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Indigenous technical knowledge practices at household and agriculture in Telangana state

Alam Prashanthi, Surkanti Prathibha and Khushboo Yadav

Department of Extension Education and Communication Management, College of Community Science, PJTSAU, Saifabad, Hyderabad, Telangana, India

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Corresponding Author: Alam Prashanthi

Abstract

The study examined the utilization of Indigenous Technical Knowledge (ITK) in household and agricultural practices in three villages of Suryapet district, Telangana state of India. An exploratory research design was adopted, involving 128 randomly selected respondents. The socio-economic profile revealed that 45.3% were aged 20-35 years, 81.3% were female and 89.8% were married. Regarding education, 30.5% were illiterate and 53.9% were engaged in agriculture. A significant proportion of respondents (96.1%) used turmeric paste for wound care, 83.6% used turmeric in milk for treating cough and cold, and 82.8% used neem leaves for infection control. In agricultural practices, 57.0% sprayed ash on soil 59.4% applied poultry manure, and 86.7% used manure to enhance soil fertility. The study highlighted the role of ITK in sustaining traditional health and agricultural practices, emphasizing the need to integrate these practices with contemporary scientific knowledge for sustainable development.

Keywords: Indigenous technical knowledge, household, agriculture, traditional practices, Telangana

Introduction

Indigenous Technical Knowledge (ITK), also known as Traditional Ecological Knowledge (TEK) or Indigenous Knowledge (IK), refers to the wealth of knowledge, practices, skills, and innovations developed and passed down through generations within indigenous and local communities. This knowledge is deeply rooted in the cultures, languages, and environments of these communities, and it encompasses a wide range of areas including agriculture, medicine, resource management, technology, and more. ITK is acquired through direct experience, observation, and interaction with the natural world, and it often emphasizes sustainability, harmony with nature, and the interconnectedness of all living beings.

Indigenous knowledge systems typically view the world as an interconnected web of relationships. This holistic perspective considers not only the physical aspects of the environment but also the cultural, spiritual, and social dimensions. It is context-specific and adapted to the local environment, climate, and resources. It is developed and refined over centuries to ensure the well-being of the community within its unique surroundings. Many indigenous practices are guided by principles of sustainability and long-term resource management. These practices often aim to maintain a balance between resource use and natural replenishment to ensure the well-being of both current and future generations. ITK is frequently transmitted orally from one generation to the next, often through stories, myths, rituals, and practical demonstrations. This emphasizes the importance of intergenerational learning and the role of elders as knowledge holders. Contrary to the misconception that indigenous knowledge is static, it is a dynamic body of knowledge that evolves over time. Indigenous communities adapt their practices to changing circumstances and incorporate new insights and innovations when appropriate.

ITK is intimately tied to the cultural identity and spirituality of indigenous communities. It often plays a central role in rituals, ceremonies, and daily life, reinforcing the connection between people, land, and tradition. It has enabled communities to thrive in challenging environments for centuries. These systems offer valuable insights into strategies for coping with climate change, environmental fluctuations, and other challenges. It's important to recognize and respect Indigenous Technical Knowledge as a valuable resource that can contribute to sustainable development, biodiversity conservation, and the resilience of communities. Integrating indigenous knowledge with contemporary science and technology can lead to innovative solutions that address pressing global challenges while respecting local traditions and wisdom. However, it's crucial to engage with indigenous communities in a respectful and equitable manner, involving them as active partners in any efforts to incorporate their knowledge into broader discussions and initiatives.

ITK is an important resource for sustainable development, particularly in the areas of agriculture and natural resource management (Krujia, 2020) [15]. It can help to promote organic farming and sustainable agriculture practices.

Materials and Methods

An exploratory research design was adopted for this study. The investigation was carried out in three villages *viz*., Penpahad, Dhupahad, and Gaddipally of Suryapet district, Telangana state. The study was conducted in August 2023. A sample of 128 respondents were randomly selected from the villages. A structured interview schedule was developed and used to collect profile characteristics and ITK-related information (ITK at Household and ITK at Agriculture). The ITK at household questionnaire consists of 15 statements with Yes or No option and ITK at agriculture consists of 13 questions with Yes or No option. This study was extensively focused on the indigenous technical knowledge associated with traditional household and agricultural practices.

The obtained information was entered into MS Excel 2019 and IBM Statistical Package for the Social Science (SPSS) for descriptive analysis.

Results

A perusal of the characteristics of respondents in the study areas (Table 1) indicated that nearly half of the respondents (45.3%) were between 20-35 years of age. The data with regard to gender indicated that majority of them were female (81.3%) followed by male (18.8%) whereas more than three-fourth were married (89.8%) and only few of them were widowed (7.8%). Regarding education levels, nearly one-third were illiterates (30.5%), while about one-fourth had studied up to secondary school (25.0%). The data also highlighted that more than half of them were engaged in Agriculture (53.9%), followed by homemaker (25.8%) and agriculture labour (7.0%). Almost three-fourth of the respondents (70.3%) had medium family size i.e., 4-6 members, whereas 26.6% had small family size and only 3.1% had large family size. Nearly half of the respondents (46.1%) were marginal landholders with up to 2.5 acres, whereas 26.6% were small landholders with 2.5 to 5.0 acres, 18.0% were semi-medium landholders with 5.0 to 10.0 acres and 7.8% had no land for cultivation. The majority of the respondents (82.8%) were found to be growing paddy.

Source of Indigenous Technical Knowledge (ITK)

It was revealed that the majority of the respondents received ITK knowledge from their parents (58.6%), followed by grandparents (54.7%), neighbours (17.2%), farmers (13.3%), relatives (6.3%) and media (0.8%) (Table 1).

Table 1: Socio-economic characteristics of the respondents

Variables	Mean ± SD / F (%)
Age (years)	40.5 ± 14.5
20-35	58 (45.3)
35-50	32 (25.0)
Above 50	38 (29.7)
Gender	
Male	24 (18.8)
Female	104 (81.3)
Marital Status	
Married	115 (89.8)
Widowed	10 (7.8)
Education	
Graduation	21 (16.4)
Intermediate	15 (11.7)
Secondary school	32 (25.0)
Primary school	20 (15.6)
Illiterate	39 (30.5)
Occupation	
Agriculture	69 (53.9)
Agriculture labour	09 (7.0)
Home maker	33 (25.8)
Government sector	07 (5.5)
Shopkeeper	03 (2.3)
Tailor	05 (3.9)
Other	02 (1.6)
Size of family	
Large (7-9 members)	04 (3.1)
Medium (4-6 members)	90 (70.3)
Small (1-3 members)	34 (26.6)
Size of Land holding	
No Land	10 (7.8)
Marginal (up to 2.5 acres)	59 (46.1)
Small (2.5 to 5.0 acres)	34 (26.6)
Semi-medium (5.0 to 10.0 acres)	23 (18.0)
Medium (10.0 acres to 25.0 acres)	1 (0.8)
Large (above 25.0 acres)	1 (0.8)
Type of cultivation	
Cotton	13 (10.2)
Paddy	106 (82.8)

Other	02 (1.6)
No cultivation	07 (5.5)
Source of ITKs	
Grandparents	70 (54.7)
Parents	75 (58.6)
Relatives	8 (6.3)
Neighbours	22 (17.2)
Farmers	17 (13.3)
Media	1 (0.8)

ITKs at household level

The use of traditional practices for various health conditions is common practice in many households. In the context of provided data (Table 2), it is evident that a significant majority (96.1%) used turmeric paste for wounds to stop the flow of blood and 83.6% used turmeric in milk for the treatment of cough and cold. Turmeric has known anti-inflammatory, antimicrobial properties (Kumar *et al*., 2020; Trifan and Aprotosoaie, 2019; Vaughn *et al*. 2016) [16, 33, 34] and wound healing activities (Farhat *et al*., 2023) [8].

The combination of Tulasi leaves and honey, both known for their medicinal properties, were used by a majority (82.8%) of respondents for cough relief. Neem leaves were used by 82.8% of respondents to control and clean infections, as neem is known for its antimicrobial properties. Tulasi and honey possesses antimicrobial and anti-inflammatory properties that can alleviate cough symptoms (Cohen, 2014; Oduwole *et al*., 2014) [4, 25]. Neem leaves are rich in bioactive compounds with potent antimicrobial and immunomodulatory effects, making them effective for infection control and promoting wound healing (Madhulatha *et al*. 2017) [19]. Ginger, widely recognized for its anti-inflammatory and soothing properties, was reported to be used by 78.1% of respondents for throat soothing and pain reduction and to bring out mucus. The potential benefits of ginger in alleviating throat discomfort and reducing inflammation have been supported by scientific evidence (MohamadHesam *et al*. 2019; Elzwi, 2020) [21, 7]. Lemon juice was used by 77.3% of the respondents for stain removal on cloths due to its acidic properties. This practice was attributed to lemon's natural bleaching properties, as supported by Zubir *et al*. (2020) [36]. The results highlighted that using of copper vessels to store drinking water practice was followed by 70.3 percent of the respondents. The use of copper vessels for storing drinking water is an indigenous traditional knowledge (ITK) method that has been practiced in India for centuries. Copper is known to have antimicrobial properties, and studies suggest that it can inhibit the growth of harmful microorganisms in water, acting as a natural disinfectant (Grass *et al*., 2011) [10].

Due to the antimicrobial properties, black pepper was utilized by 67.2% of the respondents to prevent respiratory tract infections. The use of black pepper to prevent respiratory tract infections is supported by its antimicrobial properties, as indicated by studies on the antimicrobial activity of black pepper (Halligudi *et al*., 2022) [11]. Garlic was used by more than half of the respondents (66.4%) for reducing pain and fever caused by inflammation. Garlic has been found to possess anti-inflammatory, analgesic, antimicrobial, antidiabetic, anticancer, and antioxidant properties (Tesfaye, 2021; Singh & Singh, 2019) [32, 30]. Half of the respondents (51.6%) used Amla to strengthen and stimulate the immune system. Amla is rich in vitamin C, minerals, amino acids, and bioactive compounds such as tannins, flavonoids, and alkaloids (Saini *et al*., 2021) [27]. It is renowned for its diverse therapeutic properties, including immunomodulatory, antioxidant, anti-inflammatory, and hepatoprotective effects (Nirala *et al*., 2020; Saini *et al*., 2021) [23, 27]. A paste of Datura leaves was used by 43% of the respondents for the treatment of knee and joint pain. Datura species are widely known for their anti-inflammatory and analgesic properties, because of their capacity to inhibit the synthesis of chemical mediators that stimulate nociceptors and cause pain or inflammation (Sharma *et al*., 2021) [27].

The use of a mixture of tamarind, salt, and ghee as a preservative by 31.3% of the respondents as traditional food preservation practices. Tamarind, with its acidic nature, and salt, with its ability to inhibit microbial growth, can contribute to the preservation of food items. Ghee, a clarified butter with antimicrobial properties, may also aid in preserving the quality of the food product. However, it is essential to ensure that food preservation methods are carried out safely and hygienically to prevent foodborne illnesses. The results were in line with Luzzi *et al.* (2021) [18]. Usage of salt to store eggs reported by 30.5% of the respondents as it has been a traditional method of preserving eggs. Salt creates a hostile environment for microbial growth, thereby extending the shelf life of the eggs (Katz, 2013) [14]. However, it is crucial to follow proper guidelines for egg preservation to ensure food safety and minimize the risk of contamination. The use of castor leaves by 29.7% of the respondents to reduce inflammation and soothe the throat was attributed to the traditional medicinal properties of castor leaves. Castor leaves have been historically used in various traditional medicine systems for their potential anti-inflammatory (Elkousy *et al*. 2021) [6]. The reported use of cardamom seeds by 28.9% of the respondents to control infections was linked to the traditional belief in the antimicrobial properties of cardamom. Research has indicated the potential antimicrobial and anti-inflammatory effects of cardamom, which may support its traditional use for managing infections. However, further scientific investigation is necessary to validate the efficacy and safety of cardamom seeds for controlling infections. This traditional belief is supported by the potential antimicrobial properties of cardamom seeds, as indicated in the literature (Noumi *et al*., 2018) [24].

Table 2: ITKs at household level

S. No.	Statements	F	%
1.	Using paste of Datura leaves for treatment of knee and joint pain	55	43.0
2.	Using turmeric paste for wound to stop flow of blood	123	96.1
3.	Using of copper vessels to store drinking water	90	70.3
4.	Use tamarind and salt in ghee as preservative to improve and keeping quality	40	31.3
5.	Use of lemon juice for removal of stains on cloths	99	77.3
6.	Use of turmeric in milk for curing cough and cold	107	83.6
7.	Use of salt to store eggs	39	30.5
8.	Usage of Tulsi leaves and honey for curing cough	106	82.8
9.	Usage of ginger for soothing of throat, reduce pain and to helps bring out mucus	100	78.1
10.	Usage of Amla to strengthen and stimulate immune system	66	51.6
11.	Usage of Black pepper to prevent infection of respiratory tract	86	67.2
12.	Usage of garlic to reduce pain and fever cause due to inflammation	85	66.4
13.	Usage of Castor leaves to reduce inflammation and soothing of throat	38	29.7
14.	Usage of cardamom seeds to control infection	37	28.9
15.	Usage of neem leaves to control and clean the infection	106	82.8

ITKs at Agriculture

From Table (3), it was evident that majority of the respondents (86.7%) use animal manure to improve soil fertility highlights the importance of traditional agricultural practices. Manure provides essential nutrients (N, P, K) and can elevate soil C, N, and microbial activity, crucial for soil organic carbon stabilisation (Das, 2023) [5].

The majority of the respondents (25.8%) soak their seeds for germination. The act of seed soaking softens the seed coat and begins germination, hastening the emergence of seedlings (Jang *et al*. 2022) [13].

The use of neem leaves in the preservation of wheat, rice and legumes was practiced by 72.7% of the respondents. Neem found to be effective against fungal growth in certain plant- based food items (Ipinmoroti and Taiwo, 2015) [12].

The use of sheep and goats for field-penning prior to ploughing, as practiced by 79.7 percent of respondents, indicates a major use of Indigenous Technical Knowledge (ITK) in agricultural practices. Sheep and goats can serve as efficient, traditional tools to improve soil fertility and regulating weed growth when utilised in field-penning practises before ploughing (Nandhini and Suganthi, 2018) [22].

The spraying of neem solution for pest control in agriculture by 71.9 percent of the respondents emphasizes the importance of indigenous technical knowledge practices. Neem-based pest control solutions provide a sustainable and worker-safe approach to agricultural pest management, with no related handling concerns, and are suited for use throughout the crop production process (Boeke *et al*. 2004) [1].

Poultry manure was used by 59.4 percent of respondents to improve soil fertility. Poultry manure has the capacity to increase soil microbial activity and modulate nutrient cycling processes, which promotes an overall enhancement in soil fertility (Minkina *et al.* 2022) [20].

The results revealed that 66.4 percent of respondents spray a combination of cow manure and water in fields. Chopped colocasia (Colocasia esculenta) and fresh cow dung were found to be used in rice fields to suppress pests such as case worm (*Nymphula depunctalis*). Colocasia generates an anaerobic toxic state in rice microclimates (Borah *et al.* 2023) [2].

The majority of respondents (57%) utilize ash to enhance agricultural soil. This low-cost, eco-friendly technique has the potential to improve soil quality and agricultural production. ITK utilized by farmers in Kuthu's Reddypalem village, spraying ash on the soil can help manage powdery mildew sickness (Yadav *et al.* 2017) [35].

The results stated that a sizable proportion of respondents (30.5%) following the traditional practice of storing grain with curry leaves to reduce stored grain pests. In stored grain, dried curry leaves with insecticidal qualities are introduced. They may function as a repellant, antixenosis agent, or insect growth regulator (Shelke *et al*. 2021) [29].

A traditional pest management practices i.e., use of turmeric powder to suppress red ants in vegetable crop seed beds, was practiced by 57.8 percent of the respondents. To suppress red ants, turmeric powder is applied to the seed bed of vegetable crops such as tomato, cabbage, cauliflower, and others (Gohain *et al*. 2019) [9]. The fragrance of turmeric repels ants and possesses fungicidal qualities (Boruah *et al.* 2020) [3].

The study reveals that just 21.9 percent of respondents blend green gram seeds with sand for improved storage. Mixing green gram seeds with sand improves eco-friendly food grain and seed storage, using traditional indigenous techniques for improved preservation (Prakash *et al.* 2016) [26].

Rice stubble burning after harvesting was practiced by 71.9% of respondents, reflecting a prevalent practice in India. This traditional method, while controversial due to environmental concerns, was rooted in Indigenous Technical Knowledge (ITK) for rapid field clearing and pest control. Studies by Singh and Sidhu (2015) [31] and Lohan *et al*. (2018) [17] highlighted that farmers perceived stubble burning as a cost-effective and time-efficient practice.

Table 3: ITKs at Agriculture

S. No.	Statements	Yes	%
1.	Spraying of ash in the soil	73	57.0
2.	Application of poultry manure in the field to increase the fertility of soil	76	59.4
3.	Application of animal manure in the field to increase the fertility of soil	111	86.7
4.	Application of Neem Leaves for storage of Wheat, Rice and pulses	93	72.7
5.	Sheep and Goat are penned in fields prior to ploughing, to enrich fertility status of the soil.	102	79.7
6.	Soaking of seeds for germination before sowing	33	25.8
7.	Mixing the green gram seeds with sand for better storage	28	21.9
8.	Spraying of diluted onion or garlic juice to control insects	80	62.5
9.	Spraying neem solution to control all type of insects in crop	92	71.9
10.	Burning of rice stubbles after harvesting.	56	43.8
11.	Placing of curry leaves in grain storage to control stored grain pests.	39	30.5
12.	Application of turmeric powder in the seed bed of vegetable crops like tomato, cabbage, cauliflower etc. to control Red ants	74	57.8
13.	Spraying cow dung mixed water in the field to prevent the attack of cattle and goats.	85	66.4

Discussion

The data reveals a significant reliance on traditional practices for both household and agricultural purposes. In the household context, the high prevalence of turmeric paste for wound care (96.1%) and the use of neem leaves for infection control (82.8%) highlight the trust in natural remedies. These practices are deeply rooted in local traditions and are likely passed down through generations, reflecting a community-wide acceptance and validation of their efficacy.

The agricultural practices reveal a similar trend, with a notable majority (86.7%) using animal manure to increase soil fertility. This practice not only utilizes readily available resources but also aligns with sustainable farming practices by recycling organic matter. The use of neem leaves for storage of grains (72.7%) and neem solution for pest control (71.9%) further emphasizes the community's preference for natural, eco-friendly solutions over chemical alternatives.

Conclusion

The study emphasized the critical role of Indigenous Technical Knowledge (ITK) in enhancing agricultural productivity and sustainability in Telangana State. ITK practices, such as application of animal manure, neem leaves, turmeric powder have great potential to improve soil fertility, pest management and crop storage. Despite this, some traditional practices such as stubble burning have environmental challenges but its holistic adaptive nature provides teachings towards sustainable resource management. The findings show that a significant number of respondents are actively involved in ITK practices indicating deep-rooted cultural heritage and practical knowledge base. To ensure the sustainability and resilience of agricultural systems, it is important to integrate ITK with modern agricultural practices that foster innovation while respecting and preserving traditional wisdom. Sustainable alternatives and community engagement are instrumental in addressing environmental concerns associated with certain ITK practices.

Conflict of Interest

The authors declared that there is no conflict of interest.

Author Contributions

AP conceived the idea; AP and SP framed the questionnaire, collected the data, descriptive analysis and table preparation and supervision. AP, SP and KY: writing draft, review and editing the manuscript.

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