

**“STUDY AND DOCUMENTATION OF INDIGENOUS
TRADITIONAL PLANTS AND TECHNIQUES USED IN
AGRICULTURE IN TRIPURA”**

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Introduction

The advent of the concept of sustainable agriculture in late eighties in Indian agricultural scenario has evoked interest on indigenous technical knowledge (ITK) that has the element of use of natural products to solve the problems pertaining to agriculture and allied activities. Indian farmers, over centuries, have learnt to grow food and to survive in difficult environments, where the rich tradition of ITK has been interwoven with the agricultural practices followed by them.

Indigenous technology knowledge (ITK) can be defined as any information originated out of farmers experience which has practical utility in solving farmers problems which is feasible, profitable and socially acceptable and adopted farmers own conditions which moves from one generation to another by word of mouth (Sabarathnam, 1990). Indigenous technology knowledge (ITK) refers to the unique, traditional, local knowledge existing within and developed around the specific conditions of women and men indigenous to a particular geographical area (Grenier, 1998). Indigenous Technology Knowledge (ITK) is based on the experiences that gathered momentum through generation and are being developed and standardized through innumerable experimentation and practices to enhance the life of the people who greatly depend on agriculture production system.

Characteristics of ITK:

- I. ITK is not static but dynamic
- II. Exogenous knowledge and endogenous creativity brings change to ITK
- III. ITK is intuitive in its mode of thinking
- IV. ITK is mainly qualitative in nature
- V. ITK study needs a holistic approach
- VI. ITK, if properly tapped, can provide valuable insights into resources, processes, possibilities and problems in particular area
- VII. ITK is recorded and transferred through oral tradition
- VIII. ITK is learned through observation and hands-on experience
- IX. ITK forms an information base for variety
- X. ITK reflects local tradition

Roles of ITK

- I. ITK can aid development efforts
- II. ITK can facilitate local people's participation
- III. ITK is a valuable source of developing appropriate technologies

Scope of ITK analysis

- IV. New biological and ecological insight
- V. Resource management
- VI. Protected areas and conservation education
- VII. Development planning
- VIII. Environment assessment

Advantages of ITK

- ❖ It has low cost and is readily available.
- ❖ ITK is found to be socially desirable, economically affordable, sustainable, environmentally safe and minimum risk to research users and widely believed to conserve resources.
- ❖ ITK provides basis for problem solving strategies for local communities.
- ❖ Use of ITK assures that the end user of specific development projects are involved in developing technologies appropriate to their needs.

Survey Work:

Survey works were conducted in Belonia, Rajnagar agri Sub-division, South Tripura; Bamutia, West Tripura; Killa village, Gomati ; Khowai, in Khowai district. For present survey work, use of local resource persons and In-depth interview of farmers survey methods were used. Notes, Photos, Audio-recordings and Video-recordings were used for documenting the ITK in different parts of Tripura by present investigator.

Different Indigenous Technical Knowledge observed during survey work in Tripura:

There is a lot of indigenous agricultural know-how available with the farming communities specially the tribals. These traditional farming systems are products of centuries of accumulated experiences. Farmers all over the world have developed their own indigenous systems of farming with local inputs. Some of the ITKs are herewith documented with photographs and description.



Name of the ITK	Function	Preparation method	Name of the farmers from whom collected	Place of collection
mai kaimo/sowing in jhoom or jhoom cultivation	Sowing of paddy/jhum rice	It's a traditional cultivation technique followed by the tribal people in Tripura. After slashing the jungle in hilly areas, they used to burn the jungle residues. After that they sow the seeds of paddy by digging pits on the land with the help of "da" and placed the seeds.		Rajnagar, South Tripura



Name of the ITK	Function	Preparation method	Name of the farmers from whom collected	Place of collection
Paddy soaking and Parboiling of paddy in an Aluminium container	Soaking of paddy before parboiling	Paddy is parboiled in an aluminium container after which it is dried in sun. Then, it is milled through rice miller to get rice.		Belonia



ITK : Drying of paddy after parboiling

Place of collection : Belonia



ITK : Storing of paddy on floor after threshing. It is covered with paddy straw for few days. After few days, it is cleaned and stored in granary.

Place of collection : Belonia



Name of the ITK	Function	Preparation method	Name of the farmers from whom collected	Place of collection
Mai dul	it is use as a breakfast while working in the field	It is prepared from boiled rice.		Killa, Gomati



<p>ITK : “BOROJ” beetle vine cultivation Place of collection : Rajnagar, Belonia</p>	<p>ITK : “BOROJ” beetle vine cultivation Place of collection : Rajnagar, Belonia</p>
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<p>ITK : Weed (Collected from Forest part) Use: Thatching on beetle vine structure (“Boroj”) Place of collection : Khowai</p>
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Name of the ITK	Function	Preparation method	Name of the farmers from whom collected	Place of collection
Cultivation of vegetable near the pond	Vegetable cultivation	Cucurbitaceous vegetables or trailing type vegetables are sown near the pond and “macha” type structure constructed over the pond where the plants are grown. It increases the cropping intensity as well as reduce the labour cost by reducing the irrigation requirement as it is near the pond. It also shows the proper utilization of land.		Rajnagar, Belonia



Name of the ITK	Function	Preparation method	Place of collection
Mesta (local type) or Roselle - <i>Hibiscus subdoriffa</i>	It is used for preparation of prickle, food item. Its taste is sour.	Fruit is similar like commercial mesta crop. It's a wild type of mesta. Local people use this for preparation of prickle, chatni, food item etc. It has also some medicinal value. Roselle is rich in organic acids including citric, malic, tartaric and allo-hydroxycitric acids. The plant is also known for its Beta carotene, vitamin C, protein and total sugar. Roselle, having various medically important compounds called photochemical, is well known for its nutritional and medicinal properties. Many parts of Roselle including seeds, leaves, fruits and roots are used in various foods as well as in herbal medicine as a potential non-pharmacological treatment. Different extracts from Roselle plays a crucial role in treating different medical problems including many cardiovascular disorders, helmenthic disease and cancer. The plant also act as an anti oxidant and used in obesity management.	Chittamara, Belonia



Name of the ITK	Function	Preparation method	Name of the farmers from whom collected	Place of collection
Local name - Jhanta (Broom)	It is used for cleaning purpose.	It is made off of one type of weed which is available in the forest and weeds are tight with the rope.		Khowai



Name of the ITK	Function	Preparation method	Place of collection
Pit Begun (<i>Solanum torvum</i>)	It is used for cooking purpose. Having medicinal value.	It's a wild type brinjal which is used by the local people for cooking purpose. It has some medicinal value. The glycoalkaloid solasodine, which is found in the leaves and fruits, is used in India in the manufacture of steroidal sex hormones for oral contraceptives. The juice of the plant is used to treat fevers, coughs, asthma, chest ailments, sore throats, rheumatism, dropsy, stomach aches and gonorrhoea. The juice of the flowers, with salt added, is used as eye drops. The leaves are applied topically to treat cuts, wounds and skin diseases. There are many health benefits of Solanum Torvum for our body viz. Bloodstream, Hemorrhoid, minus eyes, Osteoporosis, Flu, Cure high uric acid, Neutralize Toxin in our body, Increase men and women sexual desire, Natural cancer medicine, erectile dysfunction. Although there are many health benefits of Solanum Torvum, but we have to notice some caution when consuming it. Eat it naturally, don't too excess. Because if you	Khowai

		eat Solanum Torvum too excess, it can cause poisoning. Solanum Torvum is not recommended to consume by glaucoma sufferer because it is dangerous. If you have disease and want to use it as herbal medicine, you should consult first with your doctor, it is good for you or not.	
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Name of the ITK	Function	Preparation method	Name of the farmers from whom collected	Place of collection
Local beetle vine (Gechopan) – <i>Piper beetle</i>	Food item (Confectionary purpose)	It's a wild type beetle vine which is used by the local people for confectionary purpose. It does not require any control environment like “boroj” which is used for commercial cultivation of beetle vine.		Chittamar a, Belonia



Name of the ITK	Function	Preparation method	Place of collection
Mukhi (Wild elephant foot yam) - <i>Amorphophallus sylvaticus</i>	It is used for making different food items.	It's a wild type colocasia which is used by the local people for cooking.	Chittamara, Belonia



Name of the ITK	Function	Preparation method	Place of collection
Wild yam - <i>Dioscorea villosa</i>	Used for food material of pig	It's a wild type yam which is used by the local people for food material of pig.	Chittamara, Belonia



Name of the ITK: Paddy hay storage

Purpose: The main purpose of this ITK is storage of hay for future use for cattle feeding and as a litter for livestock rearing.

Source: Rajnagar, Belonia



Name of the ITK	Function	Preparation method	Name of the farmers from whom collected	Place of collection
Cultivation of Bitter gourd in brinjal as relay cropping	To use the brinjal stem as “Machha” for bitter gourd crop.	After the brinjal, bittergourd crop is planted 2 weeks before the completion of brinjal as relay crop. When the brinjal harvesting is completed, the leaves are destroyed by applying herbicides, only stems are left in the field. This stems are used for supporting the bitter gourd crop for trailing.	Chandan Das	East R. C. Ghat, Khowai

Indigenous Technological Knowledge for Soil Management in Tripura

The concept of indigenous knowledge in the context of agriculture is the traditional wisdom used for the conservation of soil and water resources for their sustainable use. These practices are the outcome of trial and error method and passed down from generation to generation, usually verbally or by practice. But in the pace of agricultural intensification these values are mostly lost. However, in the current context of declining soil health it is the high time to think again of indigenous nutrient management which is being lost to modern agriculture and use it properly either in toto or after suitable refining it scientifically as per need of the farmers.

Soil is the most basic and vital natural resource on which agricultural production depends. Maintenance of soil fertility and productivity is, therefore, a real key to achieve sustainability in agriculture. No doubt, well frontier science based technologies appropriate for efficient management of soil fertility optimizing nutrient supplies from different sources have been developed, but many of these technologies could not find favour with farming community, in general and resource poor

small and marginal farmers, in particular. Against this, there is growing realization that the present technologies need to be modified in the light of indigenous technological knowledge (ITK) available with farmers so as to make them cost effective and acceptable to local farming communities.

Farmers possess a store-house of knowledge about their soil and various practices to restore and maintain soil fertility. Since the earliest stage of agriculture, farmers have been active in developing techniques for crop production and maintaining soil fertility. The indigenous technological knowledge available with farmers provides much needed insight into the management of soil fertility and nutrient management for sustained agricultural production, because such knowledge has been time tested and inherited from one generation to another. Moreover, indigenous technologies developed on the basis of experience gained and lessons learnt by the farmers are generally eco-friendly and do not require off-farm inputs. These technologies are at the finger tips of the farmers and thus give result invariably. In order to make use of these technologies they should be collected and fine tuned with scientific touch.

The state of Tripura is endowed with diverse geo-edapho-meteorological condition. Consequently a spectrum of socio-economically and culturally distinct people is engaged in agriculture. The people of Tripura have evolved a large numbers of practices related to soil management systems suitable for different agro-climatic conditions of the state. They are time tested and effective for nutrient management. The systematic documentation of indigenous nutrient management practices in the form of a book chapter is necessary to conserve the agricultural heritage of Tripura from being lost. Here are few ITKs related soil nutrient management.

1. Use of Ash:

Ash, particularly from rice husk and cowdung cake is an important material for agricultural use in the plains and valleys of Tripura. In *jhum* cultivation ash from burning of grasses weeds etc are used by the tribal people in hilly areas of the state. Ash primarily meets the deficiency of potash and supplies huge amount of silicon and it imparts friability to the seedbed soil which facilitates germination of seeds and also the easy uprooting of the seedlings. A thin film made by spreading of ash protects the seeds from the damage caused by birds. Spreading of ash mixing with kerosene oil on vegetable leaves in the morning hours is a common practice to protect the plants from the attack of insects pests, particularly jassids and red beetles. Mixing of ash with household waste helps in surface soil crust breaking, and rain water conservation This ITK practice is widely used in entire Tripura. This practice is

technically feasible, inputs easily available, compatible with internal resources of the household, eco-friendly, enhance soil fertility and crop production.

2. Spade Insertion into the soil as indicator of irrigation requirement:

Insertion of spade or digging the soil is used to test moisture content of the soil.

It is a local practice to ascertain the optimum utilization of water and its penetration up to the root zone of the soil profile. Moisture content in the soil particles are necessary for increasing soil fertility. Both under rain fed and irrigated condition farmer test soil with the help of spade digging. Farmers regulate irrigation to desired soil depth by inserting spade to the soil. If it is completely inserted from front portion, it is considered to be properly irrigated. Similarly in other cases soil is thrown upside with spade and its splits into small pieces. This practice is a good indicator for farmers of Tripura to estimate proper irrigation of agricultural land. It is simple, easy to adopt and saves time as well as labour.

3. Moisture conservation through mulching:

In Tripura many farmers use paddy straw as mulch material. Mulching conserves soil moisture in the field and also helps in maintaining soil temperature, controlling weed population. Moreover, it resists soil erosion to some extent. Mulching with farm yard manure is also used. This ITK practice is cheap and simple to adopt, conserves soil moisture, boon to the rural people for increased crop production and higher soil fertility as well as maximum use of raw material.

4. Indigenous compost pit:

Application of compost helped to restore the fertility and soil moisture. So farmers of Tripura indigenously developed some compost pit structure in which natural earthen pit is prepared wherein cow dung, grasses, wasted vegetables were dumped, and opening of pit is closed for three months. The application of compost improve soil fertility and improves the water holding capacity of soil.

5. Use of pond silt:

Use of pond silt (dried bottom mud of pond) in crop and plantation crops is an age-old popular practice in the state. During summer months the village ponds are dried up naturally or are dried by pumping out water in a rotation once in an interval of 5-10 years for the purpose of deepening of the pond. When bottom mass are clearly dried it is dug out and directly applied to the plantation as well as field crops. It is believed that the longer the period of inter-

val between two successive drying of the pond, the better in the quality of pond silt in term of nutrient. Besides, the darker the colour and lighter the weight per unit volume the richer is the pond silt in nutrients. The darker colour and the lighter weight signify the presence of large amount of humified organic matter. Many farmers reapply the silt gathered in pond or lakes to the crop field in order to improve soil fertility and physical condition like texture and structure owing to the presence of a good amount of organic matter and clay.

Silt collected from ponds and lakes are spread evenly on the field alone or in combination with FYM before sowing. Advantages of silt application include increased soil fertility and therefore improve crop yield, increased moisture content of soil, improvement in water table due to increased filtration.

6. Crop residue application in the field:

The farmers of Tripura apply crop residues in crop field which on decomposition increase the organic matter content of soil and also improve the soil physical, chemical and biological properties of soil resulting in higher crop yield. But quantification of yield advantage after the incorporation of crop residue is a researchable issue which needs to be addressed.

7. Use of sand bags as erosion control measure:

A sandbag is a bag or sack made of polypropylene or other sturdy material that is filled with sand or soil and is used in Tripura for gully erosion control which is very common under Tripura condition. The advantages are that the bags and the sand are inexpensive. **When empty the bags are compact and lightweight and easy to storage and transport. They can be brought to a site empty and filled with local sand and soil.**

8. Application of mixture of salt, ash and soil in the coconut pit before transplanting:

Coconut trees need high potassium. Use of common salt (NaCl) at the time of planting coconut saplings and also almost in every year is a common age-old practice in the state. On an average, one *ser* (900 g approx.) is applied per plant. The Na in NaCl may replace non-exchangeable form of K from soil sites and make it available to the plants. This is how use of salt is beneficial to the trees. The objective of application of ash to provides potassium and sand makes root penetration easier so that productivity increases.

9. Use of Coconut husk inside the planting pit of plantation crops: Coconut husk increases the water holding capacity of the soil and also supplies potassium. It also helps in easy root penetration.

10. Penning of animal in the field: Tribal families those practice *Jhum* cultivation are nomadic in nature. They migrate from one place to another along with their cows and sheep also. The practice of penning animal in the slash and burn field is common to *jhumian* tribal families. Wooden logs are usually used to tie the animals in the fields. Frequent shifting of animal is done so as to cover the whole field for uniform distribution of the animal dung and urine.

Present Relevance of Indigenous Technological Knowledge

- The excavation and removal of sediments from the pond base helps in 1) enhancing the infiltration rate of water during the monsoon and the storage capacity of water, and ii) minimizing the chances of nitrate addition to ground water through pond base. The high infiltration rate of water in the pond helps in increasing the recharge of ground water. In such a process surface removal of nutrient coming from the runoff water is recycled by putting back all these nutrients, humified organic matter and clay in the form of pond silt. Such approach also reduces the chance of ground water pollution.
- The practice of animal penning has practical value. The fresh dung left in the field rapidly dries up. The drying checks the ammonification and methane emission. The dung is usually worked into the soil and therefore, does not lose much of its fertilizer value. The urine is absorbed directly in to the soil and reduce the chances of volatilization of nitrogenous compound for being lost. Due to current short *jhum* cycle of 2-3 years, the fertility gets deteriorated quickly. Penning animal in field may rejuvenate the field to some extent.
- Ash primarily meets the deficiency of potash and supplies huge amount of silicon and it imparts friability to the seedbed soil which facilitates germination of seeds and also the easy uprooting of the seedlings. A thin film made by spreading of ash protects the seeds for the damage caused by birds. Spreading of ash mixing with kerosene oil on vegetable leaves in the morning hours is a common practice to protect the plants from the attack of insect pests, particularly jassids and red beetles. Mixing of ash with household waste helps in surface soil crust breaking, and rain water conservation. This practice is technically feasible, inputs easily available, compatible with internal resources of the household, eco-friendly, enhance soil fertility and crop production.
- Application of table salt in coconut plant has scientific relevance. Coconut plants are potassium loving crop. The Na in common salt (NaCl) may replace non-exchangeable form of K from soil sites and make it available to the plants. Thus, plant gets benefitted. Currently, relevance of salt application in coconut plants is lost due to the use of KCl as potassic fertilizer.

- In general, it is observed that organic manure based farming systems encourage the build-up of soil organic matter, which reduces the erosion and runoff of inorganic matter to streams and rivers besides improving the physical, chemical, biological and biochemical properties of soils. In addition to the highest degree of yield stability, organic manure and crop residues can also reduce the pest and disease incidence by increasing species diversity, absorb and inactivate residual pesticides. Organic matter by virtue of its high CEC protects the nutrients being lost and thus, improves the use efficiency of applied chemical fertilizers.
- Material used for mulching like straw, saw dust etc. are bad insulator. Small wave length rays having high energy coming from sun while fall on mulching material pass through mulching material and converted into long wave length rays of less energy. Energy is then converted to heat energy and cannot dissipate through mulching material due to their bad insulator property, thus, maintains soil temperature. Water, thus, vaporised cannot escape from soil due to mulch coverage.

Conclusion

ITK is still an under-utilized resource in the development activities. It needs to be intensively and extensively studied and incorporated into formal research and extension practices in order to make rural development strategies more sustainable. Special efforts are needed to understand, document and disseminate ITK for preservation, transfer or adoption elsewhere. We conclude that ITK is used in agriculture, engineering, medicine, soil conservation and in many other fields. For instance, wooden hand hoes out of wood were used for cultivation, farmers knew which trees to get herbs from, fresh foods were obtained from the wilderness and people observed changes in climate by watching the entire environment. Intercropping is believed to increase on the crop yield per unit area and also to replenish the soil. Long periods of fallowing land were observed, mulching was practiced and crop rotation was equally important. Management strategies employed by the local people to exploit the environment show that there is a store of indigenous knowledge which people have developed over generations through daily observations and practices.

Indigenous knowledge still plays an important role in traditional farming in the culture, thus supporting local food security. The potential food insecurity is not primarily due to decreasing yields, but more so because of the uncertainty of market prices. To protect biodiversity and ensure the in-situ management of natural resources, an adequate farmer's income is required.