

## Indigenous Traditional Knowledge: A Saviour for the Depraved Effects of Modern Agriculture

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### Abstract:

Indigenous Traditional Knowledge is local knowledge that is used by indigenous communities to live sustainably without harming the environment. Dissemination of indigenous knowledge is necessary for agricultural prosperity as utilization of harmful chemicals is causing ecological and biochemical pollution. For preservation of local wisdom and natural resource management flow of indigenous knowledge needs attention and it can be done by linking the indigenous knowledge system of people with the researchers through extension activities. The article is based on use of secondary sources for collection of information about the indigenous traditional knowledge. Thus indigenous traditional knowledge can become an invaluable basis for securing sustainable agriculture development.

### Introduction

Incongruous exploitation of chemical fertilizers, fossil fuels, agrochemicals and monocropping of modern varieties is degrading the environment and destroying the natural and agricultural systems. Indigenous knowledge systems are considered as a dynamic tool for sustainable agriculture and conservation of natural resources. It is basically based on the principle of interaction between locally available natural resources and human environment. The uniqueness of this system is to maintain the productivity by utilization of locally available natural resources that are compatible with the regional climatic and spatial diversity along with its public acceptability and ecologically benign nature. ITK is the basis of how to live sustainably; it is common among tribal people who follow these traditional ways of farming from many generations which make them self-sufficient and self-determined. India has a larger concentration of the tribal people living in hilly areas and undulating tracts which make them follow these traditional practices. However, ITK is becoming extinct now days due to modernization and less research and utilization in the development. Thus, this article



revolves around the beneficial effects of Indigenous Traditional Knowledge and identifying and its preservation through proper validation and documentation of these ITKs for sustaining eco-friendly agriculture.

### **What is Indigenous Traditional Knowledge?**

It is an area based cumulative body of knowledge maintained and developed by people with histories of interaction with their natural environment. This knowledge is an integration of resource use practices, social interactions, ritual and spirituality which provide a foundation for locally appropriate sustainable development.

### **Characteristics of Indigenous Traditional Knowledge**

- **Indigenous Traditional Knowledge is adaptive**( based on historical experiences but adapts to social, economic, environmental, spiritual and political changes)
- **Indigenous Traditional Knowledge is cumulative** (based on knowledge and skills developed from centuries of living in close proximity to nature).
- **Indigenous Traditional Knowledge is dynamic** (based on a particular point in history but has developed, adapted, and grown over millennia)
- **Indigenous Traditional Knowledge is holistic** (based on all aspects of life - spirituality, history, cultural practices, social interactions, language, healing.
- **Indigenous Traditional Knowledge is humble** (based on how to live in harmony with the gifts of the Creator and not to destroy the nature).
- **Indigenous Traditional Knowledge is intergenerational** (based on passing of information within a community, from one generation to the next orally through language, stories, songs, ceremonies, legends, and proverbs).
- **Indigenous Traditional Knowledge is irreplaceable** (based on aspect that there is nothing western science can do to replace or replicate Indigenous knowledge).
- Indigenous Traditional Knowledge is **unique** (based on the live experience of each community and is unique to a given culture or society).
- **Indigenous Traditional Knowledge is based on observance** (based on observance of the environment and make decisions on what would be best for the community seven generations in the future.

### Indigenous Traditional Knowledge vs. Western Scientific Knowledge

<b>Mode of Knowing</b>	<b>Indigenous knowledge</b>	<b>Western scientific knowledge</b>
<b>Relationship</b>	Subordinate	Dominant
<b>Dominant mode of thinking</b>	Intuitive	Analytical
<b>Communication</b>	Oral, teaching through story telling	Literate, Didactic
<b>Characteristics</b>	Holistic Subjective Experimental	Reductionistic, Objective Positivist
<b>Data creation</b>	Slow/Inclusive	Fast/Selective
<b>Prediction</b>	Short time cycles Recognises the onset of long- term cycles	Short-term linear, Poor long-term prediction
<b>Explanation</b>	Spiritual – includes the Inexplicable	Scientific Hypotheses Theory and Laws
<b>Biological classification</b>	Ecological	Inclusive-internally differentiating

### ITK practices documented for agricultural activities

#### Storage of Seeds:

After cultivation and harvesting grain storage is one of the important practice since storage losses are found to be more due to improper availability of storage facility. Thus people living in tribal areas adopt and make different types of storage box or space for the storage of

grains. Dhikutiis a four-sided box or bin built of wood with a wooden lid and is built inside the house, often utilizing one or more of the existing walls. The capacity of this box is variable and can store about 300–400 kg seed or grain. It is commonly used for storing rice but can store other grains too and is a long term method of storage.

Bhakari is a woven bamboo mat rolled into a cylinder. The base of the mat consists of rice straw smeared with cow dung. Plastering of the mat with cow dung or mud not only make it waterproof but also prevents the attack of rodents and insects. It has a durability of about 4 to 5 years with careful maintenance.

Kotha/Kotheis also a woven bamboo mat rolled into a cylinder but the circumference of this storage unit is plastered with mud lining or cow dung. It can be of various sizes usually 3–4 ft in height with a capacity of holding about 1.5–2 q of seeds. It would normally take two to three days to weave a Kotha/Kothe of above mentioned height. After it is woven, the structure is smeared with cow dung or mud to seal the holes for safe storage of seed/grains. It has a durability of about 3–4 years. Seed/grains of paddy, buckwheat, soybean and urdbean are usually stored in kotha/kothe.

Chindo is type of storage box wherein the seeds are stored in dry and emptied shell of gourds (especially bottle gourds and ash gourds). The process involved in making of this box is harvesting of matured gourds, removing the outer soft parts, cleaning and drying in a well ventilated area to avoid rotting. These are then sundried till it is thoroughly dry. The seeds can then be stored successfully for 2–3 years. It is used to store seed/grains of vegetables, black gram and green gram.

Jhutta means to tie in bunches. This method of storage is commonly used for storing maize and occasionally garlic. After the maize is harvested and dried, the husk of bunch of maize is shucked and tied together to make a jhutta. Traditionally, jhutta of 6–7 cobs are placed in an open structure made of bamboo poles and timber for further sundry and storage.

Dalo is a small conical or circular shaped basket made out of bamboo. The bamboo is thickly woven to ensure that grains remains intact inside it. Unlike Bhakari and Kotha/Kothe, it doesn't require any plaster or mud/cow dung lining. It has the capacity of holding about 10–15 kg of grains/seeds. It is often used for holding small quantities of threshed grain for milling or the milled product. Dalos are also used for storage of surplus grain when all the major structures are filled. Storage bins are also made with the help of wooden spinters of

Pine (*Pinus roxburghii* Sarg.), Deodar (*Cedrus deodara*), Kataunj (*Castanopsis tribuloides*), Bamboo (*Dendrocalamus strictus*), Cheura (*Diploknema butryacea*), Tooni (*Cidrella toona*) and tin sheets. The bins made of wooden splinter are known as Bhakar and the bins made up of Bamboo and Ningal are called as Topare or Doke. These are the indigenous methods used for storage of seeds in different regions which are eco friendly and involve the utilisation of locally available resources.

### Protection of seeds against storage Pests and Diseases

Seed is the basis of production of plant as it contains the basic DNA thus conservation of seed means the conservation of planet. However to store the seeds safely indigenous communities first do the selection of healthy and disease free material which is done by the old and experienced women folk of the village. After selection material is threshed and kept separately then the threshed seed materials are sun dried to reduce the moisture content in seeds. The seed material is then tested for moisture by crushing the seed with teeth if it breaks with a hard sound it becomes optimum for storage. Finally then the wooden or cow dung ash is mixed with the seed material @50 g per seeds after mixing of ash 4-5 leaves of Peach (*Prunus persica*), Neem (*Azadirachta indica*), Timur (*Zanthoxylum armatum*), Walnut (*Juglens regia*.L) or Bakayan (*Melia azadirachta*. L) Or Turmeric (*Curcuma Longa*.L) or Lemon (*Citrus limon*. L) rhizomes or leaves are mixed in per kg of seed material for protection of seeds from the storage pests and diseases.

Use of red baked soil is also an important tradition of storage pests used by the indigenous communities wherein soil is dug and stones/pebbles are removed from the soil thereafter kneaded into dough which is then flattened and baked in kiln. After baking the soil is split into small pieces then grounded in the local water mills in the form of a reddish brown powder and finally is used as a seed dresser against storage pests of food grains (Wheat, Barley, Rice and Pulses). The rationale behind the use of ash and soil as seed dresser is the quantity of silica deterred the egg formation and larvae feeding.

Use of various plant parts as storage pesticides is also practiced by the indigenous communities because of availability of essential oil in the plant parts, the emission of a kind of smell which act as a repellent of insect and deters their survival. Eg: Bach (*Acorus calamus*. L) contains 1.5%-3.5% of yellow bitter aromatic volatile oil (Asarone), Peach (*Prunus persica*.L) contains hydrocyanic acid, tannin like substance (8%),

quercetin, kampferol, caffeic acid etc., Neem (*Azadirachta indica*) contains meliacin, nimbin, nimbinen, nimbandiol and azadirachtin, timur (*Zanthoxylum armatum*) contains piperine, phenolic constituents, monoterpene, linalool 5.7%, walnut (*Juglans regia*) leaves contain ascorbic acid, carotene and juglone. Bakayan (*Melia azadirachta*) contains meliacin, turmeric (*Curcuma longa*) contains lemon oil, citric acid and pectin which act as antifeedants against several insects.

Mustard oil also acts as an antifeedant against several insects and is useful against (*Callosobruchus chinensis*) a major insect of storage pulse due to the presence of allyl isothiocyanate in it. Thus these are the eco-friendly pesticides which can act as an alternative to chemical pesticides and can help in conservation of plant genetic source in a sustainable manner.

### **Soil Conservation**

Indigenous communities follow some practices to increase the productivity of soil without harming it. Firstly they do not favor or follow monoculture as it can harm the productivity of the soil instead they utilize a leguminous crop (Peas) to restore soil fertility as these crops are known to fix nitrogen in the soil and restore the lost fertility in the soil due to exploitation by crops grown earlier and which can further help the following crop to reap the benefits of increased fertility in the soil.

Some parts of the locally available species of some trees are also used as a soil loss restorer by the indigenous people. Needle shaped leaves of *Pinus wallichiana* (Pine tree or Kyle tree) which are flexible with a length of 12 to 18 cm are tied in small bundles for spreading on the field as the land in mountainous regions is generally slopy so the leaves slow down the velocity of water and allow more percolation into the soil. These leaves also prevent water erosion and contribute to even spreading of irrigation water in the field. They are also utilized as mulch for conserving soil moisture and as they decompose, they also act as a source of nutrients too.

Instead of using fertilizers for increasing the fertility of soil indigenous people at the time of sowing make a group of sheep and goat and keep them in a particular farmer's field for two to three days. Droppings of sheep and goat in this duration are uniformly spread on the field and are mixed with the soil by plowing which acts as a source of nutrients for the soil and when the turn of one farmer is completed, they are moved to another farmer's field



of the group. This way, the whole village is covered and sufficient manure and nutrition are provided for the crops. Hence, it is an efficient way of adding organic manure by community participation and is also easy with less requirement of labor. Thus, these indigenous practices of soil conservation can be utilized for preventing soil erosion and maintaining its fertility in a sustainable way.

### **Climate Change Resilient Practices**

Since the our agriculture is completely climate resilient so sudden change in climate can affect it similarly indigenous people are also adapting to these sudden climate changes through different practices like traditional agroforestry, agro-horticulture system i.e. integration of cash crops, fruit, fodder trees and medicinal crops for reducing the soil erosion and regulation of the field climate. Zero tillage and mulching are also the well-known climate smart strategies adopted against soil erosion, for conservation of soil moisture and moderating the soil thermal conditions. Increasing water scarcity for drinking and irrigation purposes due to sudden climate change is also decreased by water conservation techniques like artificial glaciers or glacier grafting in high altitude regions. Thus, these indigenous practices should be considered and promoted as climate resilient practices for eco-friendly agriculture.

### **Animal Husbandry Practices**

Farmers living in the hilly regions rear livestock along with the farming for their own needs of milk, milk products and they also serve as draught power in their agricultural fields but sometimes they suffer from diseases so they are treated by the farmers using their indigenous knowledge described below:

Ecto-parasite are transmitter of several protozoan diseases of dairy animals which causes annoyance in the animals as well due to which milk production also decreases. Clipping of hairs is the indigenous method adopted by the farmers to reduce the transmission of parasites from animals to animals. Prolapse is a reproductive disorder found in cows when abnormal repositioning of cervi/ vagina or sometime both occurs from its normal anatomical position to hanging outside the vulvar lips. Feeding of tukmalanga/sweet basil seed (*Ocimum basilicum*)@ 1.5 Kg in 3 liters cow in divided doses at the rate of 250 g in 500 mL milk in 5-6 daily doses may prevent or cure the prolapsed.

Anestrous is also a reproductive disorder when animal fails to come in estrous cycle. Dalda and jaggery are fed to dairy animals suffering from anestrous as the major causes of

aneurous are lack of energy, negative energy balance, deficiency of minerals and vitamins etc. thus dalda which contains vitamin A, long chain fatty acids and high caloric energy along with jaggery which is also rich in phosphorous and energy are used as a indigenous treatment.

Sesame oil which is a long chain fatty acid contains about 40% of linoleic acid is used as a indigenous treatment to maintain pregnancy in females and helps in improving sperm quality in males

Hing is used as a indigenous ointment by dissolving in water for direct application on teats for mastitis treatment and is fed as 5-10 g/ animal for treatment of bloat. Its use in the treatment of bloat is to reduce the surface tension in frothy bloat and relieves the condition by removal of gas from the rumen. Since bloat is the over distension of the rumen and reticulum with gases derived from fermentation. Solution of turmeric (30 g) in 500 mL used to treat the animal by relieving the over distension.

Ascariasis (Junn) is a wormy condition resulting in loss of body condition, decreased production, diarrheas and is fatal particularly in calves. The combination of salt, turmeric and mustard oil is used to kill and expel the ascarid worms from the gastro-intestinal tract as the salt may cause death of worms by osmotic action on their body wall and turmeric may have anti infective effect in the animal's body to the damage caused by ascaris, while the mustard oil expel the dead ascaris from the body by laxative action.

Hemorrhagic septicemia (H.S.) is a bacterial disease which causes brisket oedema resulting in labored breathing and subsequently death. Neem branches with attached leaves soaked in luke warm water are used to reduce the swelling of the brisket region of the animal. Inhalation of kerosene is also used to treat labored breathing in H.S. while its topical application in feet is useful to cure lesions in foot and mouth diseases in dairy animals. Application of alsika butta (*Linum usitatissimum*) is also used to reduce the swelling of the brisket region in animals suffering of H.S., Fascioliasis and other oedematous diseases.

Application of dhan (*Oryza sativa*) and sugarcane (*Saccharum officinarum*) is used to prevent retention of fetal membranes in dairy animals. The combination of turpentine oil and mustard oil is used as a drench to cure the tympany in dairy animals. Due to laxative action of mustard oil, it is used to relieve the constipation in dairy animals particularly suffering from impaction or other related digestive disturbances.





Traditional feed formulation is used in proportionate ratio to feed as concentrate from locally available materials by mixing different ingredients and boiling them. This practice is considered as economic as compared to commercially available concentrate mixtures and is more nutritious.

### **Conclusion**

Indigenous Traditional Knowledge is a low-cost strategy which has evolved after thousands of years of observation and experience which make it economically suitable and sustainable method for agricultural development. Indigenous communities experience and knowledge need to be converted into a system by linking their knowledge with research and extension so that better research outputs are received which are more usable. Indigenous traditional knowledge is a source of livelihood for the tribal/indigenous people which manage and maintain their local ecosystem in a sustainable manner. Thus, identifying and documenting ITKs followed in different regions should be the priority for the agricultural development. People need to be made aware about indigenous traditional knowledge conservation and management through training, workshops and publications which will help to facilitate collaboration and communication among the indigenous farming communities and scientists. This step will not only provide diversified options for development of agriculture in a sustainable way but will also help in the preservation of local wisdom.

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