Indigenous Technical Knowledge Relating to Farming Enterprises

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Authors' contributions

This work was carried out in collaboration between both authors. Author NS designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors NS and JVP managed the analyses of the study. Author NS managed the literature searches. Both authors read and approved the final manuscript.

Original Research Article

ABSTRACT

Indigenous technical knowledge has been traditionally owned wisdom from time to time, as the days gone it is likely to be forgotten by the society, due to an invasion of modern technologies. Due to ecological imbalance and onslaught of land, water and other natural resources, their ecology is disturbed. Taking this into consideration, this study focused on the ITK practices relating to the farming enterprises, undertaken at Idukki district of the Western Ghats in Kerala state, India. Sixty-one percent of the respondents belonged to the young age category (18-35 years. (Fig. 1 & Table1). Even though 61.00% of the respondents belong to young category there is strong adherence to ITK practices this shows their strong bondage of culture in following the similar ITK practices of their ancestors. Majority (64.00%) of the respondents had high value orientation (Fig. 2 & Table 1), (86.00%) possessed high level of norms, mores and taboos (Fig. 3 & Table 1). More than half of the

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respondents (51.00%) had a medium level of adherence to cultural characteristics (Fig. 4 & Table 1).
The sample size consisted of 100 tribals and was interviewed personally for ITK documentation through open-ended questions and discussions. Two settlements (villages) in Devikulam taluk of Idukki district was taken for the study. The indigenous technology spread over the study area in paddy, ragi and beans, were collected besides, traditional wisdom in allied activities like dairy rearing was obtained from the majority of tribal men and few tribal women. Nearly 41 indigenous practices in paddy, ragi, beans were collected. Also, 8 indigenous traditions related to dairy were also collected.

1. INTRODUCTION

To achieve the goal of sustainable agriculture, its urgent need to revive ITK in agriculture [1]. The development agents (CBOs, NGO, governments, donors, the local leader and private sector initiatives) should recognise the value of ITKs and appreciate it in their interaction with the local communities [2]. The tribals are relatively homogenous, whose social life is governed by traditions and customs. Their rigid social keeps them away from scientific and technological progress [3]. As rightly quoted by Panda a tribe is a group of people who are "Historically more disadvantaged, non-integrated to the mainstream of society and less participative in the opportunity structure of the society" [4].

Tribals are aborigines with their set pattern of values, customs, art and conservative to the outsiders. Indigenous Technical Knowledge (ITK) has been traditionally owned wisdom from time to time; as the days gone by, it is likely to be forgotten by the society, due to an invasion of modern technologies [5]. Movarej et al. found that indigenous exploring knowledge provided problem-solving strategies for local communities and helps in local solutions to revitalising farming system and environment [6]. The tribal respondents possessed the medium level of scientific orientation (Fig. 5 & Table 1). The finding of scientific orientation draws support from the findings of Alagirisamy and Selvarani [7-8]. Due to ecological imbalance and onslaught of land, water and other natural resources, their ecology is disturbed. So it is high time to restore their ecology especially of the hilly tracts of western ghats because bio-diversity is conserved in western Ghats when compared to other regions in India. The listing of indigenous practices relating to farming enterprise will be helpful for the researchers to select viable and eco-friendly technologies for popularisation. The policymakers and agricultural scientists have come to understand that the continuation of modern agriculture alone may lead to severe ecological and economic problems. To be cost-effective, increasing the availability of land and irrigation facilities and utilising eco-friendly, low input indigenous practices integrating with modern technologies are the possible solutions. Keeping this in mind, the traditional knowledge was documented as one of the objectives.

2. RESEARCH METHODOLOGY

The study was conducted in Idukki district which comprise of four taluks out of which Devikulam taluk was purposively selected for the study purpose, since major part of hill area and tribal population comes under Devikulam taluk.

2.1 Selection of Taluk and Block

Idukki district has four taluks, *viz.*, Peerumedu, Udumbanchola, Devikulam and Thodupuzha. Devikulam taluk was selected for this study purpose since major part of hill area and tribal populations comes under Devikulam taluk. This taluk consists of nine blocks *viz.*, Santhampara, Vattavada, Mattupatti, Munnar, Marayoor, Nullathani, Chinnakanal, Devikulam and Thenmallai. Among these nine blocks Devikulam block was selected purposively for the study, since it is densely populated with the tribal people.

2.2 Selection of Villages (Settlememnts)

Devikulam block consists 21 settlements (village) these 21 settlements are distributed in Chinnar and Marayoor grama panchayat of Devikulam block (Chinnar-9, Marayoor-12). Among these 21 settlements (villages), two settlements (villages) Thaianankudi (Chinnar) and Irutalakudi (Marayoor) were selected due to dense population of tribal community.

2.3 Selection of Respondents

Respondents were selected by using proportionate random sampling method. It was decided to have a sample size of 100 considering the limitations of the researcher. In Thaianankudi and Irutalakudi settlements they were 1177 and 1252 tribal people respectively. It was decided to have a sample size of 100 respondents which includes both men and women. From Thaianankudi and Irutalakudi settlements 48 and 52 tribal respondents were selected by using proportionate random sampling method

$$Q_i = \frac{A_i}{B_i} \times N$$

Where,

Q_i = Number of respondents to be selected from i^{th} settlement

Ai = Total number of respondents in the village

B_i = Total number of respondents in the two settlement

N = Sample size

More than half of the respondents were male. Might be due to strict adherence towards their norms and culture women participation might have been lesser when compared to males.

Research methodology is a way to systematically solve the research problems [9]. For this study, expost-facto type of research design was used. In this type, the research, instead of creating a treatment, evaluated the effects of a statistically occurring phenomenon after the occurrence. Indigenous Technical Knowledge (ITK) is being an already existing phenomenon in the study area and hence the expost-facto type of research was employed.

To get the data regarding the area under medicinal plant cultivation in the districts of Tamil Nadu and description of study area had been discussed through secondary data through different sources. Considering the objectives and the variables under the study, a comprehensive structured interview schedule covering all aspects was prepared. The items included in the interview schedule were objective type questions, the most relevant, unambiguous and practical questions were included in the schedule.

2.4 Preparation of Interview Schedule

Initially, a group of independent relevant to the objectives of the study were selected based on the review of literature and discussion with experts. A list of 14 independent variables that might possibly influence the dependent variables has been identified. The experienced and senior behavioural scientists were requested to evaluate the degree of relevancy of each variable in the list on a three – point continuum.

The scores of 3, 2 and 1 were assigned for the "most relevant", "relevant" and "not relevant" responses respectively.

Based on the rating by judges, the mean and coefficient of variations were worked out for all the independent variables. The overall mean and coefficient of variations were also worked out. The criteria used for the selection of variables are as follows.

- The individual variables mean should be greater than the overall mean.
  Individual mean > Overall mean
- The individual variables co-efficient of variation (CV) should be less than the overall coefficient of variation.
  Individual CV < Overall CV

Through this process, 14 variables were selected based on the judges' ratings.

The interview schedule was designed into eight parts, and this particular objective belonged to the first part. A pilot study was conducted in the non sample area to pretest the schedule in order to test and verify the applicability of the schedule. Based on the experiences gained in pre-testing, necessary modifications were made in the schedule. The questions from the schedule were asked in the local language (in Tamil), hence there was no language bias.

The Indigenous Technical Knowledge (ITK) was documented from the respondents through open ended questions. The International Institute of Rural Reconstruction (IIRR) suggested identifying indigenous specialists, case studies, field observation, in depth interviews, participant observation, participative technology analysis, surveys, brain storming, games, group discussions, role play, SWOT analysis, village reflections, village workshops, flow chart, mapping, taxonomies, participatory video, and photo / slide documentation [10].

3. RESULTS AND DISCUSSION

UNFCCC (recognizes the conservation of traditional knowledge as co-benefits of ecosystem-based approaches to adaptation [11]. Investigation was done in an exhaustive way to collect and document technical wisdom from the elderly tribal respondents. The studies further showed that the tribals had no inclination to modern technologies and adoption of scientific technologies was significantly low. More than half of the respondents had low level of innovativeness (Fig.6.& Table1) because of the reputation on ITK. This finding is supported by the findings of Jamatia and Marimuthu [12&3].

Indigenous technologies followed in the major cultivated crops *viz.,* rice, ragi, beans and potato are presented in Table 2. In addition, traditional wisdom in animal husbandry was also collected from respondents. The ITK documented are presented in Table 3.

Table 1. Distribution of the respondents according to their profile characteristics (n = 100)

S.No.	Category	Number	Per cent
Distribution of the respondents according to their age			
1	Young	61	61.00
2	Middle	25	25.00
3	Old	14	14.00
Total		**100**	**100.00**
Distribution of the respondents according to their value orientation			
1	Low	16	16.00
2	Medium	20	20.00
3	High	64	64.00
Total		**100**	**100.00**
Distribution of the respondents according to their norms, mores and taboos			
1.	Low	2	2.00
2.	Medium	12	12.00
3.	High	86	86.00
Total		**100**	**100.00**
Distribution of the respondents according to their cultural characters			
1.	Low	48	48.00
2.	Medium	51	51.00
3.	High	1	1.00
Total		**100**	**100.00**
Distribution of the respondents according to their scientific orientation			
1	Low	21	21.00
2	Medium	75	75.00
3	High	4	4.00
Total		**100**	**100.00**
Distribution of the respondents according to their innovativeness			
1	Low	56	56.00
2	Medium	19	19.00
3	High	25	25.00
Total		**100**	**100.00**
Distribution of the respondents according to their progressivism - traditionalism			
1.	Low	47	47.00
2.	Medium	16	16.00
3.	High	37	37.00
Total		**100**	**100.00**

Table 2. Indigenous technical knowledge relating to crops

S. No.	Indigenous practices
I	**Rice** *(Oryza sativa)*
1.	Rough levelling of the surface of paddy fields is done by moving soil with the wooden plate of 1.8 m broad and 40 cm height.
2.	Scarce crow is used to drive away sparrows.
3.	A banana trunk about 3.5 m long is suspended with a rope that is wound around the hip of the farmers is pulled to level the surface of the Paddy field.
4.	Economically poor farmers harvest paddy earlier by beheading the panicles alone and leave the plants as such. If there is good late rain, they get second crop from the tillers which had not flowered earlier.
5.	Due to the constraints in labour supply at the time of paddy transplantation many farmers soak the paddy seeds for about 24 hours in water. Then the seeds are taken out of water and covered with cloth until they sprout. Such sprouted seeds are sown directly.
6.	During the main field preparation the bunds are trimmed well to avoid weed growth.
7.	If *'Kolingi'* is applied in the nursery, there will not be any pest incidence in the nursery.
8.	Ploughing twice using country plough and work bullocks.
9.	Applying farm yard manure (FYM) and green leaf manure (GLM) to the nursery field.
10.	Mixing the seeds with fresh cow dung for sprouting and keeping in the dark room of the house for three days.
11.	Ploughing main field for four times and levelling twice.
12.	Applying Green Leaf Manure (GLM) in the field and digging with mumuty to bring fine tilth in the field.
13.	Application of large quantities of farm yard manure (FYM) in the main field every year to get higher yield.
14.	Belief that the yellowing of leaves and turning of green seeds to yellow indicates the maturity and harvesting time.
15.	Drying of threshed seeds for one day in hot sun or 2-3 days in cloudy weather condition.
16.	Storing the paddy grains with "*Nochi*" (*Vitex negundo*) and "*Pungam*" (*Pongamia pinnata*) leaves .
17	*Lantana camera,* a weed, applied as green manure increases the soil fertility.
II.	**Ragi** *(Eleucine coracana)*
1.	Farmers broadcast the seedling of ragi *(Eleucina coracana)* crop on well puddled land. Broadcasted seedlings establish in the soil easily.
2.	Farmers spray goat's milk on the crop to control wilt.
3.	Application of farm yard manure at 1 load/ acre and 4-5 ploughing before sowing ragi seeds.
4.	Sowing of ragi seeds during April/May months after receiving the rains.
5.	Local proficient person in sowing only utilized for broadcasting seeds in the field.
6.	Shallow bullock ploughing after one month of broadcasting of ragi seeds to loosen the soil and for conservation of soil moisture.
7.	Sowing ragi seeds in raised bed nursery which consists of soil and farm yard manure mixture in the corner of the field to keep the seedlings for long time.
8.	Transplanting the seedlings in the main field after receiving rains.
9.	More application of cow dung sometimes causes stunting of plant because of production of some defective chemicals in the soil.
10.	Harvesting only ear heads of ragi for separating seeds.
11.	Separating ragi seeds from the ear head by the process of walking over the ear heads.
12.	Keeping the best ear head selected from the own field along with ash in earthen pots in dark place for 3-4 years for seed purpose during next season.

S. No.	Indigenous practices
13.	Storing the grains in small constructed inside the house.
14.	Storing the grains in bags and placing over the stones or wood logs.
15.	Practicing intercropping of ragi with Beans at 1:1 ratio in irrigated condition.
16.	Broadcasting of *Kirai (Amaranthus sp)* seeds inside the ragi field and raising as a mixed crop to get additional income.
17.	Mixed cropping involving ragi / samai or millets, greens and beans in same field.
18.	Using broad winnowing basket (Mora) for cleaning the grains.
19.	Using small basket (goodai) for storing the grains.
III.	**Bean *(Phaseolus vulgaris)***
1.	Empty pod shells of kidney bean is burnt with same green farm waste to fumigate the Bean field to minimize the aphid infestation.
2.	Whenever aphid attack is seen on beans, ash is sprinkled on the plants.
3.	Soaking bean seeds in water for few minutes, then mixing with wet red soil and wood ash and sowing seeds after drying under sun to prevent pest infestation during crop growth.
4.	Following shallow earthing up operation after sprouting of bean seeds.
5.	Preservation of bean seeds were done by pressing it over cowdung paste fixed on the wall of kitchen over the earth. Cowdung and seeds get dried gradually. This was done to protect the seeds from insect attack and to improve the viability of the seeds.

*(Source: Field survey, 2005,Idukki district)*

Table 3. Indigenous technical knowledge relating to animal husbandry

| V.	Animal husbandry
1.	Fermented wheat flour or fermented banana was fed to the buffaloes, which were weak and anemic.
2.	Mixture of salt and water was applied on the body of buffaloes infested with ticks.
3.	Fried salt with cucumber leaves was fed to the buffaloes to bring them to heat.
4.	Applying common salt controlled leach infestation in the nostrils of the buffaloes.
5.	In case of indigestion, ground coriander seeds mixed with water were fed to animals.
6.	Foot and mouth disease, an important viral disease of animals was prevented by feeding them with the flour of ragi
7.	Mastitis, bites of poisonous creatures, mechanical injury and improper milking may cause swelling of udder. The soil about 20 gm collected from Termite burrows is boiled in water. The boiled suspension was given to buffaloes. It gives relief within 24 hours.
8.	When an animal suffered from indigestion or gastric problems, 10 betel leaves and 10gm each of pepper and garlic were ground together, diluted in hot water and administered to suffering animal.

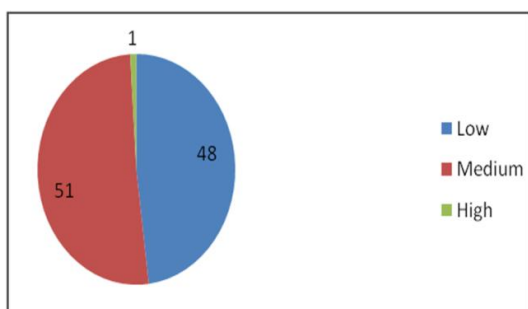*(Source: Field survey, 2005, Idukki district)*

Fig. 1. Distribution of respondents according to their age
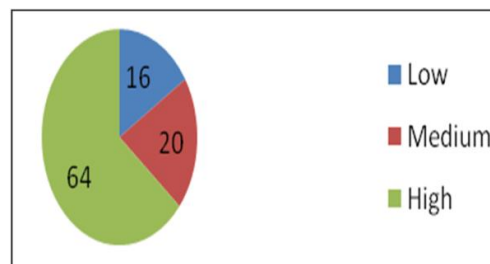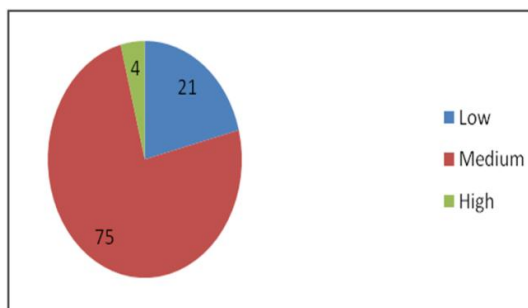

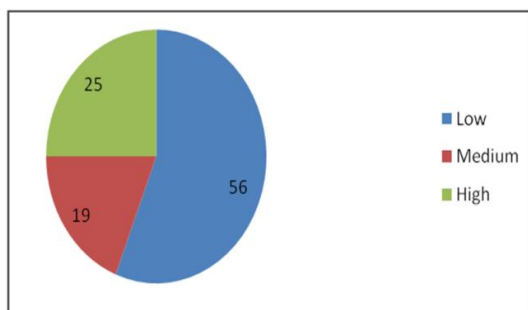**Fig. 2. Distribution of respondents according to their value orientation**
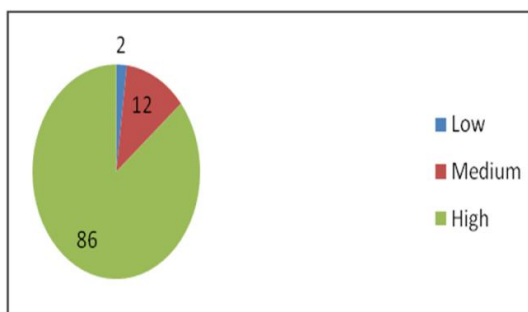
Fig. 3. Distribution of respondents according to their norms, mores and taboos
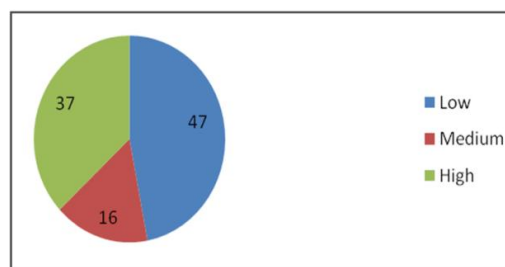

Fig. 4. Distribution of respondents according to their cultural characteristics

Fig. 5. Distribution of respondents according to their scientific orientation

Fig. 6. Distribution of respondents according to their innovativeness

Fig. 7. Distribution of respondents according to their progressivism-traditionalism

4. CONCLUSION

The listing of indigenous practices will be helpful for the researchers to select viable and eco-friendly technologies for popularisation. The tribes are relatively homogenous, whose social life is governed by traditions and customs. There is comparative isolation between progressive society and their rigid social structure with lesser social mobility keeps them away from scientific and technological progress. More than half of the respondents had the low level of innovativeness because of the reputation of ITK which have been passed on from their elders over the generation and less acquaintance with novel technologies.

Most of the tribes possessed the low level of progressivism-traditionalism (Fig.7& Table1) and the medium level of scientific knowledge due to steadfast adherence to ITK even though exposed to modern technologies.

Hence, All the above findings and documentation would be a ready reckoner for future research and efforts must be taken to develop appropriate technologies, which will have a blend of both conventional as well as scientific technologies. The tribal farmers follow only the traditional practices for pest and disease management. Hence scientists may consider this area for priority research item to develop simple technologies of management so that it would be easily understood and adopted by tribal farmers.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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