produce by the farmers.

Transportation of produce from farm to market:

Proper cleanliness of the transportation vehicles should be ensured before loading. Farmers have to ensure that fresh fruits and vegetables are not transported in trucks which have carried live animals or harmful substances. If these trucks are used, then they should be washed, rinsed, sanitized before transportation fresh produce.

The concept of good agricultural practices (GAP) has evolved in recent years in the context of a rapidly changing and globalizing food economy. In addition, the concerns and commitments of a wide range of stakeholders on food production and security, food safety and quality, and the environmental sustainability of agriculture, have also promoted the concept of GAP. These stake holders include governments, food processing and retailing industries, farmers and consumers. According to Food and Agricultural Organization(FAO), GAP is the application of available knowledge to address environment, economic and social sustainability for on farm production and post production processes, resulting in production of safe and healthy food and non food agricultural products. Many farmers in developed and developing countries already applied GAP through sustainable agricultural methods such as integrated pest management, integrated nutrient management and conservation technology. Presently, GAP is formally recognized in the international regulatory framework for reducing risks associated with the use of pesticides, taking into account public and occupational health, environmental and safety considerations. GAP applies to a broad section of food/agricultural commodities, which include fruits and vegetables, livestock, flowers and ornamental plants, medicinal/aromatic plants, and aquaculture. Some of the GAP is given below:

Taxus baccata (Yew tree): A new hope against cancer

Rinku Bharali, SMS (Hort.), Krishi Vigyan Kendra - NRCM, Porba, Phek, Nagaland

Taxus baccata (Yew tree) is an evergreen tree growing up to 15m height. It is found in Europe, East to North Africa, Iran, Himalayan range. It is hardy and frost tender and is in leaf throughout the year. It bears flower from March- to April and the seeds ripen from September to November. Flowers are dioecious (individual flowers are either male or female). Only one sex is found on any one plant so both male and female plants must be grown if seed is required.

Taxus baccata

Edible uses:

Fruits are eaten raw. It is very sweet and gelatinous. Fruit is a fleshy berry of about 10mm in diameter and contains single seed.

Medicinal uses:

It is highly toxic plant that has occasionally been used as medicine mainly in the treatment of chest complaints. All parts of the plant, except the flesh of the fruit are highly poisonous having a paralyzing affect on the heart. The modern research has shown that the plant contains a compound **taxol** in their shoots which has anticancer properties. Taxol was discovered through a prospecting venture begun in the 1960s by the Nation Cancer Institute (NCI) in co-operation with the US department of Agriculture. These agencies began screening plant tissues in North America for anti tumor activity. In the hope of discovering new treatments for cancer, a research team led by Dr.Wani at the Research Triangle Institute received the assignment and began to isolate the active compound present in *Taxus baccata*. The compound was difficult to obtain because it is present in relatively low concentrations in the bark of yew tree (0.5g for 12 kg of bark). In 1980s chemical trials showed that taxol is effective against ovarian, breast, lung, head & neck, and esophageal cancers. The use of taxol has been approved by the Food and Drug Administration for use in the treatment of these two ovarian and breast cancer. The content of taxol is high in *Taxus brevifolia* species. A 100 year old tree might yield 3kg of bark which provides enough taxol for one 300mg dose. The compound should be used with great caution and only under the supervision of a qualified practitioner. All parts of the plant except the fleshy fruit are antispasmodic, cardiotonic, diaphoretic, emmenagogue, expectorant, narcotive and purgative. The leaves have been used internally in the treatment of asthma, bronchitis, hiccup, indigestion, rheumatism and epilepsy. Externally the leaves have been used in steam bath as a treatment for rheumatism. The homeopathic remedy is made from the young shoots/leaves and the berries. It is used in the treatment of many diseases including cystitis, eruption, headache, heart and kidney problems.

Plant characters:

Plants are easy to grow. It is extremely tolerant to cold and heat, thrives well in sunny and shady conditions and can be grown at any pH. The plants can tolerate temperature below -25^{0}C. Plants are deciduous, though sometimes there may be change in the sex and monoecious trees may also be present. Male and female trees must be grown if fruits and seeds are required. The fruits are produced undersides of one year old branches. The trees have high longevity. Reports suggest that a tree in Perth shire is 1500 years old, making it the oldest plant in Britain.

It is however slow growing and usually takes about 20 years to reach a height of 4.5 meters. Young plants occasionally grow 30cm in a year but this soon tails off and virtually no height increase is made after 100 years.

Propagation technique:

It can be propagated through seeds and cuttings. Seed should be sown when it is ripe during autumn. Seeds take long time to germinate often taking more than 2 years. Cutting is the best method to get true to type plant having all the characters of the mother plant. Cutting of terminal shoots of 5-8cm long should be taken in the month of July-Aug under shade house. Rooting of cuttings will take place in the month of Sept.-Oct and planting should be done in the March-April.

Cultivars:

There are various cultivars of the genus *Taxus baccata*.

Repandens: A semi prostrate female form eventually forming an undulating mass up to 75cm tall and 4.5 meter wide. It makes an excellent hedge.

Nidiformis: It bears large sweet fruits.

*Hessii***:** This cultivar forms a spreading shrub of about 5 meter tall and wide. Bears heavy crops of firm, well flavoured fruits, though they are slightly bitter after taste.

Fructo-luteo: Bears very attractive orange coloured fruits. The fruits are of high quality and are produced in abundance.

Fastigiata: A slow growing female tree eventually reaching a height of 15meters. The plant occasionally bears some male flowers and the occasional seedlings that are produced as a result of self fertilization are usually of similar habit to the parent. Otherwise seedlings produced from cross fertilization usually follow the growth habit of the male.

There may be difference in taxol yield between sub species of yew tree but it is not yet apparent that the yields are affected by seasonal or and gender factors within each sub species. About 10 different species of yew are recognized. However, they are very similar in many aspects and more research is needed in defining the different species. All are evergreen, needle-leaved trees or bushes. If a particular yew tree or group of yew trees prove to have specific qualities that are beneficial then it is especially important to preserve those trees and preserve the line of descent through a planting programme taken from cuttings from individual trees. To harness the value of *Taxus baccata*, we must not only exploit them but also set up nurseries and plantations so that it can be preserved for the future.

Varieties of *Taxus baccata*

Commercial Anthurium cultivation

Rinku Bharali, SMS (Hort.), Krishi Vigyan Kendra - NRCM, Porba, Phek, Nagaland

Floriculture in Nagaland has gain popularity in the recent years. Amongst various flowers, anthurium is being grown commercially by numbers of entrepreneurs and flower lovers in the state. Anturium is grown both as a commercial and homestead flower crop. Anthurium is an evergreen, tropical herbaceous plant cultivated for its colourful spathe and attractive foliage. It has around 600 species and belongs to *Araceae* family. The most popular and economically important species are *Anthurium andreanum* and *Anthurium scherzerianum.*

Varieties:

Anthurium has different varieties depending on the spathe colour. They are:

Spathe colour	Varieties
Red	Hawaiian red, Ozaki, Cancan, Tropical, Scarlet, Mauritius Red, Tanaka, Cherry red, Eureka red
Orange	Nitta, Sunset Orange, Sun Burst, Gino Orange, Avo Gino, Mauritius Orange
White	Acropolis, Manoa Mist, Trinidad, Meringue White, Lima White
Pink	Agnihotri, Passion, Candy Queen, Candy Stripe, Pink Hawaii, Abe Pink, Sonata
Obake	Red Dragon, Fantasia, Madonna, Lambada, Senator
Green	Midori,Manaka, Verino, Laguna
Miniature	Lady Jane

Types of Anthurium

There are three types depending upon the spathe characters.

Standard:

Most common heart shape, spathe often overlaps. Colours include red, orange, pink, coral, white, green

Obake:

Popular for bicolor patten of spathe including green and major spathe colour. Some losses the green colour during summer.

*Tulip***:**

Up right-cupped spathe, with a straight and erect spadix. Tulip types are mostly hybrids with more than one species as their parents.

Propagation:

Anthurium can be propagated by through seeds but takes long duration of about 40days for germination and takes long time to develop into a economical plant. Vegetative propagation is commercially practiced through cuttings, multiplication through suckers and tissue culture methods. The ability to produce suckers depends up on the variety and suckering capacity can be increased by exogenous application of BAP (75mg/l of water) at monthly interval. Anthurium starts producing suckers at 12-16 months age. *Invitro* propagation or tissue culture technique has also boosted up the production of disease free true to type planting material.

Growing condition:

Day and night temperature, light, humidity are the most essential factors for growth and quality flower production. For better growth it requires minimum of 18.3^{o}C night temperature and 21.2-23.9^{o}C night temperature for flower initiation. Growth ceases at higher day temperature above 35^{o}C and night temperature below18 ^{o}C. Anthurium is basically a shade loving plant and thus prefers shade. It is advised to grow anthurium commercially under shade net house. Higher light intensity coupled with low relative humidity and poor shading often results in scorching of young leaves and immature flower buds. In commercial practice it is advisable to have 50 per cent shade net on the top and a 25 per cent shade net below it, so that the light levels for the plant growth can be modified depending on the ambient light condition.

Growing structure:

Low cost polyhouses:

In areas where the relative humidity levels are low and the temperature is moderate. The hot air inside the polyhouse can be expelled through top ar side ventilation.

Shade net houses:

Shade houses can be constructed by using locally available tree trunk or bamboo. Net with 75% and 25% shade can used with a provision for installing overhead sprinkler/mister system by running GI wires from one end to another end.

Growing media:

Anthurium requires a highly organic, well aerated medium and with good water retention capacity. Various medium used so far are saw dust, tree bark, sugarcane bagasse, cured coffee pulp, chicken manure, ground nut shell, gravel etc. Coco peat is the most popular medium for anthurium cultivation. For pot flower cultivation miniature type is ideal.

Cultivation in beds:

Anthurium can also be successfully cultivated in beds. Soils should be thoroughly ploughed and it is mixed with growing media such as cocpeat, coffee husk etc. Beds should be raised to 30 cm height and 1m wide.

Precaution s to be taken during planting:

- Do not plant the material during high temperature and high rainfall period
- Moist the beds before planting
- Provide an initial fertilizer dose having high potassium and low calcium levels
- Dip the roots in fungicidal solution of 0.1% Bavistin before planting
- Plant in rows at 15 cm depth so that aerial roots appear above the surface
- Spacing of 45cmx45cm should be maintained

Watering:

Watering is very mush essential for proper growth of anthurium. Watering should be done twice a day during summer months. Rain water is considered to be the best quality for anthurium cultivation. Water from underground sources varies in its salt concentration and therefore it needs to be tested before using.

Fertilizer application:

Anthurium prefers smaller doses of fertilizers at frequent intervals rather than larger dose at longer intervals. For pot cultivation it is advisable to apply 5g of any complex fertilizer in 500 ml of water (1%) once in a month. Foliar application of 1% urea is beneficial. In beds one gram of ferlitizer/litre of water/m^2 is found to be the best. Just after fertilizer application beds should be irrigated with two litres of plain water/m^2 to avoid acculmulation of salts at the root zone.

Harvesting:

Flowers are harvested when the spathe completely opens and the spadix is well developed or when one third of the spadix length from base changes colour.

Grading:

Flowers are graded after harvest for selling in market.

Garde	**Spadix length**
Miniature	Below 8cm
Small	8-10cm
Medium	10-13cm
Large	15cm

Mushroom Production in Nagaland

R K Singh and Rinku Bharali, Krishi Vigyan Kendra - NRCM, Porba, Phek, Nagaland

Oyster mushroom (*Pleurotus sp.*) an eatable fungus, grows wildly in temperate to sub tropical forests throughout the state on dead and decaying wooden materials. It can also be grown on decomposed organic matter. Unlike other agronomic crops, the set-up costs for mushroom production unit is quite low. Fertilizers, machinery, and pesticides are not used, the market price is relatively high, and profit margins for mushroom crops can be considerably higher than traditional crops. In general the enterprise takes very little space and can produce returns within a short span of time. It is a popular food item in tribal belts of the North-East India and Nagaland is no exception. Usually people in this region do not practice mushroom cultivation but they collect it from the forests.

There are different varieties of mushroom, which grow in wild and are available almost whole year except extreme cold months (Figure 1), but some of them are poisonous and hallucinogenic. Consumption of such poisonous varieties sometimes becomes a potential threat as they may induce toxicity. Even deaths are reported due to consumption of such varieties. Effects of mushroom are dependent on dose and the individual reaction and sensitivity, previous experiences and the setting. The major effects are related to the central nervous system but there are also some sympathomimetic effects. The subjective effects, however, vary greatly between individuals to individual. Nearly all of the psilocybin containing mushrooms is small brown or tan mushrooms which could be mistaken for a number of non-psychoactive, inedible, or poisonous mushrooms in the wild. The primary distinguishable feature of most psilocybin containing mushrooms is that they bruise blue when handled.

Mushroom, a white vegetable, is a rich source of proteins, vitamins and fibres. It contains approximately 20 to 35% crude protein (% dry matter), which is higher than any other vegetable. Certain strains of mushroom are also known to have medicinal properties and consumption of such varieties is considered ideal for the patients of hyper tension and diabetes.

Oyster mushrooms are largely cultivated in the South-East Asian countries and China contributes maximum. Other countries are Korea, Thailand, Taiwan and Philippines. In India, estimated production of mushroom is 15000 tonnes per annum because of the low domestic demand. Oyster mushroom can grow well at moderate temperature ranging between 22 to 25°C with 55 to 70% humidity. In hilly terrain, it can be successfully grown round the year except during extreme cold months, when temperature is below 15°C. Cultivation of Oyster mushroom is not difficult and can be done easily at household level with minimum inputs.

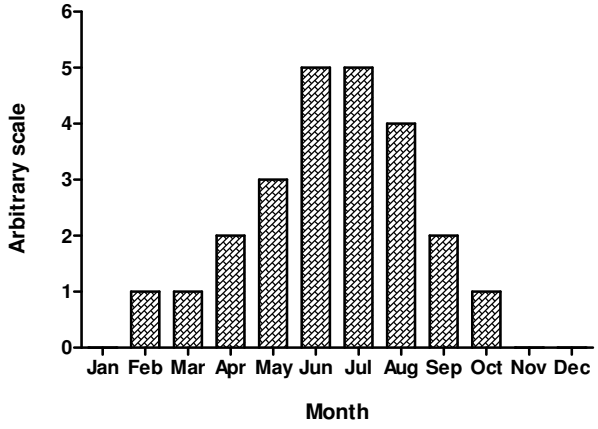


Figure 1. Availability of wild mushroom during different months of the year at Pfutsero subdivision in Phek, Nagaland

Production Process:

Culture of Oyster mushroom (*Pleurotus sp.)* is required for inoculation on sterilized substrate. The spawn can be procured from ICAR Research Complex for NEH, Nagaland centre, Jharnapani or State Horticulture Laboratory, Dimapur. Agro and forest waste having high cellulose and lignin content can be used as substrate, that includes paddy, maize and millet straw, dried grasses, saw dust, tea leaves waste etc. Substrate should be boiled thoroughly and should be placed in polythene bags. Boiling of the materials helps in sterilization. Moreover it also helps in faster degradation of the cellulose by the enzymes secreted from mycelia. Spawning is carried aseptically and spawned substrates is to be kept in semi dark cropping room on raised platforms for approximately 20 to 25 days for colonization of mycelia. The spawned bags can also be hanged from ropes or strings instead of keeping on raised platforms. Mycelia grow well in-between 10 to 30°C, but optimum temperature for spawn running is 22 to 26°C, which is to be maintained. When mycelia are fully colonized over the substrate, it appeared white due to growth of mycelia. Following colonization it became ready to bear the fruit. The bags have to open in order to initiate fruiting inside the cropping room. The cropping room may be constructed with thatch for low scale production. Bamboo and wooden planks can be used for making racks to keep spawned bags. Moisture level of 75 to 80% during fruiting is essential so it should be maintained by frequent spraying of water in the cropping room by sprayer. Once fruiting is initiated it continues for 25-30 days and regular harvesting is required to get good yield. Usually 1.5 – 2.0 kgs substrate is used in a bag, which yields about 1.0-1.5 kgs of mushroom.

Development of Breeder Farmer: Step towards development of Piggery industry in Nagaland

Prakash R Dutta, SMS (Animal Science), Krishi Vigyan Kendra - NRCM, Porba, Phek, Nagaland

Nagaland is a tribal populated state and almost all people are non-vegetarian in food habit. So animal husbandry sector has great scope to establish as a viable industry in the state. Out of various types of meat, pork and pork products are the first choice of the people of Nagaland and in this aspect, piggery has enormous potentiality to develop. The present pig production of the state can not fulfill its high pork demand and therefore a sizeable number of pigs have been imported from outside the state. The major constrains of piggery development in the state are lack of superior germplasm, majority pigs are of non-descript in nature which are poor in productive traits, improper feeding, breeding and management practices, less number of breeder farmers, high feed cost, irregular supply of concentrated feeds in the market etc. However, today's discussion will be limited to the development of breeder farmers and breeding management of pig only.

Purchase of one or two piglets at 2-3 months of age, rearing up to 7-8 months for fattening and then sell in the local market as meat is the common pig farming scenario of the state. The problem in this system is that farmers have to wait for a long time after selling one crops, as piglets are not available in their locality and supply by the suppliers are also not regular. Moreover, suppliers are the middle men where farmers have to purchase the piglets at higher price which ultimately increases the cost of production. Therefore, locality/village wise development of breeder farmers can help a lot to overcome the above mentioned problem. In this aspect, rural unemployed youths should give more emphasis which can give them self employment and good income. As pigs are prolific breeder (6-12 piglets per farrowing) and with good management practices, two batch of crops can be achieved in a year from a sound sow (breedable female). These piglets can be supplied to the local farmers at reasonable price. The breeder farmers themselves can also raise few piglets for fattening purpose which increases their income more.

Pig breeding requires some technical knowledges like selection of sound male and female, breed, heat (estrus) detection, time of insemination, care and management of pregnant sow and newborn piglets etc. In this aspect, State Animal Husbandry and Veterinary department and Krishi Vigyan Kendra of the particular district can impart skill oriented trainings to the needy farmers to establish them as breeder farmers. It is also essential by the government to launch need and area based pig production technology packages.

In selecting gilt or sow (breedable female), the primary aim is to secure a female that will produce large litters of fast growing pigs capable of being fattened to marketable weights at an age of six months or less. A desirable sow presents a well balanced appearance, size and weight are proportionate to age, reasonable amount of development in the region of the high priced cuts of pork chops etc. Ancestry record should also be considered in selection process. While selecting a boar (breedable male), most of the consideration mentioned for selecting a gilt/sow should be taken into account. A desirable boar is larger for his age and heavier of bone than gilt and shows masculinity and ruggedness. Boar should be selected at 4 to 6 months of age since serious defects in type are not so likely to develop after this age is reached.

Production traits of indigenous pigs are very poor. This can be up-graded by crossing with better quality breeds. There is an increase trend in production performance of crossbred pigs up to 87.5% Hampshire breed blood. The upgraded pigs have better performance in terms of litter size (no. of piglets born at a time) and weight at birth and weaning (separation of piglet from mother), individual weight at weaning, age at first farrowing, interfarrowing interval, post weaning growth rate etc. than indigenous pigs.

Female pigs become sexually mature between 8-11 months depending on the breed, nutritional status and managemental conditions. Male also reaches puberty at almost the same age. It is advisable to leave first one or two heat (estrus) and gilt should be bred in the third heat. Detection of heat and breeding at proper time are the main keys for successful breeding. The heat period lasts for 2-4 days in pig and the best time to breed the sow/gilt is between 12-36 hours after the onset of estrus. The general signs of heat are restlessness, frequent urination, elevation of tail, loss of appetite, swollen vulva, sticky mucus at vulva, pink vaginal mucous membrane, arched back etc. If one pressurizes with palm of both the hands on the loin region of the female pig and if she stands motionless, it is also an indication that the sow is in heat. It is advisable to rebreed the sow to get higher conception rate and litter size if her heat still remains for next day also, after the first breeding.

The pregnancy period of pig is 114 days on average. Females become increasingly docile during pregnancy and reduction of physical activity is influenced by the increased body weight associated with advanced pregnancy. The sow should be transferred to farrowing (act of giving birth) pen 2-4 days before the expected date of farrowing. Before transferring to the farrowing pen, the sow should be washed with soap and warm water which helps in removing the adhering parasitic eggs and other disease germs from the body surface. Similarly, farrowing pen should be cleaned with phenyl water to reduce possible infection. Soft chopped straw should be provided as bedding material on the floor of the farrowing pen. The process of farrowing should be observed from a distance and if any difficulty arises, veterinarian should be contacted immediately. Guard rail around the farrowing pen has to be constructed to avoid losses of piglets laid on by the mother. The piglet should be cleaned off all the mucus for proper breathing and weak piglets are to be guided to suck mother's teat. Artificial heat, more particularly in early spring and winter should be provided for possible chilling of the piglets. Separation of the piglets from mother is to be done at the age of 45-60 days.

Problems and Prospects of Piggery in Nagaland

Prakash R Dutta, SMS (Animal Science), Krishi Vigyan Kendra - NRCM, Porba, Phek, Nagaland

Nagaland is a tribal populated state and almost all people are non- vegetarian. In food habit, meat is the first choice of the population of the state. Pork is the most popular meat of Nagaland as it is very tasty and liked by everyone and has high demand and market price. In this aspect, pig farming has enormous potentiality to increase pork production of the state and can be taken as sustainable source of livelihood.

Fig: Hampshire crossbred pig

The existing pig production of the state is unable to fulfill its demand. A sizable population of pig is imported every year from other parts of the country to the state. There are many hindrances to the pig industry of the state, of which lack of superior germplasm is one of the main factor. Majority of pigs of the state are indigenous with poor production performance compared to crossbred pigs with exotic inheritance upto 87.5% with Hampshire breed which has a great potentiality in the state. The upgraded pigs have better performance than local pigs in terms of size and weight of the litter (number of piglets born) at birth and weaning, post weaning growth rate, age at first farrowing (act of giving birth), inter farrowing interval and feed conversion ratio. Hence, development of upgraded pigs following systemic breeding programme is one of the important step to uplift the pig industry of the state. State government of Nagaland can play a vital role in this aspect by establishing district level pig breeding farm to supply improved germplasm to the farmers. Very less number of farmers in the state are engaged in pig breeding, and most of the farmers procure one to two piglets and sell after fattening. Due to lack of regular availability of quality piglets, farmers have to wait for longer duration to buy a new stock for his livelihood. Therefore, there is great scope for development of breeder farm at village level by providing technical guidance and financial assistance to the farmers.

Non-availability of quality feed and its high price is another constraint in the piggery sector. Remoteness of different areas of the state and poor transportation facility is the main barrier for regular supply of feeds coming from outside the state. In the existing feeding practice, most of the farmers prepare feed by cooking locally available grasses/leaves with little amount of household grain/grain by-products. Such feeds contain very low protein and energy level which fail to meet up the demand of a growing pig. Pigs must be fed with balanced diet fortified with vitamin and minerals. Therefore it is essential to encourage the farmers to cultivate different crops such as maize, millets etc. that can be utilized as pig feed and thereby reducing the cost of production. Maize, being the major ingredient of most of the livestock feeds, farmers should be encouraged to cultivate high yielding varieties of maize. Moreover, training to the farmers on feed formulation by utilizing locally available feed materials is essential. These type of activities can be carried out collaboratively by the State Animal Husbandry and Veterinary Department, State Agriculture Department and Krishi Vigyan Kendra present in the respective areas.

Health coverage is important to optimize pig production in the state. Most of the pig population suffers from nutritional deficiencies, worms and infectious diseases. Swine fever being one of the highly fatal infectious disease is responsible for death of large number of pigs every year in the state. Worms, both internal and external parasite infestation lead to stunted growth even if the animal is fed with quality feed. Therefore, deworming against parasites and vaccination to the major infectious diseases at regular interval is essential and if any signs of ill health observed, should immediately be contacted to nearby veterinary department for treatment.

Pigs grow faster than any other farm animals. They can efficiently convert spoiled feed stuff unfit for human consumption and other agro industrial by-products into meat. Landless farmers who cannot go for agricultural operations can also adopt piggery. Since pork has huge demand in the state, pig farming can generate ample of employment opportunity to the unemployed youths. Hence, there are enormous prospects of pig farming to boost up economic upliftment as well as to meet the meat demand of the state.

Goat - Poor men's Cow

Prakash R Dutta, SMS (Animal Science), Krishi Vigyan Kendra - NRCM, Porba, Phek, Nagaland

Role of livestock sector in employment generation, self employment and poverty elimination is well documented. In India, more than 74% of total population lives in rural areas and 73% of these households own livestock. With increasing human population, individual land holding capacity is reducing day by day. Therefore, goatery can be an useful enterprise in this aspect for the marginal and landless farmers. The advantages of goat farming are-

1. Low initial investment and labour.

2. Due to small body size and docile nature, a family can easily maintain 8-10 nos. of goats.

3. Goats can be reared entirely on wastelands, agricultural by products and kitchen wastes. It does not compete with human foods like other livestock.

4. No need to provide sophisticated and well equipped shelter. Goat house can easily be made by utilizing family labour with locally available materials like bamboo, wooden plank, thatch etc.

5. Goat can be reared for both milk and meat purposes, though in northeastern region, it is mainly reared for meat purpose.

6. Due to its nutritive value and easy digestibility, goat milk is useful for babies, old and sick persons.

7. Occurrence of disease in goat is also comparatively less than other domesticated animals due to its high adaptability nature.

8. Goats of north eastern region are prolific animal where twining is common.

Due to all these advantages and characters, goat is popularly known as "Poor men's cow".

Important Goat breeds:

Goats of Northeastern region:

The goats found in northeastern region are mainly Black Bengal and Assam Hill goats. Twining is common in both these goats, attain sexual maturity at 6-12 months of age and almost two kidding are obtained per doe per year. They reach 14-15 kg body weight in a year and mostly used as meat animal as they produce very less amount of milk.

Barbari: This is a dual purpose breed distributed in U.P. and Rajasthan. It gives 750-1000ml milk daily with a fat percentage of about 5. It is highly prolific and generally gives birth to twin and triplets and two kidding in a year is possible. Adult male and female attain 40kg and 24 kg body weight, respectively.

Beetal: This breed is distributed in Punjab and Haryana and can easily adopt in agroclimatic condition of northeastern region. It is a good dairy animal with average daily yield of 2kg milk. It may attain 21kg body weight in a year and adult male and female attain 50-62kg and 35-40kg body weight, respectively. Beetal is also a prolific animal with advantage of twining.

Jamunapari: It is one of the popular goat breed of India and originated in U.P.This breed has been utilized extensively to upgrade indigenous breeds for milk and meat purpose. Mature male of Jamunapari attains 50-60 kg and female 40-50kg body weight. Average daily milk yield varies from 1.5-2kg. It may reach 29kg body weight in a year. Usually doe kids once a year giving birth to single offspring.

Selection of doe:

The female goat (doe) selected for breeding purpose as future stock must be healthy and vigorous. Wedge shaped body conformity, proper size, shape and teat position of the udder should be observed for milk production. Further, the characteristics- early attainment of sexual maturity and kidding, low inter kidding interval, prolificness, quality and quantity of milk, higher and faster body weight gain of the individual goat or her parents should be considered for selection.

Selection of buck:

Importance on selection of breeding buck (breedable male) is very important as buck is considered as the half of a herd and to get best result in future. The buck must be healthy, vigorous, masculine and well conformed in body structure. Male goats attain sexual maturity in between 7-12months of age and before this, they should not be used for breeding purpose and kept away from females.

Breeding of doe:

Female goat matures sexually at 6-12months of age and come into heat at every 18-24days interval. The estrus (heat) persists for 2-3days and breeding should be done at 24-36hours after the onset of heat with outstanding male. For artificial insemination of goat with frozen semen, nearby veterinary doctor should be consulted. The symptoms of heat in female are restlessness, shaking of tail, loss of appetite, sudden drop in milk yield, swelling and reddening of genital opening, mounting on other goats irrespective of sex etc. Goat gives birth 150days (average) after breeding (gestation period).

Feeding:

Goat takes grasses, tree leaves and bushy plants and they can easily be managed on grazing on wastelands, agricultural by products and kitchen waste. In additional, if we provide 100gms of concentrated mixture of the composition- maize 25%, rice polish 25%, wheat bran 30%,mustard oil cake 17%, mineral mixture 2% and common salt 1%, it helps in early maturity, faster weight gain and to keep the animal free from many diseases.

Housing:

Goats do not require special shelter specially for a small unit. The shed should be constructed in a dry, well elevated and aerated area. The floor of the house should be 3-3.5 feet above the ground and perforated floor with bamboo or wooden plank is better than solid impervious floor so that faecal material, urine and waste feeds directly fall down and the house always remains clean and dry. It saves the animal from various diseases, specially worms and lung problems. The walls should be constructed such a way that fresh air circulates easily. Thatch grass or asbestos roofing material is preferred to maintain uniform temperature round the year inside the shed. Floor space requirement for different categories of goat are mentioned below-

Adult goat –	1.5 m^2/goat
Lactating and pregnant doe –	2 m^2/goat
Bucks –	2 m^2/goat
Kids-	
7-90days-	0.5-0.6 m^2/kid

3-6months – 0.7 – 0.9 m^2/kid

6months and above- 1 m^2/kid

Health coverage:

Good hygiene and sanitation, nutrition and management practices have positive impact on health management. Besides, preventive and control measures against possible epidemic diseases should be taken at proper time to keep the diseases aside. Few commonly occurring diseases of goat with their preventive measures are mentioned below-

1. Enterotoxaemia: All goats above three months of age are to be vaccinated against this disease.

2. Colibacillosis: kids should be provided with adequate quantity of colostrums to prevent this disease. During the time of its occurrence, antibiotic treatment should be resorted.

3. Skin diseases: Vitamin A and mineral mixture should be provided to keep the goats away from skin diseases. Floor and side walls of the shed should be kept clean to reduce the intensity of these diseases. Periodical grooming with ectoparasiticidal like deltamethrin, cypermethrine is also essential.

4. Endoparasitic diseases: Goats are affected with various endoparasites like gastrointestinal nematodes, coccidia and blood protozoa. Therefore, it is necessary to follow periodical anthelmintic medication against these parasites as per advice of the veterinarian.

Goatery as component of integrated farming system:

The basic concept of integrated farming is utilization of synergetic effects of inter-related farm activities and conservation including the full utilization of farm wastes. Integrated farming of fish and livestock is an old practice. Like other domesticated animals and birds, goats can also be utilized in fish cum goat integrated farming system. It involves recycling of animal wastes-faeces,urine,spoiled feeds to serve as fertilizer and as food for fish raised in the pond. A total of 55 nos. of goats can be raised in one hectare fish pond area.

Vanaraja Poultry Farming

R K Singh, Programme Coordinator, Krishi Vigyan Kendra - NRCM, Porba, Phek, Nagaland

The role of small scale poultry production in accelerating the pace of poverty reduction and reaching out to the poorest of the poor is getting recognition among the development community. Village chicken production under the free range and semi-intensive system is a viable option for improving the livelihood of rural households and it also helps in promoting the gender equality. It provides additional income and supplement protein intake in rural folks.

There is wide gap in per capita availability and consumption of egg and meat. As per an estimate the north eastern region is deficient by 45 % in meat production and 87 % in egg production. These products are imported from other states to meet the requirement. Backyard poultry farming in rural areas is the best alternative to meet the growing demands of the population and to improve the per capita consumption.

Traditionally keeping poultry in backyard is common among rural area but production potential of the local strains raised is very low around i.e. 60-80 eggs per year, thus making the backyard poultry less economical. Vanaraja developed by Project Directorate on Poultry, Hyderabad, India, is a dual purpose breed of fowl that suits well to backyard conditions. The male grows faster and attains one kg body weight in 8-10 weeks in backyard conditions so suits well as table purpose bird, on other hand female produces 110-120 eggs per laying cycle under backyard conditions. Females can produce upto160-180 eggs in a laying cycle with minimum supplementation of locally available feed ingredients and other managemental inputs. This makes Vanraja better layer than local strain.

The plumage pattern and colour of Vanaraja bird is very attractive and it closely resembles to the local fowl. Vanraja birds have relatively light weight and long shanks, these birds are also capable to protect themselves from predators which are otherwise a major problem observed in birds reared in backyards.

Promising features of Vanaraja:

- Natural and attractive feather colour pattern.
- Comparatively these birds are sturdier and have higher immune status so perform better under adverse conditions.
- It has better feed efficiency so can perform better even with poor quality diets having low energy and protein like rice bran, broken rice, ragi, bajra sorghum, podo millet, etc.
- Under backyard conditions they can perform well even by eating green grass and insects available in the fields therefore they can be raised on low or negligible input cost
- It starts producing eggs between 6-7 months of age and produces about 160- 180 eggs in a year under well management conditions and 110-120 eggs under backyard.
- Eggs of Vanaraja birds are heavier (50 to 60 g) and they look more attractive than the eggs of local hen.
- Vanraja attains maturity at 6 months of age and at that age a female weighs about 3 to 4 kg, and cock weighs about 3.5 to 4.5 kg.
- Fertility and hatchability of eggs are higher in Vanraja but they lack broodiness, however Vanaraja chicks can be hatched out from fertile Vanraja eggs by brooding with local hen.
- The performance of local fowls can be improved by crossing with Vanaraja males. This cross will be much better than local birds.

Management of Vanaraja:

Vanraja birds can be reared for egg production in small numbers (10-20) in free range conditions if plenty of natural feed resources are available. But incase the demand for the meat and egg both are higher then these birds should be raised in intensive/semi intensive system. These birds need to be reared under proper nursery management upto 6 weeks of age and after that it can be kept in free range system.

Nursery Management

Brooding is essential for Vanraja chicks to provide required temperature and protection from predators. Metal or wooden brooders can be used for the purpose and electric bulbs can be used as heat source. Heat source of 2 watts/chick is enough. Chick guard can be used for restricting the movement of the chicks. Feeding of broiler starter is better option but it also can be formulated with locally available materials. During early age protein requirement is quite high (16%) so feed supplemented should meet the demand. Chicks should be vaccinated to boost their immune response against Ranikhet (Newcastle Disease) and fowl pox.

Free range Management

Vanraja birds attain 650-750 gm weight in 6 wks and by the time they are ready to keep in free range system. These birds can be let out under backyard free range system @ 10-20 birds depending upon the housing area and natural feed base available. The birds can be let loose in day time but they require shelter in night. Clean drinking water should be provided before letting them out from night shelter. Male can be sold as they attain market weight and female should be raised for egg production. One to two male in a flock should be maintained to get fertilized eggs for hatching.

Feeding

Vanraja under free range condition can easily picks up its food from surroundings once it leans the scavenging. Additional supplementation of food is required if sufficient food is not available in free range area. The amount and nature of supplementation depends upon purpose of rearing. Care should be taken that female (Pullets) should not gain weight more than 2.4 kg in six months, since gaining more weight adversely affects the egg producing ability. If the problem of broken/shell less eggs observed, calcium source (lime powder, shell grit etc.) should be supplemented @ 3-4g/bird/day.

Health care

Though Vanraja has better immune status against common poultry diseases and is adaptable to the free range rearing but still they need protection against the diseases like Ranikhet (Newcastle disease) and fowl pox. They should be protected against these diseases by following proper vaccination schedule. The schedule of vaccination is as follows:

Table 1. Vaccination Schedule

Age	Vaccine	Strain	Dose	Route
1st day	Marek's Disease	HVT	0.20 ml	Subcutaneous
5-7th day	Newcastle Disease	LaSota	One drop	Eye drop
21st day	Pox	Fowl pox	0.20 ml	IM/SC injection
28th day	Newcastle Disease	LaSota	One drop	Eye drop
9th week	Newcastle Disease*	R2B	0.50ml	SC injection
12th week	Pox*	Fowl pox	0.20 ml	SC injection

* repeat these vaccines at every 6 months interval

The night shelters of the birds must be clean and dry. It should be well ventilated and lighted. Maintaining hygiene is essential to keep the flock healthy. The materials used for night shelter such as wood and bamboo offer a good hiding place for external parasites. Therefore periodical cleaning of night shelter is a must. Blowing with blow torch helps in keeping away these parasites. Since these birds are reared under free range condition so there is every possibility of parasitic infestation so deworming at every 3 months helps in keeping these birds healthy.

Concept Of Organic Farming

Prakash R Dutta, SMS (Animal Science), Krishi Vigyan Kendra - NRCM, Porba, Phek, Nagaland

The sentence “organically produced food” is now a days very popular among most of the people. People are more interested in organically produced products rather than inorganic one due to increasing awareness on environmental pollution, ecological imbalance and health consciousness. Use of chemical fertilizers, hormones, insecticides, herbicides, various medicines, growth promoters, ectoparasiticides etc. in agriculture and livestock farming has direct or indirect deleterious effects on human health. Moreover, chemical inputs in agriculture pollutes our soil, water and environment causing degradation of cultivable land, problems of soil pH, development of drug resistance strains of various microbes, insects and pests, ground water pollution etc. To overcome all these problems, the concept of organic farming has been developed which is the system based on ecosystem management rather than external agriculture inputs. It emphasizes on use of management practices by eliminating the use of synthetic inputs like synthetic fertilizers, pesticides, herbicides in agriculture and chemicals, artificial vitamins, growth promoters, hormones, genetically engineered animals in livestock farming sector.

In livestock sector, enough grazing and resting area, feed and clean drinking water should be provided to the animals. Farm animals should be fed with organically produced feed. As an example, we may consider about organic poultry farming. Here, birds are reared in free range system where mobile housing systems are preferred to allow rotational grazing facility. The grazed area must be free from synthetic fertilizers, herbicides, pesticides etc. Birds suitable for backyard rearing and indigenous breeds with the characters like hardiness, docile, disease resistance, free range nature are preferred for organic farming. All the feed ingredients must be produced organically and no synthetic vitamins should be used. In health care aspect, vaccination should only be done if known disease risk is there in the area which can not be controlled by any other means. Similarly, some other highly infectious and contagious diseases of poultry like coccidiosis must be tried to control through managemental practices.

In organic agriculture, chemical fertilizers are replaced by organic manuring to the soil. Green manuring, vermicomposting, vermiwash, liquid manure are the examples of such organic manures which improve over all physical condition of soil, fertility, microbial activity and also having insecticidal property. In this context, area specific indigenous knowledges (ITK) are very much helpful which can be exploited to a great extent. Similarly, chemically treated seeds and plant materials are not used. Primary forest area is maintained as such and soil erosion, soil salinity and water pollution are checked efficiently.

Use of different chemical fertilizers, pesticides, weedicides etc. in agriculture and different medicines, antibiotics, feed additives, hormones, ectoparasiticides in animal husbandry practices in conventional farming systems have residual effect on the products and they reach human health through food chain which are having toxic effect. They may affect different body systems like respiratory, hepatic, urogenital and nervous systems of consumers and produced their ill effects like gynecological and obstetrical defects, sterility, carcinoma, dermatological problems etc.

Concept of organic farming among our farmers is in very primitive stage and still many farmers are unaware about it. Therefore, it is necessary to make them aware through extension activities. It involves disseminating knowledge on hazardous effects of chemicals on human health, environment, soil and water. In this aspect, Krishi Vigyan Kendra, State Veterinary and Animal Husbandry deptt. State agricultural deptt. Fishery deptt. Soil and water conservation deptt. can play vital roles to make the farmers familiar with this farming system. But at present it is also important not to cover entire region/area under organic farming system to ensure our food security. Therefore area specific commodities should be selected which can give suitable organic production and in this aspect researchers

and extension workers have the role to specify area specific commodity for organic production. With increasing global health consciousness, people's priority towards organic food is increasing day by day and accordingly, farmers due attention is also essential for organic production to obtain quality product and price.

Adolescent and Reproductive health

Verginia Thabah, Programme Assistant (HS), Krishi Vigyan Kendra - NRCM, Porba, Phek, Nagaland

Adolescent is a period of sexual maturity that transforms a child into a biologically mature adult capable of sexual reproduction. Adolescent play a crucial role in controlling the growth of population in the country as they are in a preparatory stage for their future productive and reproductive roles in society and family respectively. The age of adolescents varies from 13-19 years.

Reproductive health is a crucial component of general health. It is a state in which people have the ability to undertake sexual activity safely. Reproductive health is a state of complete physical, mental and social well being, all matters relating to the reproductive system and its functions and processes. Reproductive health includes puberty, facts on reproduction, pregnancy, childbirth, abortion, HIV, Sexually transmitted diseases, reproductive tract infections, family planning, etc.

So far reproductive health services in the country focus mainly on adults and do not address the special needs of adolescent. Adolescent reproductive health needs are poorly understood and ill served, while the needs of children or pregnant women are acknowledged in national programmes. Neither services nor research have focused on the unique health and information of adolescent. Adolescent ignorance about sexual and reproductive behaviour is compounded by reluctance among parents and teachers to impart relevant information.

There is increased awareness all over the world towards provision of reproductive health care, as many as 1.3 million women still die each year from reproductive most of which can be prevented. According to World Bank estimates about one third of the total diseases burden in developing country women aged 15-44 years is linked to health problems such as pregnancy, child birth, abortion, HIV and Reproductive Tract Infections. While the Indian government has established the necessary infrastructure throughout the country to provide health services, the health system is not fully geared to provide the full range of reproductive health care services. The family planning association of India evolved a project to develop a services system to provide comprehensive reproductive health services to adolescent, men and women through clinic- based as well as community- based approaches.

Although there is a commitment by the government to meet young people's sexual and reproductive health, the health needs of the adolescent has not been implemented seriously by either the government or municipal authorities, or voluntary agencies as having any priority. Neither have doctors, nurses nor the teachers given much thought and attention to the health needs of adolescent. The services being adult based, an adolescent is often confused as to whom to approach for reproductive health advice. What little information they received on this subjects is generally given by peers or a handful of doctors who are sensitive to their needs.

Therefore there is an urgent need to provide accurate, user friendly information on reproductive health to adolescent by organizing special education programme and efforts should be made by incorporating sex education as a part of the school curriculum, in order to improve the knowledge of adolescent. Adolescent's knowledge can be raised by making them aware through dissemination of information on different issues related to reproductive health.

Educating young people about reproductive health and teaching them skills in negotiating conflicts resolutions, critical thinking, decision making and communication improves their self confidence and ability to make choices, such as postponing sex until they are mature enough to protect themselves from human Immuno Deficiency Virus (HIV). Sexually Transmitted Diseases (STD) and unwanted pregnancies.

Parenting:

Verginia Thabah, Programme Assistant (HS), Krishi Vigyan Kendra - NRCM, Porba, Phek, Nagaland

Parenting refers to the knowledge, skills and abilities that parents have which influence the way they raise children. There is a vast different between having children and being a good parent. The quality of parenting is the single most important influence in children's emotional development. A few decades ago, the relationship between children and their parents was very simple and clear-cut. Children had to obey their parents without demur. Moreover the duties of the father and mother were distinct. The duty of the mother was primarily that of housekeeping and childrearing, with little scope for decision making. The father's role was that of the breadwinner and decision maker. Major decision pertaining to housing, finance, choice of the children's school, and even their choice of career, marriage plans, etc, were decided by the father. With the passage of time and changing societal mores, Indian families and parenting have changed. Men and women are equal in status and due to financial career parents seldom have time to spent and care for their children.

Role of parenting for infant and children

During infancy years, parent-child relationships are more important than any other relationship.

- Just after the baby is born his adjustment to life is greatly influenced by parental attitude. Parents who pad or hold the baby just after delivery will develop a strong bond and intimate relationship later in life.
- Fathers who are present during delivery usually have more favourable attitudes towards their children than to those who do not share the child birth experience with the partners.
- Parents should create a loving atmosphere at home. Understanding their feelings and inculcating values is the greatest gift a child will cherish forever.
- The child will feel more content and happy if parents are calmed and relaxed. Care and intimate relationship of parents to the child will develop a feeling of security

Parenting for children is different from parenting for infant because at this stage the child start to grow and various changes takes place, physically, emotionally and intellectually.

- Parents must be able to adapt their own parenting style to the changing needs of the child as they grow and develop, they should also adapt to the child's wants such as food, clothing, shelter and physical necessities.
- In certain case parents often punish in order they may subtly teach their children both appropriate and in appropriate behaviour. Parents' punishment is not a withdrawal of love and attention rather to teach children the behaviour pattern to become a well manner and adjustable person.
- It is the responsibility of the parents to monitor their child closely so that they can make their value more available.
- Parents should not be too autocratic as this interferes with children's ability to understand parental values.
- Family with both parents living together in the same household provide better environment for children's development. Father and mother are important resource for the child each is a source of emotional support, guidance and supervision.

Conflict of parenting:

There are many reasons of conflict which arises in a family between parents and children and which affects the style and value of parenting.

- In certain cases parents are unable to maintain and adjust with their children as a result it causes negative impact on children psychological adjustment.

- Lack of parental supervision, may increase the chances that children "gets into trouble" through truancy, delinquency, or premarital pregnancy.
- Single parents family has increased substantially through out the world, the reason may be due to higher rates of divorce, and single mother child rearing, it may also be due to the direct result of poverty and exploitation of young girls. Furthermore parenting and childhood become more difficult when there is high unemployment and poverty and when the economy of a country as a whole is depress.
- Death of the parents is a great loss to the children, this causes grief and resentment to their lives, in such a situation they feel isolated, neglected and abandoned especially if they fail to receive help, support and assistance from others.
- Families with an alcoholic member have more stress than other families, there happened to have more conflict, more negative effects, separation and divorce.
- Some children suffer from over parenting. They may have parents who give too much attention and protection, when parents cater to a demanding child and give to every whim it does not take long for the child to realize the parents are completely under his or her thumb.
- Today's societies the quality of life has very recently deteriorated, children's environment have become more complex, more dangerous and less supportive and parenting becomes more difficult. Some parents have no time to counsel or teach children the value on moral behavior.

Conclusion:

Parents occupy very special purpose in the life of children and if the style of rearing is favourable it will motivated the child to grow into well adjusted person. It is the responsibility of the parents to cater to all the needs of the child and provide a family environment that is consistent for the child. In general parents with warmth and acceptance are more effective than other parents in transmitting their own values and goals to their children. The home can promote acceptable values with the parents own model of behavior giving the child freedom to explore. The parents must accept the child as a personality in his/her own right. The traditional concept that the "hand that rocks the cradle rules the world" holds good especially as far as the child is concerned. The parents and siblings of the child have the most important influence in making up his/her personality structure with or without any stress or tension.

Krishi Vigyan Kendra Phek was established in year 2003 under the administrative control of National research center on Mithun (ICAR) , Jharnapani, Nagaland. It comes to full functioning in the last part of the year 2006 after the recruitment of staff has completed. It is located at Porba village uner sub division of Pfutsero in Phek district.

Krishi Vigyan Kendra has several activities like conducting ON as well as OFF campus trainings in various disciplines, conducting frontline demonstration of proven technologies on farmers fields in cereal, pulses, oilseeds and horticultural crop. Front line demonstrations are also carried out in other enterprises like, livestock, farm machinery, post harvest, home science etc. KVK 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 (OFT)", refining and documenting Technologies for developing region specific sustainable land use systems. The conduction of OFT's on newly developed/refined technologies on farmers fields helps in collecting feedback for further refinement. KVK also establishes functional linkages with other related organizations and it actively participates in extension activities like Exhibitions, field days, seminars, Kisan Melas and also contributes in Mass Media like Newspapers, All India Radio and Doordarshan programmes and also publishes popular articles and extension literature like folders, booklets, technical reports etc. for further dissemination of technologies. It also conducts village surveys for assessing the technological gaps and training needs of farmers, rural youth and farm women and offers technical guidance to needy farmers.

Publish by

Director, NRC on Mithun (ICAR)
For Krishi Vigyan Kendra – NRCM
Porba, Pfutsero, Phek – 797107
NAGALAND