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Knowledge of the tribal farmers on indigenous agricultural practices in paddy cultivation in the Pachaimalai hills of Tiruchirappalli district in Tamil Nadu

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Abstract

In the last ten years, there has been a significant focus by researchers on indigenous practices, primarily due to the alarming rate of diseases among urban populations caused by the extensive use of fertilizers and pesticides on agricultural land. These contemporary technologies have a direct and indirect effect on both people and the land. To address this issue, a study was conducted in the Pachaimalai hills, where a considerable number of tribal individuals reside in the Tiruchirapalli District. Therefore, the research was specifically conducted in the Pachaimalai Hills of Tiruchirapalli District in Tamil Nadu. Among the 30 revenue villages, twelve were selected through purposive sampling based on their high tribal population. The main crop cultivated in this area is paddy. This paper particularly discusses the indigenous practices that the respondents have implemented in paddy cultivation. It also highlights the aspects of paddy cultivation that tribal farmers prioritize, such as seed germination and storage. The tribal farmers mainly adhered to these practices to manage seed-borne diseases and improve storage techniques. They consistently use a unique container referred to as 'kudhir' to effectively protect against pests and diseases during storage. In this context, the indigenous knowledge employed by the tribal respondents is low-cost, reliable, and viable, having been traditionally upheld by their ancestors in their tribal paddy cultivation regions.

Keywords: Indigenous knowledge, Paddy Cultivation, knowledge level, Tribal farmers, Pachaimalai Hills

Introduction

Indigenous learning encompasses the knowledge that native individuals within a specific community have developed. It is based on understanding, often tested over a long period of application, adapted to local culture and traditions, dynamically evolving, and emphasizes risk minimization rather than profit maximization. The knowledge, skills, and survival strategies of indigenous farmers, who operate with limited external resources, have frequently been overlooked in the advancement of modern agriculture (Kanjikar, 2019; Qusti, *et al.*, 2018) [3, 5]. The indigenous knowledge possessed by farmers holds a scientific rationale and significant relevance for agricultural productivity and sustainability. Indigenous learning is recognized as socially acceptable, economically viable, sustainable, and involves the least risky and rural farmers and producers. The failure of modern chemical farming to bring prosperity to agricultural and farming communities, the increase in pest attacks on crops, the degradation of soil and water resources, and the costs to human and animal health have encountered numerous limitations. The researcher aims to investigate whether indigenous practices are inherent to the tribes as farmers through their traditional wisdom. Although current challenges exacerbate issues in agricultural development within tribal areas, there is a need to adapt to modern agriculture. Consequently, this study was conducted to identify the essence of Indigenous learning in paddy cultivation among the tribes of Pachaimalai Hills Yasin *et al.*, (2020) [11].

Methodology

This study was conducted based on the hypothesis and objectives to evaluate the knowledge level of tribal respondents concerning indigenous agricultural practices, aiming to provide a clear understanding of the local area. The research took place in the Pachaimalai Hills of the Tiruchirapalli district in Tamil Nadu. Pachaimalai Hill was purposefully chosen due to the prevalence of paddy cultivation in the region. The hill comprises thirty revenue villages, and from the ten villages with the highest tribal populations, twelve were selected from the entire hilly area. A total of 130 tribal respondents were chosen through the proportionate random sampling method. First-hand information was collected and forwarded to various experts, including SAU scientists, professors, State Agricultural Department officials, Research Station staff, and KVK representatives, to create a well-structured interview schedule. The data collected were analyzed using suitable statistical tools, and the results were carefully examined. The collected data were subjected to appropriate statistical

analyses to derive meaningful interpretations and conclusions Velavan.

Results and Discussion

Socio economic characteristics of the respondents

Tables 1: Characteristics of the respondents (N=130)

SI No	Attributes	Characteristics	Frequency	Percentage
1	Age	Young (up to 35 years)	38	29.23
		Middle (36-45 years)	52	40.00
		Old (Above 45 years)	40	30.77
2	Education	Illiterate	32	24.62
		Can read-only	12	9.23
		Can read and write	23	17.69
		Primary education	20	15.38
		Middle-level education	18	13.85
		High school education	10	7.69
		Higher secondary education	8	6.15
		Graduate & above	10	7.69
3	Annual income	Up to Rs.25,000	26	20.00
		From Rs.20,001 to Rs.50,000	39	30.00
		From Rs.50,001 to Rs.75,000	56	43.08
		From Rs.75,001 to Rs.1 lakh	5	3.85
		Above Rs.1 lakh	4	3.08
4	Occupation	Agricultural farmers alone	38	29.23
		Agricultural farmers + Labour	40	30.77
		Agricultural farmers + Caste Occupation	14	10.77
		Agricultural farmers+ Business	28	21.54
		Farming + Independent Profession	6	4.60
		Agricultural farmers + Sales Service	4	3.08
5	Family Type	Nuclear Family	18	13.85
		Joint Family	112	86.15
6	Farm Size	Up to 2.5 acres	72	55.38
		Above 2.5 acres and up to 5 acres	46	35.38
		Above 5 acres	12	9.24
7	Farming Experience	Low (Up to < 5yrs)	13	10.00
		Medium (5-10yrs)	46	35.38
		High (>10yrs)	71	54.62
8	Social participation	Low	90	69.23
		Medium	29	23.08
		High	11	7.69
9	Socio-economic status	Low	70	53.85
		Medium	46	35.38
		High	14	10.77
10	Mass media exposure	Low	31	23.85
		Medium	72	55.38
		High	27	20.77
11	Information source	Low	39	30.00
		Medium	66	50.77
		High	25	19.23
12	Information sharing behaviour	Low	42	32.31
		Medium	74	56.92
		High	14	10.77
13	Innovativeness	Low	29	24.17
		Medium	49	40.83
		High	42	35.00
14	Progressiveness	Low	38	29.23
		Medium	68	50.00
		High	27	20.77
15	Risk bearing capacity	Low	42	32.31
		Medium	74	56.92
		High	14	10.77

The socio-economic profile of respondents revealed that 40% were middle-aged, 29.23% were young, and 30.77% were old. About 24.62% were illiterate, while others had varying levels of education up to graduate level. Most respondents (43.08%) had an annual income between ₹50,001-₹75,000, and 30.77% engaged in agriculture along with labor work. A majority (86.15%) lived in joint families, and 55.38% had landholdings up to 2.5 acres. Over half (54.62%) had more than 10 years of farming experience. Low social participation was observed in

69.23% of respondents. About 53.85% belonged to the low socio-economic category. Mass media exposure and source of information were mostly at medium levels. Information sharing was moderate in 56.92% of respondents. In terms of innovativeness, 52.31% adopted new practices after seeing others, while 45.38% followed agricultural officers' advice. Regarding progressiveness and risk-bearing capacity, the majority fell into the medium-level category. Similar findings are also reported by Limpo.

Knowledge on indigenous agricultural practices by the tribal farmers

Table 2: Knowledge of indigenous agricultural practices in paddy

S. No.	Indigenous agricultural practices Paddy Indigenous agricultural practices in nursery preparation	Fully Correct (f/%)	Partially Correct (f/%)	In-Correct (f/%)
1.	Soaking of seeds in water at night for sprouting	70 (53.8%)	38 (29.2%)	22 (16.9%)
2.	Seed rate @20-25 Kg per acre	55 (42.3%)	50 (38.5%)	25 (19.2%)
3.	Raising nursery in isolated place of the field	43 (33.1%)	44 (33.8%)	43 (33.1%)
4.	In nursery area no other crop grown	48 (36.9%)	35 (26.9%)	47(36.2%)
5.	Applying of green manure and FYM	60 (46.2%)	45 (34.6%)	25 (19.2%)
6.	Planting 2-3 seedlings per hill	52 (40.0%)	51 (39.2%)	27 (20.8%)
7.	Maintaining water during flowering stage	65 (50.0%)	40 (30.8%)	25 (19.2%)
	Mean value	56.14	43.29	30.57
	Indigenous agricultural practices in seed treatment			
8.	Treating seed with bed ash	58 (44.6%)	42 (32.3%)	30 (23.1%)
9.	Mixing neem oil with 1 litter water for seed treatment before soaking	50 (38.5%)	49 (37.7%)	31 (23.8%)
10.	Mixing cow dung with seeds before soaking	63 (48.5%)	40 (30.8%)	27 (20.8%)
	Mean value	43.67	29.33	57.00
	Soil fertility management			
11.	Ploughing by thorn made wooden plough in the summer season	61 (46.9%)	39 (30.0%)	30 (23.1%)
12.	Decomposing the leaves, crop residues and forest waste in the field	69 (53.1%)	41 (31.5%)	20 (15.4%)
13.	Broadcasting the forest residues and FYM soil mixture over the field during rainy season	56 (43.1%)	47 (36.2%)	27 (20.8%)
	Mean value	62.00	42.33	25.67
	Water conservation and irrigation			
14.	Irrigating rice field by canals and ground water	67 (51.5%)	42 (32.3%)	21 (16.2%)
15.	Irrigating field with help of bucket made of leather handle from canals	54 (41.5%)	46 (35.4%)	30 (23.1%)
	Mean value	60.5	44.0	25.5
	Plant Protection			
16.	Applying of neem oil and castor cake for control the termite in the stunted growth of paddy	68 (52.3%)	42 (32.3%)	20 (15.4%)
17.	Ploughing the crop field for control of termite caterpillar and grasshopper in summer season	60 (46.2%)	45 (34.6%)	25 (19.2%)
18.	Controlling the birds and animals by using man made structure known as Wooden traditional doll (Marapachi doll)	55 (42.3%)	40 (30.8%)	35 (26.9%)
19.	Applying neem leaf and neem cake to control pest in earlier stage	62 (47.7%)	43 (33.1%)	25 (19.2%)
20.	Mixing unni plant leaf (*Lantana camera*),+ wild tulsi + chilli powder extract with 5 litre of water solution is used to control rice earhead bug	50 (38.5%)	50 (38.5%)	30 (23.1%)
21.	Mixing of cow dung, urine, chilly and garlic with 10 litter of water to control the pests	48 (36.9%)	52 (40.0%)	30 (23.1%)
22.	Spraying of neem seed extract to control leaf minor insects	58 (44.6%)	47 (36.2%)	25 (19.2%)
23.	Spraying an arali leaf (*Nerium*)+ Kattamanaku (*ipomea*) leaf extract with water soap solution + jaggery solution used to control leaf eating insect	52 (40.0%)	50 (38.5%)	28 (21.5%)
24.	Indicating the rust in ("khajulaiyan") trees shows that more chances of rust in paddy field	45 (34.6%)	45 (34.6%)	40 (30.8%)
25.	Planting (Bhelana) stem twigs in rice filed to control the gundhibug	60 (46.2%)	40 (30.8%)	30 (23.1%)
26.	Planting using standing crop (Maize cob) in the filled to control bunky insect	42 (32.3%)	48 (36.9%)	40 (30.8%)
27.	Applying ash on early morning to control aphid	50 (38.5%)	55 (42.3%)	25 (19.2%)
28.	Applying rice bran + kerosene mixture as pellets in the field to protect the rice yellow borer	65 (50.0%)	40 (30.8%)	25 (19.2%)
	Mean value	55.23	45.15	29.62
	Post-harvest			
29.	Drying of rice for one or two days in the field itself	66 (50.8%)	42 (32.3%)	22 (16.9%)
30.	Threshing by hitting the paddy bundles with wooden blocks	64 (49.2%)	43 (33.1%)	23 (17.7%)
31.	Threshing by the cattle for removal of grains	58 (44.6%)	45 (34.6%)	27 (20.8%)
32.	Separating the grains by a winnower called Bamboo tray (Muram)	60 (46.2%)	48 (36.9%)	22 (16.9%)
33.	Parboiling of paddy	52 (40.0%)	50 (38.5%)	28 (21.5%)
34.	Dehusking of paddy	56 (43.1%)	46 (35.4%)	28 (21.5%)
35.	Grounding of rice in a heavy weight wooden grinder called Wooden grinding	48 (36.9%)	50 (38.5%)	32 (24.6%)

	device (Urral)			
36.	Storing the seed with a small wide mouthed earthen pot in daily usage	62 (47.7%)	44 (33.8%)	24 (18.5%)
37.	Storage of paddy grains in "Small house"	60 (46.2%)	45 (34.6%)	25 (19.2%)
38.	Spread of Vitex negundo (Vitex negundo) and Neem leaves over the small house to control rice moths	58 (44.6%)	47 (36.2%)	25 (19.2%)
39.	Spraying of cow dung solution in paddy grains for protection of pest and diseases	50 (38.5%)	50 (38.5%)	30 (23.1%)
40.	Using methi straw (fenugreek) in bottom and top of the grains to protect insect attack in small house (small house)	55 (42.3%)	48 (36.9%)	27 (20.8%)
	Mean value	56.08	45.25	28.67

The extent of the knowledge level of various indigenous agricultural practices in paddy are presented in Table.

It could be observed from the Table that out of 7 indigenous practices in Nursery Preparation, the knowledge levels varied considerably among respondents. The highest correct responses were observed for soaking of seeds in water for sprouting (53.8%), followed by maintaining water during flowering stage (50.0%) and application of green manure and FYM (46.2%). Practices like raising nursery in an isolated place (33.1%) and not allowing other crops in the nursery area (36.9%) showed lower awareness. The average for fully correct responses was 56.14%, with 43.29% partially correct and 30.57% incorrect. These findings suggest a moderate level of knowledge retention in nursery practices, consistent with the findings of Rizwana and Lyaqet (2011) [6]. The above Table revealed that out of 3 indigenous practices in Seed Treatment, two practices had a moderate percentage of fully correct responses. These include treating seed with bed ash (44.6%) and mixing cow dung with seeds before soaking (48.5%). The practice of mixing neem oil with water for seed treatment before soaking was known correctly by 38.5% of respondents. The average fully correct knowledge level was 43.67%, while 29.33% gave partially correct responses and 57.00% were incorrect. This indicates a fair level of awareness with room for improvement in seed treatment knowledge, similar to the findings of Srinivas *et al*. (2018) [9]. The Table also revealed that out of 3 indigenous practices in Soil Fertility Management, all practices were known correctly by more than 40% of respondents. Decomposing leaves, crop residues, and forest waste was most recognized with 53.1% fully correct, followed by ploughing with thorn plough in summer (46.9%), and broadcasting FYM and forest residue mixture (43.1%). The mean value for fully correct responses was 62.00%, with 42.33% partially correct and 25.67% incorrect. This shows a relatively good understanding of traditional fertility enhancement practices, supported by Gosai Kuldip *et al*. (2011) [2]. From the above Table, it is interesting to see that both indigenous practices under Water Conservation and Irrigation in Paddy were known by a good number of respondents. Irrigating rice fields by canals and groundwater had 51.5% fully correct responses, while bucket irrigation using leather-handled buckets had 41.5%. The mean fully correct response was 60.5%, with 44.0% partially correct and 25.5% incorrect. These practices have been passed down through generations, which supports the findings of Smith Mishra *et al*. (2012) [4]. The Table observed that out of 13 indigenous practices in Plant Protection, many practices were moderately known among the respondents. The highest was applying neem oil and castor cake (52.3%), followed by rice bran + kerosene pellet application (50.0%), and neem leaf and cake application (47.7%). However, practices like using standing maize cobs to control insects and identifying rust in "khajulaiyan" trees had lower fully correct responses (32.3% and 34.6% respectively). The mean fully correct response was 55.23%, with 45.15% partially correct and 29.62% incorrect. This mixed awareness reflects tribal dependence on both traditional and intuitive control methods, which is consistent with Vishwambhar Prasad Sati and Rinawma (2014). It could be observed from the Table that out of 12 indigenous practices in Post-Harvest, many practices showed moderate to high awareness. Drying paddy in the field (50.8%), wooden block threshing (49.2%), and storing seed in wide-mouthed earthen pots (47.7%) were among the most well-known. On the other hand, using cow dung spray (38.5%) and grounding rice in Urral (36.9%) had relatively lower awareness. The mean value for fully correct responses was 56.08%, 45.25% were partially correct, and 28.67% were incorrect. This overall high knowledge reflects the strong experience and cultural preservation of post-harvest methods, as noted by Velavan *et.al.*, (2022) and Kanjikar (2019) [3].

Table 3: Overall Knowledge of the Respondents on Indigenous Agricultural Practices (n = 130)

S. No.	Category	Frequency	Percentage
1.	Low (45 - 65)	12	9.23
2.	Medium (66 - 85)	38	29.23
3.	High (86 - 105)	80	61.54
	Total	130	100.00

The data in the above table reveals that a majority of the respondents (61.54%) had a high level of knowledge regarding the subject, followed by 29.23 percent with a medium level of knowledge. Only 9.23 percent of the respondents were found to have a low level of knowledge. This finding contrasts with the results reported by Poovarasan.

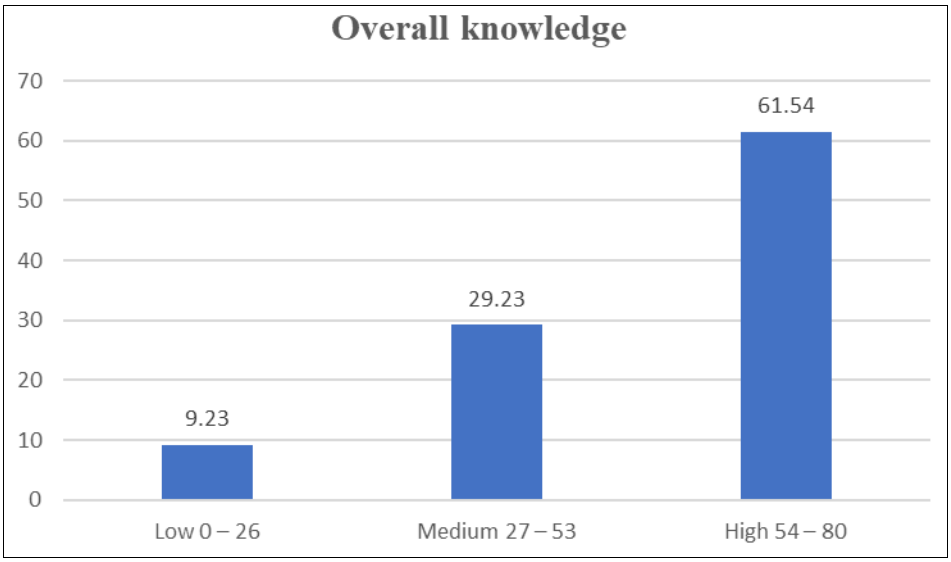

Fig 1: Distribution of Respondents According to their Overall Knowledge on Indigenous Agricultural Practices

Association between selected independent variables with the knowledge of the respondents towards improved Indigenous Agricultural Practices

Table 4: Association between selected independent variables and knowledge

SI. No.	Variables	Standardized Regression Co-efficient ('r'value)
1	Age	0.185*
2	Education status	0.945**
3	Occupation	0.278
4	Annual income	0.398*
5	Family type	0.089
6	Farm size	0.187*
7	Farming experience	0.301**
8	Social participation	0.162*
9	Socio-economic status	0.289
10	Mass media exposure	0.665**
11	Information source	0.251**
12	Information sharing behaviour	0.197*
13	Innovativeness	0.214*
14	Progressiveness	0.133*
15	Risk bearing capacity	0.799**

The data revealed that out of the fifteen independent variables, namely education status, farming experience, annual income, farm size, social participation, mass media exposure, information source, information sharing behaviour, innovativeness, progressiveness, and risk bearing capacity were found to be positively and significantly correlated with the knowledge of the farmers towards indigenous agricultural practices. However, variables such as age and occupation were found to have a moderate positive association, while family type and socio-economic status exhibited no significant correlation with the knowledge level of the farmers on indigenous agricultural practices.

Conclusion

It was concluded that a majority of the respondents were of middle age (36-45 years), most had attained only basic levels of education, and a significant portion were involved in agriculture combined with labor activities. A majority of the respondents had an annual income between ₹50,001-₹75,000 and landholdings up to 2.5 acres. Most of them lived in joint families and had high farming experience, with medium levels of extension contact, social participation, information source utilization, and risk-bearing capacity. Regarding their knowledge level on indigenous agricultural practices in paddy cultivation, 61.54 percent of the respondents had a high level of knowledge, followed by 29.23 percent with medium, and only 9.23 percent with low knowledge.

Subsequently, the independent variables such as education status, farming experience, annual income, farm size, social participation, mass media exposure, information source, information-sharing behavior, innovativeness, progressiveness, and risk-bearing capacity were found to be positively and significantly correlated with the knowledge of tribal farmers toward indigenous agricultural practices in paddy cultivation. However, age and occupation showed a moderate positive association, while family type and socio-economic status did not show any significant correlation

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