Original Research Article

Farm profile attributes and Adoptionof Indigenous Technical Knowledge (ITK)forCrop Management by Rice-Growing Farmers in Tamil Nadu,India

ABSTRACT

This study aims to identify farm profile attributes and uses of Indigenous Technical Knowledge to pest and nutrient management by rice-growing farmers in Tamil Nadu.A total of 60 respondents were used which 10 farmers selected by snowball sampling from Nagapattinam, Thiruvarur, Thanjavur, Karaikal, Thoothukudi, and Ramanathapuram districts of Tamil Nadu and Karaikal in Puducherry. The main purpose of the study was to gather information from organic farmers for crop pest and nutrient management in rice. The results of this study revealthat majority of the farmers having secondary level of education (31.67 %), the majority of respondents up to twenty years of organic farming experience (75 %), Majority of respondents contacts with extension officials ofAgriculture Officer (45 %), information obtained through mass media (73 %) and 45% of respondents actively participating in social activities. From nutrient sources Panchagavya has been mostly used almost 68% of the farmers followed by Cow dung (30%). In Panchagavya preparation Meenamilam is found to be used at the rate of 10ml/ lit by majority (68.33 %) of the farmers of Nagapattinam,Thiruvarur and Thanjavur districts. The other commonly used ITK concoctions include Jeevamirtham 20 (ml/lit), Amirthakaraisal 10 (ml/lit), five leaf extract 30 (ml/lit), 3G extract 50 (ml/lit), Themorkaraisal 100 (ml/lit). Almost 50- 60 percent of the farmers have their crops affected with pests or diseases and very few of them mitigate this issue by the use of organic sources and with the help of extension officials. This study indicated that farmers are gaining more knowledge on organic farming and its importance. Anyhow, education has to be provided to those who are in the progress of practising organic farming. Pest management strategies and trainings need to be offered to the farmers and the officials and scientists are willing to provide knowledge to the farmers as this of prime concern in agriculture.

Keywords:Indigenous Technical Knowledge Practices, Organic Farmers,Nutrient Management, Organic Concoctions, Farm Profile Attributes, Rice

1. INTRODUCTION

Rice is a staple food crop grown in South Asian Countries in which 85 per cent of the cropping system falls in the Indo- Gangetic plains [1,2]. India ranks first in terms of rice cultivation (42.5M ha) and second in terms of production (152.6 MT) [3]. The use of synthetic chemicals for crop management since green revolution has led to many adverse effects which includes soil health deterioration, increased cost of cultivation, affecting environment [4]. On the other hand, organic farming relies upon organic waste crop rotations, animal manures, crop residues and biological systems for nutrient mobilization, ensuring optimal plant protection. India ranks first in terms of organic farmers and ninth in terms of area under cultivation [5]. 1.71M ha of land has been certified under organic cultivation which represent about 4 per cent of net sown area (NPOP, 2023). Tamil Nadu ranks 14th in organic producing states in the country with 31,627 hectares of organic farm land.Indigenous Technical Knowledge (ITK) are traditional practices which uses the distinct knowledge of native farmers from various parts of the world [6]. This knowledge has been passed down through the generations unnoticed because it is dynamic and frequently changed by contact with external systems, innovation and exploration [7]. The practice of non-chemical techniques for controlling pests is of major importance in many countries. The crop production scenario in the agro-ecological region may change if these ITKs are successfully included in crop management which result in lower production costs and higher net returns [8].The present study is conducted in Nagapattinam, Thiruvarur, Thanjavur, Thoothukudi, Ramanathapuram districts of Tamil Naduand

Karaikal in Puducherryfocussing on farming practices and different crop management strategies used by organic farmers of Tamil Nadu, particularly the ITK techniques, in view with further validation and improving the technique for promotion in IPM packages for organic farming.

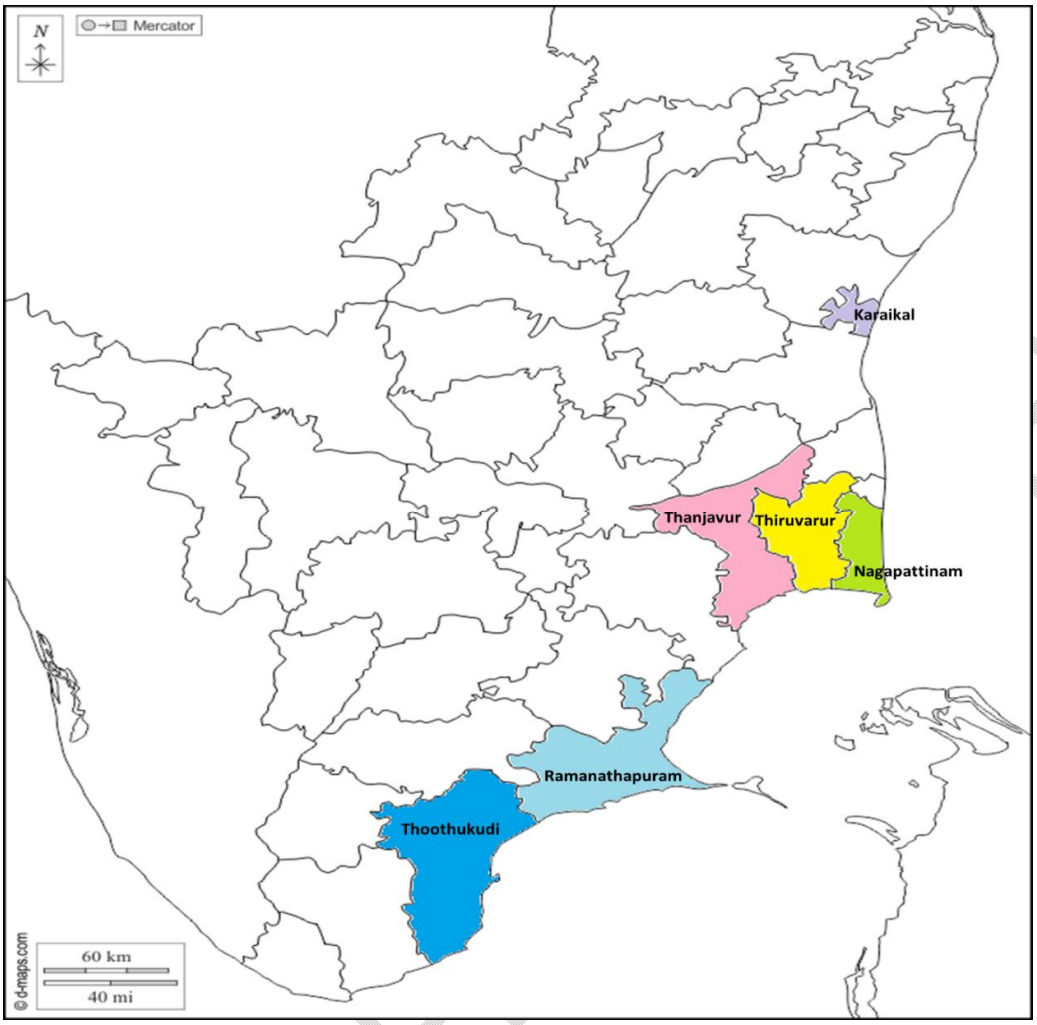
2. MATERIAL AND METHODS

Survey and documentation of indigenous technical knowledge (ITK) practices of organic farmers in the districts of Cauvery delta region of Tamil Nadu

The survey was carried out in the districts of Cauvery delta region during June 2024 to comprehend the methods of pest management followed by the organic farmers and questionnaires were prepared to conduct the survey. The questionnaire was designed ensuring that all relevant data has been recorded after discussing with Extension researchers, Scientists and the officials of Tamil Nadu Organic Certification Department (TNOCD), Department of Agriculture, Tamil Nadu. A total of 60 respondents, 10 farmers selected by snowball sampling were surveyed from the districts of Nagapattinam (10°46′02″N 79°50′42″E), Thiruvarur (10°46′23″N 79°38′13″E), Thanjavur (10°47′13.2″N 79°08′16.1″E),Thoothukudi (8°45′51″N 78°08′05″E), Ramanathapuram (9°21′50″N 78°50′22″E) in Tamil Nadu and Karaikal (10°55′58″N 79°49′55″E) in Puducherry. The purpose of the study was to gather information from organic farmers for crop pest and nutrient management in rice.

The questionnaire was designed in major view with the organic traditional practices followed for crop nutrient and pest management. It had three parts comprising general/ personal information of the farmer which includes education, years in farming experience, agencies in contact, mass media source for crop production, social participation farming details which includes area of land, source of irrigation and irrigation methods, crops grown and organic farming practices which includes practices for nutrient and pest management. Figure 1 gives the representation on number of farmers surveyed in different districts.

Fig 1. Sample distribution of organic farmers surveyed in the districts of Tamil Nadu



3. RESULTS AND DISCUSSION

3.1 Socioeconomic characteristics of organic farmers

3.1.1 General information (Table 1)

The information gathered on education, organic farming experience, ITK awareness obtained by the farmers through external officials/agencies, media exposure and social participation is provided in Table 1. [9] reported on the profile characteristics of farmers following SRI rice cultivation in Nagapattinam district of Tamil Nadu which supports the present study based on their socio-economic and farming details. The organic farmers were categorised according to the features of their selected profile.

3.1.1.1 Education

The education level of the farmers was categorized into five groups; Illiterate, Primary (up to fifth class), Secondary (sixth to tenth class), Higher secondary (up to HSLC) and Collegiate. Majority of them were educated up to Secondary level (31.67 %) and Collegiate (26.67 %), followed by Higher secondary level (20 %) and Primary level (18.33 %). The per cent Illiteracy was found to be low (3.33 %) among the respondents. The findings of [10] are found to coincide with that of the present study.

3.1.1.2 Farming and Organic Farming Experience

From the responses gathered, it is found that 65 per cent of the respondents have 20 years of experience and 23.33 per cent have 20 to 40 years of experience in farming. Only 11.66 per cent of the farmers have more than 40 years of farming experience. Those who have been following organic farming for a period of 10 years was found to be 75 per cent followed by a period of 20 years by 16.67 per cent. Farmers having more than 20 years of organic farming experience represents only about 8.33 per cent. Of the 60 respondents it is found that only 26.67 per cent of the farmers have been practising organic farming since beginning irrespective of their years of farming experience. The

findings of this study are found to be in concordance with that of [11]. From the reports of [12] it shows that the farmers were having positive attitude towards organic farming.

3.1.1.3 Extension Officials/ Agencies in contact

About, 45 per cent of farmers were in contact with Agricultural Officers and 20 per cent with Assistant Agricultural Officer. TNAU Scientists are being asked for advice regarding IPM practices by 15 per cent of farmers. In addition, farmers have contact with JDA (8.33 %), ADA (13.33 %), FPO (8.33 %), TNAU Scientists (15 %). Over 18.33 per cent of the farmers seek help from KVK specialists and VAO, where they get involved in trainings and field demonstrations. About 43.33 per cent of the farmers are in contact with any one of the extension officers or scientists followed by 28.33 per cent with two, 6.67 per cent with three and 1.67 per cent with four officials. It is notable that over 20 per cent of the farmers surveyed are not in contact with any of the external agencies.

3.1.1.4 Media Sources for Crop Production Information

The mass media exposure of farmers for gathering information on crop production techniques is found to be only 73.33 per cent. Majority (41.67 %) of the farmers were found to use Television followed by Online platform (28.33 %), News Papers (23.33 %), AIR (21.67 %), FM (20 %), and very few (10 %) were found to use Farm Magazine. Over 31.67 per cent are exposed to at least one of the media sources followed by 23.33, 11.67, 3.33, and 1.67 per cent exposed to 2 to 6 media sources respectively and 26.67 per cent of the farmers are not exposed to any source of media information.

3.1.1.5 Social Participation

Over 45 per cent of the respondents were found to be in active part of social activities. Majority (21.67 %) of them were found to have been taking part with small social activities, some of them are members (10 %) of certain associations followed by being chairman (5 %) and officers (1.67 %). It is very notable that only half of the respondents are active in social participation. [13, 14] had similar reports on social participation of farmers.

Table 1. Socioeconomic characteristics of organic farmers in districts of Tamil Nadu (n=60)

S. No.	Attributes	Frequency	Percentage
I	**Education**		
1.	Illiterate	2	3.33
2.	Primary	11	18.33
3.	Secondary	19	31.67
4.	Higher Secondary	12	20.00
5.	Collegiate	16	26.67
II	**Farming Experience**		
1.	20 years	39	65.00
2.	40 years	14	23.33
3.	60 years	7	11.67
	Organic Farming Experience		
4.	10 years	45	75.00
5.	20 years	10	16.67
6.	30 years	5	8.33
III	**Extension Officials/ Agencies in contact**		

1.	Joint Directorate of Agriculture	5	8.33
2.	Assistant Directorate of Agriculture	8	13.33
3.	Agriculture Officer	27	45.00
4.	Assistant Agriculture Officer	12	20.00
5.	Farmers Producer Organizations	5	8.33
6.	TNAU Scientists	9	15.00
7.	Others (KVK, VAO)	11	18.33
	No. of agencies in contact by individual farmers		
8.	None	12	20.00
9.	1	26	43.33
10.	2	17	28.33
11.	3	4	6.67
12.	4	1	1.67
IV	**Media Sources for Crop Production Information**		
1.	AIR	13	21.67
2.	FM	12	20.00
3.	TV	25	41.67
4.	News Paper	14	23.33
5.	Farm Magazine	6	10.00
6.	Others	17	28.33
	No. of sources used by individual farmers		
7.	None	16	26.67
8.	1	19	31.67
9.	2	14	23.33
10.	3	7	11.67
11.	4	2	3.33
12.	5	1	1.67
13.	6	1	1.67
V	**Social Participation**		

1.	Chairman	3	5.00
2.	Member	6	10.00
3.	Officer	1	1.67
4.	Others	13	21.67

3.2 Farming details followed by Organic Farmers (Table 2)

3.2.1 Land Holdings

The categories of farmers based on their farm size were furnished as marginal (<1 ha), small (1 to 2 ha), medium (2 to 10 ha) and large (>10 ha). About 45 per cent are found to be medium level farmers followed by 26.67 per cent of marginal and 25 per cent of small farmers. Only 3.33 per cent of them are found to be large scale farmers (>10 ha). All the 60 respondents had their own land and only two farmers had leased in land along with their owned lands. Based on the type of land such as wetland, garden land and rainfed it is found that majority (88.33%) had wet land followed by rainfed (8.33%) and garden land (3.33%). The results are found to be the findings of [15]

3.2.2 Source of Irrigation and Irrigation Methods

The source of irrigation found in the study area were categorized as well, borewell and canal in which 41.67 per cent having canals, 31.67 per cent having borewell, 26.67 per cent having well as source for irrigation. Majority (86.67%) practised open irrigation followed by moderate (10%) practised drip irrigation and very few (3.33%) practised either rain gun or sprinkler type irrigation method.

3.2.3 Crops Grown

The Cauvery delta zone is a predominant paddy growing area of Tamil Nadu. All the respondents had paddy as their major crop along with some vegetable, pulses, oil seeds, flower and fibre crops like tomato, bhindi, chilli, onion, radish, lab lab, brinjal, black gram, green gram, coconut, jasmine, sesame and cotton. The paddy varieties grown are as follows, Karuppu kavunni, Maapillai samba, Jeeraga samba, Aathur kichadi, CR 1009, Poongar, ADT 53, Ponni, ADT 51, IR 20, Thanga samba, Samba, Sanna ragam, Thooyamalli, CO 43, CO 42, Kaatuyaanam, CO 45, CO 54, Soora kuruvai, Nellarasi, CO 57 and Savithri 51. About 41.67 per cent prefer Karuppu kavunni followed by 36.67 per cent prefer Maapillai samba and Jeeraga samba, 16.67 per cent prefer Aathur kicchadi, CR 1009 and Poongar, 10 per cent prefer ADT 53 and Ponni and 33.33 per cent grow other listed varieties. The other crops grown are mostly local varieties.

Table 2. Farming details of organic farmers of Tamil Nadu

S. No.	Particulars	Frequency	Percentage
I	**Land Particulars based on farm size (ha)**		
1.	Marginal (<1 ha)	16	26.67
2.	Small (1 to 2 ha)	15	25.00
3.	Medium (2 to 10 ha)	27	45.00
4.	Large (>10 ha)	2	3.33
	Land Holding		
5.	Owned	58	96.67
6.	Leased IN	2	3.33
	Land Type		
7.	Wet land	53	88.33

8.	Garden land	2	3.33
9.	Rainfed	5	8.33
II	**Source of Irrigation**		
1.	Well	16	26.67
2.	Borewell	19	31.67
3.	Canal	25	41.67
	Irrigation Methods		
5.	Open	52	86.67
6.	Drip	6	10.00
7.	Rain gun	1	1.67
8.	Sprinkler	1	1.67

3.3 IPM adoption practices by the Farmers (Table 3)

The results furnished in Table 3 shows the information of Integrated Pest Management (IPM) practices. [16] pointed out the necessity of developing non-chemical, indigenous knowledge techniques as alternatives to chemical pesticides. Over 15 per cent of the farmers employed IPM practices like pheromone trap, light and sticky traps along with their organic sources. Around 51 farmers depend solely upon their organic sources and farming methods. The percentage of farmers that are unwilling to adopt new, improved methods is up to 75 per cent.

Table 3. IPM adoption practices of organic farmers

S. No.	Category	No. of Farmers	Per cent
1	ITK practises + IPM packages *viz*., light and sticky traps	9	15
2	Use of organic sources alone (Jeevamirtham, Amirthkaraisal, Panchagavya,)	51	75

3.4 Nutrient Management Practices for organic crop production

The organic practices of nutrient management adopted by the farmers of delta region are given in Figure 2. Cow dung, goat droppings, buttermilk, paddy straw, daincha, panchagavya, jeevamirtham, Manures like Farm Yard Manure (FYM), neem cake, groundnut cake, vermicompost and bio inoculant like *Pseudomonas* were used for nutrient management of the crops. Panchagavya is being used as a major (47 %) nutrient source by the farmers of Nagapattinam, Thiruvarur, Thanjavur, Thoothukudi and Karaikal. The other organic sources which are in moderate usage includes cow dung (21 %) by Thiruvarur, Nagapattinam, Thanjavur and Karaikal farmers; neem cake (9 %) by Nagapattinam and Thiruvarur district farmers and jeevamirtham (6 %) by Thiruvarur, Nagapattinam and Thoothukudi farmers. Daincha is being used by 5 per cent of Karaikal and Thanjavur farmers and Themorkaraisal by 2 per cent of Nagapattinam and Ramanathapuram district farmers. FYM is being used by the farmers of Union Territory of Karaikal (2 %). The farmers of Thiruvarur are found to be using many nutrient input sources like *Pseudomonas* (2 %), Groundnut cake (2 %), Goat droppings (2 %), and Vermicompost (1%). The usage of these sources varies district wise and it may be because of their economic status.

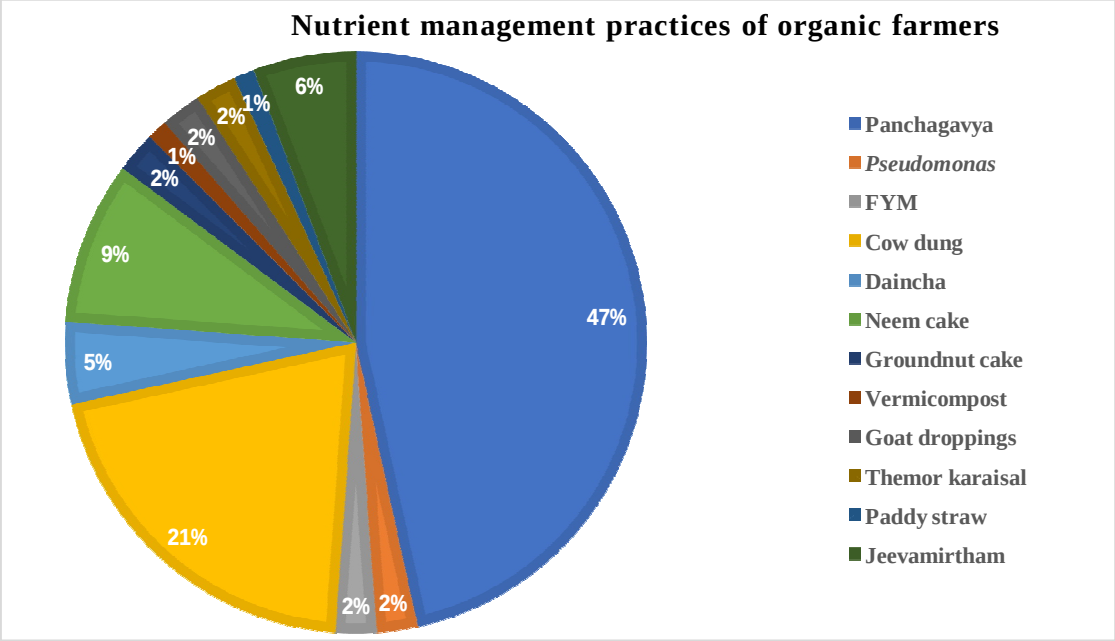


Fig 2. Nutrient management practices for organic crop production

3.5 ITK based concoctions used by the farmers:

ITK based organic concoctions used for crop production by the farmers of delta region are given in Table 5. It is found that the farmers prefer 10 different concoction which includes Panchagavya, Meenamilam, Jeevamirtham, Amirthakaraisal, five leaf extract, 3G extract, Neem oil, Themorkaraisal, Cow dung + Jaggery and Oil seed cake. Meenamilam is found to be used at the rate of 10ml/ lit by majority (68.33 %) of the farmers of Nagapattinam, Thiruvarur and Thanjavur districts. Cow dung + Jaggery (50 ml/lit) is being used by almost all the district farmers (21.67 %). Panchagavya (20 ml/lit) and Jeevamirtham (20 ml/lit) is also used as an ITK concoction by 20 per cent of the farmers of Nagapattinam, Thiruvarur, Thanjavur, Ramanathapuram and Thoothukudi districts. 3G (Ginger, Garlic Green chili – 50 ml/lit) extract is being used by 10 per cent of the farmers. Amirthakaraisal (10 ml/lit), 5 leaf extract (30 ml/lit) by 3.33 per cent and Neem oil (20 ml/lit), Themorkaraisal (100 ml/lit) by 1.67 per cent of the farmers of Thiruvarur, Thanjavur, Nagapattinam and Karaikal respectively. Oil seed cake is being used at 1-2 bags per acre by almost 13.33 per cent of the farmers. It is evident from Table 5 that farmers of Thiruvarur district use most of the ITK concoctions for crop management. [17] has also reported similar ITK practices followed by organic brinjal farmers of Tamil Nadu district.

Table 5. Organic concoctions used by the organic farmers

S. No	ITK concoctions	Dose	No. of farmers	Nagapattinam	Thiruvarur	Thanjavur	Karaikal	Thoothukudi	Ramanathapuram	Per cent use
1.	Panchagavya	20 (ml/lit)	12	5	4	3	-	-	-	20.00
2.	Meenamilam	10 (ml/lit)	41	18	14	7	-	1	1	68.33
3.	Jeevamirtham	20 (ml/lit)	12	6	3	1	-	1	1	20.00
4.	Amirthakaraisal	10 (ml/lit)	2	-	1	1	-	-	-	3.33
5.	Five leaf extract	30 (ml/lit)	2	-	2	-	-	-	-	3.33
6.	3G extract	50 (ml/lit)	6	3	2	1	-	-	-	10.00
7.	Neem oil	20 (ml/lit)	1	-	-	-	1	-	-	1.67
8.	Themorkaraisal	100 (ml/lit)	1	1	-	-	-	-	-	1.67
9.	Cow dung+ jaggery	50 (ml/lit)	13	4	4	4	1	-	-	21.67
10.	Oil seed cake	1- 2 bags/a	8	3	3	-	2	-	-	13.33

Fig 3. ITK based concoctions used by the organic farmers

3.6 Problems faced by the farmers

Seasonal rainfall and scarcity of water is the major problem faced by the organic farmers of Tamil Nadu. Some of the farmers are found to have issues with marketing their produce. Almost 50- 60 percent of the farmers have their crops affected with pests or diseases and very few of them mitigate this issue by the use of organic sources and with the help of extension officials. Farmers also face problems because of non-insect pests like birds and rodents.

4. CONCLUSION

This study concludes that most of the respondents surveyed practise organic farming based on the ITK practises. The farmers are also found to be in frequent contact with the extension officials, TNAU scientists and also with JDA, ADA, AO. Pest management strategies and trainings need to be offered to the farmers by the officials and scientists. Thereby providing proper education and support would help farmers to practice organic agriculture and enhance crop management.

ETHICAL APPROVAL

This research was conducted with strict adherence to ethical guidelines to ensure the protection of all participants and the integrity of the research process.Informed consent was secured from all participants, who were made aware that their participation was voluntary and that their personal data would be kept confidential

DEFINITIONS, ACRONYMS, ABBREVIATIONS

ITK- Indigenous Technical Knowledge
NPOP- National Programme for Organic Production
TNOCD- Tamil Nadu Organic Certification Department

Disclaimer (Artificial intelligence)
Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

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