

ITK for Sustainable Agriculture- A Review in the Indian Context

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ABSTRACT

The indigenous technical knowledge (ITK) is the localized traditional knowledge transmitted from generation to generation and time tested by the local community to solve particular problems taking cognizance of local factors. This resource conservation attitude of indigenous technical knowledge fosters sustainability. Sustainable agriculture is also urgently needed to conserve agricultural resources for the next generations. Most of the agricultural resources are exploited by chemical hazards. Indigenous technical knowledge mostly using physics, chemistry and biology of ancient knowledge to improve agricultural practices without chemical hazards. Millions of traditional knowledge have been practised over the world. Most are overlapping due to their dynamic nature and often modified by local farmers. Some are based on beliefs and unscientific. Few have unique identity for specific communities and countries. There are number of ITKs for sustainable agriculture have been verified and documented in India. In India, the scientific rationale of traditional knowledge of agricultural practices to the revival of ITK for sustainable agriculture is being documented and maintained by the Indigenous Technical knowledge Portal for Agriculture (ITKPA-ICAR, India). Internationally, the International Institute of Rural Reconstruction (IIRR, Philippines) and the Globally Important Agriculture Heritage Systems (GIAHS-FAO, Italy) are engaged in the documentation and promotion of traditional knowledge of agricultural practices to the revival of ITK for sustainable agriculture. Of course, these global efforts to conserve traditional knowledge of agricultural practices believe that the traditional agricultural systems constitute the foundation of present and future farming technologies, and their biodiversity will be maintained as sustainable systems of farming. This indigenous technical knowledge can be refined and upgraded to suit the conditions and needs of the farmers. It may be blending with modern technologies to achieve the goal of sustainable agriculture. To achieve the goal of sustainable agriculture, its an urgent need to revive ITK in agriculture. The present study was undertaken to review the efforts to revive ITK for sustainable agriculture from the perspective of Indian agriculture.

Keywords: *ITK (Indigenous technical knowledge), Sustainable agriculture, India.*

INTRODUCTION

The Indigenous technical knowledge (ITK) is also known as indigenous, traditional, local, and ancient knowledge. The indigenous technical knowledge is the localized

knowledge, transmitted from generation to generation and time tested by the local community to solve the particular problems taking cognizance of local factors.

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It is based on resource conservation to the betterment of the next generations. The indigenous knowledge are traditional practices of livelihood adopted by the confined local geographic area, which are unique to particular cultures or societies. It contrasts with the modern international knowledge system mostly based on the exploitation of natural resources. It is dynamic in nature and influenced by internal creativity as well as by contact with external systems. It is the base for a society which facilitates communication and decision-making. It fosters local decisions in farming, food preparation, healthcare, education and natural resource management. This resource conservation attitude of indigenous technical knowledge fosters sustainability and sustainable agriculture is the urgent need to conserve the agricultural resources for next generations. Most of the agricultural resources are exploited by modern agricultural technologies without taking care of adaptability of local conditions and possible consequences. Modern agricultural technologies like, monoculture cause rapid erosion of crops and livestock genetic diversity, natural soil fertility and pest outbreaks, while chemical inputs causing environmental pollution and chemical hazards and mechanization causing high cost of cultivation are confined capital-intensive agriculture and breakdown of social fabrics of rural communities. Its urgent need to minimize this exploitation for safe hand over the agricultural resources to the next generations keeping healthy agriculture for a wealthy nation. Obviously, the development of modern agricultural technologies substantially increased the crops and livestock production, but gradually decreased the farms income due to heavy investment in costly external resources of uncertain future availability. Sustainable agriculture is the holistic approach of eco-friendly agricultural technologies. The ecofriendly agricultural technologies cannot be ignored the indigenous technical knowledge (Baver & Jun, 2002; Singh et al., 2004; Borthakur & Singh, 2012; Barjendra & Singh, 2015; & Morya & Kumar, 2015).

ITK in agriculture is the source of natural resource management. They do not harm any farming resources and the environment. It was built up on farmers' own knowledge generated over centuries, unlike modern technologies, which are exogenous. But unfortunately, the mad race for modernization of agriculture, the time-tested indigenous technologies are fast getting scarce and improvised. To achieve the goal of sustainable agriculture, its an urgent need to revive ITK in agriculture. There are millions of traditional knowledges have been practised over world. Most are overlapping due to their dynamic nature and are often modified by local farmers, some are based on beliefs and unscientific and few have unique identity for specific communities and countries. India has rich biodiversity of crops and livestock, and farmers of this country have been practising various traditional knowledge of farming over centuries. Most of the traditional practices are identified unique systems of farming. This indigenous technical knowledge can be refined and upgraded to suit the conditions and needs of the farmers. It may be blending with modern technologies to achieve the goal of sustainable agriculture (Tyagi et al., 2018; Mishra et al., 2020; FAO, 2021; & NAARM, 2021).

EFFORTS FOR REVIVAL OF ITK IN SUSTAINABLE AGRICULTURE

Globally Important Agriculture Heritage Systems (GIAHS-FAO, Italy)

The Globally Important Agricultural Heritage System (GIAHS) is an initiative of the Food and Agriculture Organization (FAO), Rome, Italy started in the year 2002. It aims to verify, promote and protect globally important agricultural heritage systems and their dependent livelihoods to the entire world. Its centers are spread over 13 countries and 60 centers of the world. Its three centers located in India, namely Odisha, Kerala and Kashmir respectively. GIAHS centers are not living museums, but places where people practice their traditional approach of dependent livelihood. Its effort to retain the best of the past traditional practices to build a sustainable future of farming (FAO, 2021).

International Institute of Rural Reconstruction (IIRR, Philippines)

The International Institute of Rural Reconstruction (IIRR) is a non-profit international organization for helping to empower self-sufficient rural communities started in 1960. It aims to reconstruct their own unique resources of rural communities by delivering programs across health, education and the environment. Its reconstruction programs are spread over more than 40 developing countries in Asia, Africa and Latin America. It was incorporated in the United Nations as a research and training institute for rural reconstruction. It also provides customized courses and training covering natural resources, food security, participatory approaches, and gender, business & organizational development internationally (IIRR, 2021).

Traditional Knowledge Digital Library (TKDL-CSIR, India)

The Traditional Knowledge Digital Library (TKDL) is India's documentation initiative that started in 2001. It aims to verify information from traditional knowledge such as human medicine, veterinary medicine, farming practices, food and cosmetics etc. It also includes Traditional Cultural Expressions (TCE) such as architecture, metallurgy, paintings, carvings and textiles, etc. Being expansion of their responsibilities, the information from digitized and published works as well as verbal knowledge is also proposed to be included in the TKDL database. The TKDL has been exerted strength to protect Indian traditional knowledge at patent offices worldwide (CSIR, 2021; & TKDL, 2021).

Indigenous Technical knowledge Portal for Agriculture (ITKPA-ICAR, India)

The incorporation of Indigenous Technical Knowledge (ITK) into agricultural research and extension, the Indian Council of Agricultural Research (ICAR) has been started Indigenous Technical knowledge Portal for Agriculture (ITKPA) with the help of its constituent institute, the National Academy of Agricultural Research Management

(NAARM), Hyderabad, India in the year 2016. This web portal has been designated with various sections, namely Crop ITK, Operational ITK, Other ITK and Add ITK respectively. This web portal is open for access to relevant ITK in agriculture by states, districts and taluks (administrative units of a district) (ICAR, 2021; & NAARM, 2021).

Indigenous Technical Knowledge Resource Centers (ITKRC, India)

There are multiple numbers of institutions works as National Indigenous Technical Knowledge Resource Center (ITKRC) for the development of indigenous technical knowledge system in agriculture. The aims of this center help to provide national data management of indigenous technical knowledge systems; training for recording indigenous technical knowledge systems; and facilitate the active participation of source peoples in the conservation, utilization and dissemination of their indigenous technical knowledge systems in agriculture. In India, Farm Science Center as Krishi Vigyan Kendra (ICAR-KVK) and Agricultural Technology Application Research Institute (ICAR-ATARI) are engaged in resource centers for revival of ITK in achieving goal of sustainable agriculture (ICAR, 2021; & Mishra et al., 2020).

Individual Indigenous Technical Knowledge publications

The documentation initiative of indigenous technical knowledge in agriculture is the basically outcomes of individual publication. To achieve the goal of sustainable agriculture, scientists has been tended to revive indigenous technical knowledge for sustainable agriculture since the deterioration of quality and productivity in agricultural production. Recently worldwide agricultural scientists aware of the wealth of traditional knowledge in agriculture and working together for revival of indigenous technical knowledge for sustainable agriculture development. Though, the popular traditional systems of farming, *i.e.*, Shifting and Terrace cultivation in India; Chinampas cultivation in Mexico; and Waru-Warus cultivation in Peru being part of ITK in

agriculture, yet there are millions of ITKs are practicing over world confined very locally has not been popular after or before documentation while being wealth of sustainable agriculture. It has been taken an instance reported by Sinha et al. (2007) for revive indigenous knowledge into indigenous technical knowledge for ecological pest management practicing commonly by Garo tribes of West Garo Hills, Meghalaya, India without their scientific rationale. Garo farmers are planting more fruit bearing trees in terrace fields to attract birds for hunting and monetary concerns. But, this common practise of planting fruit bearing trees attracts predatory

birds for food and shelter. These birds keep the insect pest population down by preying them. Contrasting conventional biological insect pest management augmenting predators and parasites being limitations, this traditional practice may become revival of ITK in sustainable agriculture. An effort was undertaken to collect common traditional knowledge of farming in India has been practicing as ITK for sustainable agriculture given in table-1 (Banerjee, 1998; Prasad, 1999; Singh et al., 2004; Dey & Sarkar, 2011; Kaikini et al., 2013; Sundaramari & Ranganathan, 2013; Dwivedi, 2015; Morya et al., 2016; & Shubeena et al., 2018).

Table1. Common indigenous technical knowledge for crops and livestock production in India

A. For crop production			B. For livestock production		
S.N.	ITKs	Application	S.N.	ITKs	Application
1.	Compost	Soil fertility	1.	Alcohol	Tympany treatment
2.	Green manure	Soil nitrogen fixation	2.	Lime + Salt of ammonia	Mastitis treatment
3.	Seed soaking in common salt	Sorghum germination	3.	Sulphur + Arecanut (<i>Areca catechu</i>) seeds powder	Anthelmintic
4.	Little millet (<i>Panicum sumatrense</i>) grain ash	Rice bug control	4.	Decoction of neem (<i>Azadirachta indica</i>) leaves	Wound dressing
5.	Tobacco (<i>Nicotiana tabacum</i>) stems extract	Caterpillar control	5.	Decoction of babool (<i>Acacia arabica</i>) leaves	Diarrhoea treatment
6.	Madar (<i>Calotropis gigantea</i>) leaves extract	Thrips control	6.	Decoction of chirata (<i>Swertia chirata</i>) roots	Fever treatment
7.	Custard apple (<i>Annona squamosa</i>) leaves extract	Aphid control	7.	Decoction of deodar (<i>Cedrus deodara</i>) twigs	Acaricide treatment
8.	Mahua (<i>Madhuca indica</i>) dried flowers in the soil	Termite control	8.	Dhatura (<i>Calotropis gigantea</i>) leaves immersed in the mustard oil	Abscesses treatment
9.	Coconut & Buttermilk solution (Coconut milk: 5 lit + Butter milk:5 lit)	Insect pest repellent + Fungicide	9.	Ghee and Black pepper paste [Ghee (Cooked cream): 100 gm + Black pepper (<i>Piper nigrum</i>) fruits powder:100 gm]	Black quarter treatment
10.	Starter solution (Cowdung: 1kg + Cowurine:1lit + Palm sugar:250 gm + water:10 lit)	Plant Growth promoter	10.	Mustard and Turmeric paste [Mustard oil (<i>Brassica rapa</i>): 100 ml + Turmeric (<i>Curcuma longa</i>) rhizome powder:100gm]	Antiseptic treatment

CONCLUSION

The indigenous technical knowledge is the localized knowledge, transmitted from generation to generation and time tested by the local community to solve the particular problems taking cognizance of local factors. It contrasts with the modern international knowledge system, mostly based on exploiting natural resources. Most of the agricultural resources are exploited by modern agricultural technologies without taking care of the adaptability of local conditions and possible consequences. The modern agricultural technologies like, monoculture causing rapid erosion of crops and livestock genetic diversity, natural soil fertility and pest outbreaks, while chemical inputs causing environmental pollution and chemical hazards and mechanization causing high cost of

cultivation are confined capital-intensive agriculture and breakdown of social fabrics of rural communities. It's an urgent need to minimize this exploitation for a safe hand over the agricultural resources to the next generations keeping healthy agriculture for a wealthy nation. The sustainable agriculture is the holistic approach of eco-friendly agricultural technologies. The ecofriendly agricultural technologies cannot be ignored the indigenous technical knowledge. There are numbers of ITKs for sustainable agriculture have been verified and documented in India. In India, the scientific rationale of traditional knowledge of agricultural practices to the revival of ITK for sustainable agriculture are being documented and maintained by the Indigenous Technical knowledge Portal for Agriculture (ITKPA-ICAR, India), Indigenous

Technical Knowledge Resource Centers (ITKRC, India) and Individual Indigenous Technical Knowledge publications. Internationally, the International Institute of Rural Reconstruction (IIRR, Philippines) and the Globally Important Agriculture Heritage Systems (GIAHS-FAO, Italy) are engaged in the documentation and promotion of traditional knowledge of agricultural practices to the revival of ITK for sustainable agriculture.

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Both authors contributed equally to establishing the research and design experiment topic.

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