Indigenous Technical Knowledge (ITK) and their Role in Sustainable Grassroots Innovations: An Illustration in Indian Context

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Abstract--- Indigenous Technical Knowledge (ITK) has immense potential for innovation, especially at the grassroots level. India is a country populated by a number of indigenous communities, most of which have their own set of unique traditional knowledge and technology base. Many of these knowledge and technologies are at par with the modern knowledge and technology system and have been provided the indigenous communities with comfort and self-sufficiency. These traditional knowledge and technologies have played a significant role in the overall socio-economic development of the communities. A study on some of the aboriginal knowledge and technologies, with special reference to the concept of Indigenous Technical Knowledge (ITK), prevalent among a number of indigenous communities was carried out and the significance of the same in innovation has been evaluated. The study was conducted within the framework of “sectoral system of innovation”. A wide range of diverse sectors including agriculture, animal husbandry, fishing and textile were considered for the purpose of the study as all these sectors are imperative in Indian context. During the course of the study, it has been observed that there is an instant need to document and preserve the Indigenous Technical Knowledge (ITK) of different communities, many of which are at the brink of extinction. There is a lack of proper alliance between the practice of indigenous and modern knowledge. There are serious issues related to intellectual property rights. An appropriate association between the traditional and modern knowledge and technology systems has immense potential to benefit the society.

Keyword--- Sectoral System, Innovation, Intellectual Property Rights

I.  INTRODUCTION

INDIGENOUS Technical Knowledge (ITK) is a significant component of the indigenous knowledge base. Local or indigenous knowledge refers to the cumulative and complex bodies of knowledge, know-how, practices and representations that are maintained and developed by local communities, who have long histories of interaction with the natural environment (UNESCO, 2012). Indigenous knowledge develops within a particular community and maintains a non-formal means of dissemination. Such knowledge is collectively owned, developed over several generations and subject to adaptation, and imbedded in a community’s way of life as means of survival. Within the broad framework of indigenous knowledge, the contribution of Indigenous Technical Knowledge is remarkable. This knowledge plays imperative role in many grassroots innovations. Such knowledge is responsible for improvement in many important rural enterprises such as poultry. Despite the wide recognition of indigenous peoples’ contribution to the world’s cultural and biological diversity and sustainable development, many challenges still remain in the area of traditional knowledge and technologies.

Innovation is the first attempt to carry out an invention in practice (Fegerberg, 2006). The knowledge inherently possess by the indigenous communities is used for purposes ranging from natural resource management, agriculture, medicine to other socioeconomic developments and thus it instigates the process of innovation. In the arena of grassroots innovation, it has been observed that most of the indigenous knowledge and technologies are at par with the modern knowledge and technology systems. ITK is momentous in many sustainable grassroots innovations which provide substantial substitutions for many modern systems and methods.

II. METHODOLOGY

The study was conducted within the framework of “Sectoral Systems of innovation”. A sector is a set of activities that are unified by some linked product groups for a given or emerging demand and which share some common knowledge (Fagerberg et al, 2006; 385). A rich and heterogeneous tradition of sectoral studies has clearly shown both that sectors differ in terms of knowledge base, the actors involved in innovation, the links and relationships among actors, and the relevant institutions, and that these dimensions clearly matter for understanding and explaining innovation and its differences across sectors (Fagerberg et al, 2006;381).

A. Study Area

Following sectors are considered for the purpose of the study

1. Agriculture
2. Animal Husbandry
   a. Duck Production
3. Fishing
4. Textile
a. Weaving Technique

III. RESULTS AND DISCUSSION

3.1 Agriculture

A. Indigenous Grain Storage Structures

Agriculture plays the most vital role in Indian economy. However, the storage loss of the agricultural products i.e. food grains is a major concern in most of the agricultural countries, including India. The farmers of most of the agricultural countries have to struggle hard to protect their grains from various conditions causing damages to them. With the era of Green Revolution, many improved techniques entered Indian agriculture not only for producing crops but also for storing grains. However, along with such methods, poisonous chemical Protestants also entered the agricultural sector. Nevertheless, in many parts of the country, the farmers practice indigenous storage techniques possessing excellent storage structures. These structures are eco-friendly, cheaper and locally available and do not cause any health hazards.

The indigenous storage structures of Dindigul district of Tamil Nadu is worth mentioning in this regards. Some of such structures are described below.

- Kulumai

Kulumai (Fig. 1) is an indoor grain storage structure. It is an imperative indigenous storage structure for storing various food grains, especially paddy grains (Oryza sativa). It is indigenously fabricated with a poultice made up of tank silt, rice bran and paddy straw. It protects the grains from pests and diseases and even from rats and rodents. Paddy grains stored in the structure will have a keeping quality for about 3 yrs without much deterioration in quality. It should be mentioned here that no other modern structure will exhibit same performance. In general, total storage capacity of the kulumai is about 600-700 kg but varies with the size and number of rings. After filling the grains, kulumai is covered with its lid. Kulumai is almost a stationary structure and is not frequently moved.

![Figure 1: (Sundaramari et al, 2011)](image1)

- Underground Grain Storage Pit

This is a multipurpose and low cost structure for grain storage. The pit is dug beneath the ground usually either in the front yard or backyard of the house, with square, rectangular or circular shape. These pits are mainly used for storing the millets like sorghum, pearl millet, finger millet and other minor millets. Before filling the grains, bran or other crop wastes are spread at the bottom of the pit. Then its inner wall is lined with the dried stalks of sorghum or pearl millet. After lining, pit is filled with grains and covered with rectangular stone blocks. The structure is again covered with gunny clothes and finally with dry sand to avoid moisture. Grains are usually stored in these underground pits for about 3-5 months. However, during the rainy season, such pits are not operated.

![Figure 2: (Sundaramari et al, 2011)](image2)

Thus we can observe how the indigenous communities are preserving the grains using their own indigenous technical knowledge and helping the rural community in being self-sufficient. However, many of them became extinct because of lack of awareness.

3.2 Animal Husbandry

Indigenous Technical Knowledge (ITK) is of great significance in the sector of animal husbandry. This knowledge is imperative in keeping a healthy livestock and for economic benefit. However, the irony is that such technical knowledge prevalent in different traditional communities is not properly documented due to which most of them are at the verge of extinction.

A. Duck Production

Duck is the only species, being maintained under traditional extensive system of rearing (Gajendran et al, 2011). Among various species of poultry, ducks are robust and productive in nature. Indigenous ducks of our country constitute more than 90% of the total duck population and the second largest species contributing towards egg production in India1. Poor rural farmers, who are dependent on ducks for their livelihood and employment, are responsible for the rearing of the same. Duck farming practices in India are still traditional, nomadic and sometimes primitive. Therefore, the traditional practices which have been evolved from time to time, from ancient days since adoption of duck rearing by the farmers, still exist and proved to be efficient and economical at the same time. The use of ITK is evident in the duck farming practices. In this context, we are taking the example of Uthiramerur taluk of Kancheepuram district and Tindivanam taluk of Villupuram district of Tamil Nadu, where the duck flocks were highly concentrated.

- Incubation and Hatching Operations

Unlike the common hatchery practices followed in commercial chicken production, broody hens were found to be widely used for hatching duck eggs, thereby making the
hens as live incubators. Therefore, artificial incubation was not at all practiced in hatching operation in these two villages of Tamil Nadu. Mud pots and bamboo baskets (Fig. 3) were used for hatching purpose with paddy straws as bedding material. The duck eggs were placed in the pots over the bedding material and the broody hen was made to sit on eggs. The hen and the pot were covered by the bamboo baskets. About 15-20 duck eggs were set per broody hen for 28 days. The same broody hens could be utilized for two hatches continuously.

![Figure 3: (Gajendran et al, 2011)](image3)

- Improvised Hatching Apparatus

Some of the duck farmers are practicing hatching of duck eggs using a cabinet made up of wooden reapers (Fig. 4). At the bottom of the cabinet chicken mesh is fixed for holding the hatching eggs. The cabinet is placed in a small room with asbestos roofing and cement flooring with brick wall. For providing temperature, 40 watt incandescent bulbs are used and fixed 15 cm above the level of eggs arranged. The temperature in the cabinet is controlled by Ether capsule device. For providing humidity, old gunny bags and clothes are hanged around the cabinet, which are periodically soaked in hot water. Since, the eggs are placed in the open surface in the cabinet; the atmospheric air provides the required oxygen for the development of the embryos. Thus, the cabinet provides all physical parameters such as optimum temperature (38°C), relative humidity (70-80%) and ventilation (21% oxygen) for the successful development of the embryo. The whole arrangement looks like a walk-in incubator. The capacity of such units could be 18,000 to 20,000 eggs at a time. The cabinet is cleaned with dettol solution after taking the hatch.

![Figure 4: (Gajendran et al, 2011)](image4)

3.3 Fishing

Application of crafts and gears in fishing is an interesting occurrence which results from experiences gained over a long period of time. Every water body has its unique pattern of crafts and gear. There is a well defined pattern and distribution of fishing techniques based on the topography, ecology and habitat of the resource available. It also gives indication about the economic condition of the fishermen community where they use locally available less costly materials to make substances of technological delight giving maximum return. This kind of practice is prevalent in river Krishna. A study was conducted at selected 24 stations along the entire stretch of river Krishna, from Mahuli in upstream up to Penumudi, an estuarine fish landing centre of river Krishna in 2001-02. As many as six different type of crafts and ten different gears were encountered during the monsoon survey of the river. Some of the crafts and gears are described below.

- Crafts
  1. Coracle

Coracle is a saucer shaped country craft. It was one of the major fishing craft used in fisheries of peninsular India. Coracles were prepared by wrapping HDPP sheet over the split bamboo frame with the help of coal tar as an external covering (Fig. 5). Apart from being simple and inexpensive, coracle was durable and suitable for all types of waters.

![Figure 5: (Manna et al, 2011)](image5)

- Gears
  1. Push net (triangular)

It was made of a triangular bamboo frame fitted with a mosquito netting cloth (Fig. 6). Fishermen operate it first by pushing the net and then scooping from the water to catch the seeds of tiger prawn. A single fisherman usually uses to two such nets.

![Figure 6: (Manna et al, 2011)](image6)
2. Lantern net (light trap)
It is a cone shaped net (Fig. 7). Kerosene gas pressure lamp with incandescent mantle is used to attract the fishes. As soon as fishes come near the base of the light, they are caught by casting the net on stunned fish as river is shallow (0.5-1.0 m). Fish gets trapped inside the conical net tied with the hoop and caught. The process takes less time and effort.

![Image 7](Manna et al, 2011)

In many rural areas, traditional materials concerning fishing crafts and gears are still ubiquitous. However, due to mechanized fishing, many of the indigenous practices are at the verge of extinction. The fishermen were the best person to enlighten us about the fact that which colour of the net could harvest more fish, which material of the net caused less tear or which gear was suitable for which fish². With the detail study of the traditional crafts and gears, modern fishing equipments could be upgraded. Thus ITK helps in modernization of traditional techniques.

3.4 Textile
A. Weaving Technique
Weaving techniques which are widespread in many of the indigenous communities in India grab attention across the world. The weaving techniques are highly locale specific and need attention today as many of the traditional techniques will be wiped away without proper measures to save the same. The traditional weaving products of India have very high market potential and government should emphasis on the marketing potential of the same. One of the greatest examples of marvelous indigenous weaving technique is of Dhalapathar village near Coimbatore. The village population of Dhalapathar is mainly dominated by a community, called Rangani (Rang =colour; Ani = to bring) and their sole livelihood is weaving on handloom. So, who knows the art to bring the colour on cloth is recognized as Rangani³. The weaving techniques adopted by the villagers of Dhalapathar are not found anywhere in India. One of the methods that the traditional Rangani community applies in sizing of the famous parda (Fig. 8) made by them is worth mentioning in this context.

Sizing is carried out by putting the hands inside a pot which contains 2-3 days old water rice. Pressure is applied on the rice as well as the hank by the two hands of the worker in such a way that the water rice is converted to a paste and stick to the individual thread of hank. Then the hank is squeezed and taken out and dried in the shadow over a bamboo. During drying, the hanks are subjected to individualization and parallelization of threads of hank by worker’s hand applying tension on hank around the bamboo which facilitates easy winding of bobbins for warping.

Today the production of the famous parda by the Rangani community is declining because of the unavailability of skilled workers.

![Image 8](Nayak Et Al, 2011)

IV. Conclusions
Indigenous technical knowledge plays an essential role in sustainable grassroots innovations. Such grassroots innovation largely differs across different sectors with respect to the characteristics, sources, actors involved etc. The knowledge base needed for different grassroots innovations is different, which in turn decides the involvement of particular set of actors. In case of traditional societies, the local indigenous individual is the major actor. In many cases, the indigenous communities are not well aware of the value of their indigenous knowledge which has been passing from generation after generation. Actors such as scientific institutions and NGOs could play crucial role in this regards for capacity building among the indigenous community and popularization of traditional methods and techniques. In today’s context, there is an urgent need to evaluate and popularize indigenous innovation. Government schemes and Research and Development activities should reach indigenous innovators. The paper documented only a few examples of ITK usage in India. There are many more such examples among the ethnic groups of India. As most of the traditional knowledge and technologies are undocumented, there is also a need for more research in this field. Otherwise, this valuable knowledge will be extinct in the near future. There should be a proper collaboration between indigenous knowledge and modern knowledge. Such type of alliance is occurring in some of the sectors such as ethnomedicine. The same should happen to all other sectors so that the contributions of the indigenous innovators appropriately reach the society. Especially, there should be proper alliance between ITK and modern technical knowledge. However, such process is complicated to a major extent due to which there is a lack of proper association between the practice and implementation of indigenous and modern knowledge. There are serious issues related to intellectual property rights. An appropriate coalition between the traditional and modern knowledge and technology systems has immense potential to benefit the society.
ENDNOTE


REFERENCES


