



## **Facilitating Sustainable Agriculture by Strengthening Indigenous Technical Knowledge**

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### **ABSTRACT**

*Farmers in India have been using traditional practices in farming since time immemorial. Indigenous Knowledge refers to the unique, traditional, local knowledge existing within and developed around the specific conditions of women and men appropriate to a particular geographic area. It lays emphasis on minimizing the risks rather than maximizing the profits. Indigenous knowledge can play a key role in the design of sustainable agricultural systems, increasing the likelihood that rural populations will accept, develop, and maintain innovations and interventions. Indigenous knowledge from different parts of the world, its proper documentation, validation and sharing and exchange of knowledge on global basis to provide good quality food on sustainable basis with reduced adverse impact on the environment. Government schemes and Research and Development activities should reach the indigenous users and scientific rationale behind these indigenous technologies should be studied and strengthened for patenting the same. Indigenous knowledge may contribute in several ways such as by helping identification of cost-effective and sustainable mechanisms for poverty alleviation, which are locally manageable and meaningful. There is a lack of proper integration between the practice of indigenous and modern knowledge. An appropriate association between the traditional and modern scientific knowledge and technology systems has immense potential to benefit the society.*

*Keywords :community, indigenous, scientific rationale, sustainable*

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***“When an old knowledgeable person dies, a whole library dies”***

***– African Proverb***

### **INTRODUCTION**

The 21st century commonly known as “Age of Science and Technology” purely acknowledges western scientific knowledge. This scientific knowledge has answers to almost all questions. The scientific knowledge is enabling the world to develop through leaps and bounds in all aspects. Along with these, there is another very important issue to address i.e. “Environment Conservation” that must be taken into consideration [1, 2].

India has made tremendous progress and development in agriculture and allied fields especially after Green Revolution. The nation achieved Green Revolution with the use of modern system of agricultural production consisting mainly of high yielding varieties, chemical fertilizers, pesticides and sophisticated equipments. Consequently, the emergence of modern technologies and intensive use of inputs also resulted without considering their adverse impact on environment and sustainability. Apart from the substantial increase in crop yields, these modern technologies have made the Indian farmers become poorer as they required heavy investment on costly external resources of uncertain future availability. The intensive agriculture resulted in depletion of nutritional status of soils, erosion of biodiversity, natural habitats, forests and water resources. Indiscriminate use of chemical pesticides and fertilizers affected the agroecosystems, caused pollution of soil and water resulting in human and animal health hazards and contributed significantly to destabilize the traditional systems of agriculture. Additionally intensive mono-cropping has made production more susceptible to environmental stresses and shocks which made the farmers to rely more on markets and outside agencies resulting in an imbalanced growth between rural and urban areas. Diminishing returns from intensive agricultural practices led to create

discrimination between rich and poor farmers which tends to destabilize the overall socio economic condition of the farming community as well [4-6].

Farmers, policy makers, environmentalists and consumers have shown renewed interest in a nutritious, safe, and adequate food supply as well as an environmentally sound food production system. As a result, some farmers have sought alternative production methods to reduce their reliance on commercial chemical inputs. They often do so with the expectation that crop yields and gross income will decrease, but that, as a result of reduced purchased inputs, their net income will be similar to what they would have received had they continued their use of off farm inputs. This is the story of many developing countries across Asia where more and more farmers are switching over from green revolution methods to more environmentally sound means of agriculture i.e 'sustainable' agriculture in the new era.

### **What is Sustainable Agriculture?**

The phrase 'sustainable agriculture' was reportedly coined by the Australian agricultural scientist Gordon McClymont. Sustainable agriculture is agricultural production that is economically viable and does not degrade the environment over the long run (OECD). Sustainable Agriculture is an integrated system of plant and animal production practices that will satisfy human food and fibre needs enhance the quality of environment, make the most efficient use of non-renewable resources, sustain economic viability and enhance quality of life. Sustainable agriculture must meet the needs of the present without compromising the quality of life for future generations Sustainable agriculture must meet four important criteria : (i) it must produce adequate food of high quality (ii) be environmentally safe (iii) protect the resources base and (iv) be profitable. The objective of sustainable agriculture is to sustain and enhance, rather than reduce and simplify the biological interaction on which production agriculture depends. There are many alternatives to bring sustainability in agriculture. Among these aspects indigenous technical knowledge play creativity and regenerating role in bringing sustainability in agriculture. With the advent of the concept of sustainable agriculture in late eighties, Indian agricultural scenario has evoked interest on Indigenous Technical Knowledge as it contains use of natural products to solve problems pertaining to agriculture and allied activities. Hence it is of paramount importance to recognize the importance of ITK in agriculture and allied to achieve the goal of sustainable agriculture and to solve the problems related to climate change and challenges to food chain [6-9].

### **Indigenous Technical Knowledge**

India has a long history and much enriched culture there is abundant reservoir of indigenous knowledge in every part of the country. Indigenous Knowledge is the fundamental base of a nation's knowledge system. ITK generally refer to knowledge systems embedded in the cultural traditions of regional, indigenous or local communities. Indigenous Technical Knowledge is the sum total knowledge and practice which are based on people's accumulated experiences in dealing with situations and problems in various aspects of life and such knowledge and practice are special to particular culture [9-12]. Indigenous knowledge as the knowledge that the people in a given community have developed over time and continue to develop. It is based on experience, often tested over centuries of use, adapted to local culture and environment, and it is dynamic and changing. Any community possesses IK- rural and urban, settled and nomadic, original inhabitants and migrants. Indigenous Knowledge has also been referred to as the unique, traditional, local knowledge existing within and developed around the specific conditions of women and men indigenous to a particular geographical area. ITK is stored in people's memories and activities, and is expressed in the form of stories, songs, folklore, proverbs, dance, myths, cultural values, beliefs, rituals, community laws, local language and taxonomy. It is generally transmitted orally. It emphasizes on minimising risk factors rather than maximizing profit. Thus ITK is cumulative body of knowledge and practices maintained and developed by people with expanded histories of interaction with natural environment. ITK are socially accepted, economically viable and sustainable technologies.

### **Stakeholders of ITK**

There are various stakeholders involved in ITK who are hidden in our village, communities and countryside. The main stakeholders are :

- Farmers
- Community leaders
- Elderly people
- Folklore, song and poetry Ancient records
- NGOs
- Extension agencies
- Published materials of different languages. [10]

### **Different aspects of ITK**

Indigenous Traditional Knowledge system consists of an integrated body of knowledge system which tends to focus on different aspects like :

1. **Classification** : Local classification and quantification system of plants, animals, soil, water, air and weather.
2. **Agriculture** : Crop production and crop system, land preparation, crop selection, propagation of plant, sowing, seedling preparation, plant protection method, harvesting, seed storage and processing.
3. **Human Health**: Nutrition, disease classification system, traditional medicines and herbal remedies in disease treatment, identification of medicinal plants, collection of useful parts or preparation of medicines, storing of medicines.
4. **Animal Care** : Animal breeding and production, traditional fodder and forage species and their specific use, animal disease classification and ethno-veterinary medicines.
5. **Soil Conservation** : Soil conservation practices, use of species for soil conservation and soil fertility, enhancement of practices.
6. **Water Management** : Traditional water management and water conservation system, traditional techniques for irrigation, use of specific species for water conservation, aquatic resource management.
7. **Agro-forestry** : Management of forestlands and trees, the knowledge and use of forest plants and animals and the inter relationship between trees, crops and soil.
8. **Plants** : As a source of wild food, building material, household tools, minor forest products, fuel wood and medicinal folklore system.
9. **Social networks** : Kinship ties and their effect on power relations, economic strategies and allocation of resources.
10. **World science** : Views of the universe and humanity's place with it, relationship between human and nature, myths, beliefs and customs. [8, 3]

#### **Significance of ITK in context of Sustainable Agriculture:**

- Provides basis for local level decision making about many fundamental aspects of day to day life.
- Serves a basis for problem solving strategies.
- Useful for sustenance of the community.
- Essential for maintenance of the genetic resources for continued survival of the community.
- Potential of being translated into commercial benefits by providing clues for development of useful practices & processes for benefits of mankind.
- Brings sense of pride and empowerment to indigenous people.
- Aids in maintaining healthy ecosystem and ultimately promote sustainable agricultural practices.
- Enhances and promotes biodiversity at different levels such as local, regional, national and global.

#### **REASONS FOR PROTECTING TRADITIONAL KNOWLEDGE**

There are number of reasons why there is need to protect the Indigenous Technical Knowledge.

##### **1. To improve the livelihoods of ITK holders and communities**

ITK is a valuable asset to indigenous and local communities who depend on ITK for their livelihood as well as to manage and exploit their local ecosystem in sustainable manner. For example, local communities depend on indigenous crop varieties for sustainable agriculture and for selection of superior genotypes from these.

##### **2. To benefit national economy**

ITK has been recognized as a valuable input into modern industries such as pharmaceuticals, botanical medicines, cosmetics and toiletries, agriculture and biological pesticides. Most of industries look for the time tested traditional knowledge information for developing novel products having commercial acceptability. Hence, protecting ITK has the potential to improve the economy of many developing countries by greater commercial use of their biological wealth and increasing exports of ITK related products.

##### **3. To conserve the environment**

The traditional communities are intelligent and have made agriculture sustainable through their different agricultural practices. They create a balance between the environment and requirement.

##### **4. To prevent biopiracy**

Biopiracy refers either to the unauthorized extraction of biological resources and / or associated ITK or to the patenting, without compensation of spurious "inventions" based on such knowledge or resources.[3]

Appropriate Technology implementation should foster community empowerment and sustainability. Successful implementation requires community engagement throughout - technology conceptualization, development, implementation, assessment and impact evaluation. Development professionals should be

sensitive to socio-cultural context and respect local knowledge, part of the Indigenous Knowledge Systems (IKS).

### **Strategies for integration of ITKs into scientific research process**

Today it is widely accepted among agricultural scientists throughout the world that the reassessment of indigenous technical knowledge is an indispensable part of the introduction of new agricultural technology. It is recognized that the knowledge of farmers must be taken into account before any new technology is developed and disseminated. This view is based on the assumption that

- ♣ farmers have a wealth of knowledge pertaining to their own environment;
- ♣ farmers have developed specific skills designed to make the best use of that environment.

ITK alone is not complete panacea for sustainable agriculture. Therefore, along with ITK, scientific package of practices need to be practiced by the farmers. Alternatively, the modern science of farming should include the right blend of ITK in evolving package of practices. The four important steps in inclusion of the ITKs in technology generation, reassessment and adaptation process are Documentation, Validation, Refinement and Integration.

### **Steps for inclusion of ITK:**

#### **1. Methods of ITK collection**

There are no fixed method for collection of ITK. It depends on type of ITK, situation, people, social system, cultural values and other aspects. Methods used for collection of ITK are

1. Interaction with community leaders or elders
2. Rapid Rural Appraisal/PRA/PLA
3. Case study
4. Key Informant Method
5. History
6. Interview method
7. Participant observation
8. Brain storming
9. Games
10. Group discussion
11. Field observations
12. Surveys
13. SWOT Analysis

#### **2. Validation of the ITK :**

It refers to the degree to which ITK can be explained and supported with scientific logic, or have been established based on long term experiences. Assess the ITKs Survey, Laboratory Analysis and On farm testing are used to validate ITK. Validation of ITK is a logical step to qualify and quantify effectiveness of the practices. The criteria to be considered while validating the ITK are Efficacy, Cost-effectiveness, Availability, Complexity, Cultural appropriateness, Effect on different groups in communities, Environmental soundness and Constraint. When ITK is found to have more efficacy than the corresponding technology then the ITK is recommended as it is to the farmers and when it is found to have lower efficacy than the corresponding technology then it is send for refinement.

#### **3. Refinement of the ITK**

Refinement of ITK is used to increase its applicability on wider scale. On Farm Research, Farmer Participatory Research and Laboratory Studies are generally used for refinement. Suitable modifications of the local practices, through R&D will help to develop appropriate and acceptable methodologies that are more suited to our farming situations. The farmers practicing ITK may also collaborate with research scientists in refining the knowledge for evolving appropriate technologies.

#### **4. Patent the Valid and Refined ITK**

IT Kneed to be guarded and legalized to ensure the ownership to local communities and flow of benefits to the rightful owners. Therefore, it is essential to understand the relevance of the Intellectual Property Rights (IPR), in the context of ITKs.

#### **5. Promote the Use of validated and refined ITKs**

Involve local communities, use media mix, integrate indigenous networks, publicize & reward for popularizing the relevance of ITK. Local ITK practitioners need to be honoured and recognized and publications of local innovation in regional magazines including names and photographs of the innovators can motivate traditional practitioners to disseminate their knowledge.

### **Anticipated Outcomes**

Indian agriculture is at present confronted with a number of challenges including instability of productivity & diminishing sustainability of natural resources. These issues have evoked growing interest

in the study of indigenous knowledge system that is based upon the local resource. ITK is a treasure of knowledge of our ancestors/farmers of India. Since information on ITK is seldom documented, it often happens that such information are lost, if not passed from generation to generation or protected & practiced by the local people. Planners and implementers therefore need to decide which path to follow. Rational conclusions are based on determining whether indigenous knowledge would contribute to solve existing problems and achieving the intended objectives. In most cases, a careful amalgamation of indigenous and foreign knowledge would be most promising, leaving the choice, the rate and the degree of adoption and adaptation to the clients. Foreign knowledge does not necessarily mean modern technology, it includes also indigenous practices developed and applied under similar conditions elsewhere. These techniques are then likely to be adopted faster and applied more successfully. To foster such a transfer a sound understanding of indigenous knowledge is needed. This requires means for the capture and validation, as well as for the eventual exchange, transfer and dissemination of indigenous knowledge. Thus the socio-economic status of the tribal farming community will be improved and they will be treated as active partners in the sustainable development process. Sense of pride will boost up their confidence to participate in the development process and valuable contribution to the society and the nation.

## CONCLUSION

The Indigenous Technical Knowledge (ITK) is socially desirable, economically affordable, sustainable, involves minimum risk and focus on efficient utilization of eco-friendly resources. The context of local knowledge systems combining traditional skills, culture and artifacts with modern skills, perspectives and tools is not something that has happened only in the recent past. From time immemorial, new crops were introduced from one part of the world to another and cultural and ecological knowledge systems evolved while adapting these crops, animals, trees, tools, etc., into their new contexts. This is an ongoing process. What may set the traditional ways of dealing with local resources and external knowledge and inputs apart, may be a slower trial and error approach which may not necessarily be unscientific. But, it may not be fully compatible with modern methods of experimentation, validation, and drawing inferences. In some cases, the correspondence is close but in many case it may not be. However, it is possible that through flexibility, modification and mutual respect and trust, traditional knowledge experts can and may work with the experts from modern scientific institutions to generate more effective solutions for contemporary problems. Therefore, The need of the day is to establish a foundation at the national level that helps in building national register of innovations, file applications for patents, provides micro-venture capital support for enterprises based on indigenous knowledge and non-material incentives such as recognizing or honouring innovators and community holding indigenous knowledge. Policy reforms need to be aimed at building local ecological knowledge in educational curriculum, development of markets for the indigenous and organic products and supporting collective resource management institutions reinforcing conservation ethics. It is only through multi-pronged comprehensive approach that the sustainable agriculture can be accomplished on a long term.

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