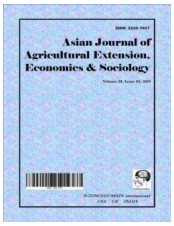

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A Study on Awareness and Adoption of the Rational ITKs in Tea Crop among the Hilly Tribes

R. Nisha[1*] and R. Arunachalam[1]

[1]Department of Agricultural Extension and Rural Sociology, Tamil Nadu Agricultural University, Coimbatore-3, India.

Authors' contributions

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

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ABSTRACT

The study focused on the documentation and rationalization of Indigenous Technical Knowledge (ITK) practices pertinent to tea in Nilgiris district of Tamil Nadu. An attempt was made to study the awareness and adoption level of the rationalized ITKs among tea growing hilly tribes. The study was conducted in two phases including documentation and rationalization and field survey. The ITK practices were documented from the tea growing from the elderly tribal farmers of Nilgiris district. They were rationalized based on the experience of 32 scientists from TNAU and KVKs of Tamil Nadu. Among the 34 total documented ITKs 26 were found to be rational. These rational ITKs were tested for the awareness and adoption level among the tea growing hilly tribes of the Konavakorai village of Kotagiri of block, Nilgiris district. The respondents were selected using simple random sampling technique and the majority of them were found to possess with medium to high level of awareness and adoption level about the ITKs in tea crop.

Keywords: Indigenous technical knowledge (ITK); tribes; tea; documentation; rationality; awareness; adoption; Nilgiris; Tamil Nadu.

**Corresponding author: E-mail: nisharaghavan19@gmail.com;*

1. INTRODUCTION

Traditional ecological knowledge is vital for the sustainability of natural resources and agroecosystems. It comprises of a component of local knowledge of species, environmental phenomenon, beliefs and practice in the way people carry out activities related to resource use within the ecosystems. Interest in traditional ecological knowledge has been growing in recent years, particularly due to recognition that such knowledge can potentially contribute to biodiversity conservation, maintenance of sustainable resources and strategies. Warren [6] defined indigenous knowledge as local knowledge, a knowledge that is unique to a given culture or society. This knowledge is the information base for the society, which facilities communication and decision making. Indigenous knowledge is passed down from generation to generation by word of mouth.

Traditional knowledge and practices have their own importance as they have stood the test of time and have proved to be efficacious to the local people and forms the basis for their link with nature, and the varied levels refinement depend on the level at which the society finds itself in the social evolutionary basis.

Tribal people have a long traditional wisdom of preserving plant species and maintaining agro-ecosystems. However, there is an immediate need for preservation and documentation of traditional practices and learn from the available local wisdom. The importance of agro-biodiversity must be recognized as the distinct national issue of prime concern within the broader area of biodiversity. An environmental conservation practice is a comprehensive agricultural production system. The practices support the sustainable agricultural production and biodiversity conservation. These eco-friendly practices comprise of organic, mechanical, physical and cultural practices of agriculture. Environment conservation practices improve the soil health, pest and disease management.

While framing National laws and constitutional law, Tribal customs and conventions must be included into the part of the laws as the tribes are more integrating with nature for their livelihood strategies. Some of the world countries have legal and statutory provisions for preserving the tribal rights. The environmental acts are though cautiously framed, there are some practical complexities arise during execution. Sometimes, the forest laws framed by the government are against the forest dwellers and the tribes. As they numerically very small their antagonisms over these acts will not be strongly echoed. As the tribes are not only the destroyer of the nature but also protector of the nature and good conductor of classical customs and conventions inherited from the past and generation to generation.

Selvarani [5] found that the tribal farmers expressed the medium level of adoption of ITKs viz., varietal selection, recommended season, pest and diseases, and seed rate were the practices. She also stated that ITKs like the application of FYM, growth regulator, and micronutrient were found with low level of adoption among the tribal farmers. Such thorough understanding of such knowledge would help in developing a knowledge base and providing them a crystallized knowledge with a blend of modern science.

In Tamil Nadu, the Nilgiris district is a hilly ecosystem enriched with luxuriant natural vegetation and hence it attracts lakhs and lakhs of tourists all over India and world every year. This district apart from having rich natural vegetation, it gives cover for various wild animals. Recent studies based on Nilgiris biosphere reveals that the natural resource potential of Nilgiris is degrading presently in an alarming way more than the past. On the other hand the tribal communities, the native tribes are constantly adopting their every socio cultural practices in line with preserving the natural resource potential. Several studies as reported earlier also confirm that the native tribes of Nilgiris are following a good fund of indigenous practices suited to their system. A thorough understanding of such knowledge would help in developing a knowledge base and providing them a crystallized knowledge with a blend of modern science.With this background, the present study was designed with the following two major objectives.

- To document the ITKs pertinent to tea cultivation in the tribal ecosystem.
- To analyse the extent of awareness and pattern of adoption of the rational technologies by the tribals.

2. METHODOLOGY

2.1 Selection of Study Area and Respondents

Tamil Nadu is one of the major states of the southern zone in India which has prominent tribal

groups. In accordance with the objectives of the study, the Nilgiris district of Tamil Nadu was purposively selected considering the following reasons. It is one of the districts in Tamil Nadu where the percentage of the tribal population is higher and the native tribes are constantly adopting their every socio-cultural practices in line with preserving the natural resource potential.

Lakshmana [3] several studies also confirm that the native tribes of Nilgiris are following a good fund of indigenous practices suited to their system. Among various crops cultivated, Tea is the major crops in the Nilgiris tribal ecosystem which decides their socio-economic life and hence tea crop was selected for the study purpose. Kotagiri block of Nilgiris district was selected for the study purpose based on the maximum area under the tea crop. On the same criteria the village konavakorai was selected.

The study is focused to document and analyse the awareness and adoption of the rational ITKs pertinent to the crop production system of tea. It has been decided to select 60 tea growing hilly tribes as the sample respondents for the study. The respondents were selected by employing a simple random sampling technique.

2.2 Documentation of Tribal Wisdom in Tea Crop

Alarmelu [1] stated that the information developed by farmers over a period of time was passed on from generation by oral words of mouth. This knowledge is definitely called as indigenous technical knowledge (ITK). This forms the base for a society and unique to a culture or that society. ITK facilitates communication and decision making. This knowledge changes through indigenous creativity and contact with other intelligent systems.

In consultation with the elderly tribes and chieftains of the settlement ITK relating to farming enterprise and environmental conservation were identified from the study area. The tribal farmers in the villages were asked to explain the ITKs possessed by them in the cultivation of tea crop from preparatory cultivation to storage and processing. The tribal farmers were motivated to share and express all the ITK possessed by them. The ITK practices expressed by them were recorded in sequence and in proper form from preparatory cultivation to storage. Besides elaborate discussions were also made with the extension functionaries of the study area to collect and document the ITKs. Thus, a total of 34 ITKs were collected for the study.

2.3 Rationality of the Documented Tribal Wisdom

It is essential to analyze the rationality of the selected ITK practices as it has been proposed to study the adoption and impact of those practices as perceived by the farmers for the study. In this study, ‘rationality’ refers to the degree to which the indigenous traditional knowledge practices can be explained or supported with scientific reasons or established based on long time experience. Likewise, ‘irrationality' refers to the degree to which indigenous traditional knowledge practices cannot be explained or supported by scientific reasons or cannot be established based on long time experience. Kalaivani [2] differentiated that rational belief is a belief which can be explained by empirical evidence whereas irrational beliefs lack the empirical evidence.

For the present study, the list of ITKs was classified into two major categories viz., crop production and crop protection and with this classification, a questionnaire was prepared for checking the rationality of the ITKs documented under tea crop. The questionnaire was sent to different crop production, crop protection scientists of Tamil Nadu Agricultural University, Krishi Vigyan Kendras and other state agricultural universities.

Finally, 32 responses were received from the scientists Mean scores were calculated for each of the indigenous traditional knowledge practices and those practices, which were having a mean score of 2.5 and above were identified as rational and those below 2.5 were identified as irrational and thus finally there were 26 rational technologies identified to assess the awareness and adoption pertinent to tea.

2.4 Assessment of Awareness and Adoption of Rational ITKs in Tea Crop

Their awareness was assessed with a structured interview schedule with the responses as ‘aware’ and ‘unaware’ with scores of 2 and 1 respectively. The adoption was assessed with the responses such as ‘adopted’ and ‘not adopted’ with scores of 2 and 1 respectively. The scores for all the items were summed up for each respondent against awareness and adoption

individually. Further, the index was worked out separately for awareness and adoption by using the following formula.

$$\text{Awareness index} = \frac{\text{Total awareness score obtained by a respondent}}{\text{Possible maximum score}} \times 100$$

$$\text{Adoption index} = \frac{\text{Total adoption score obtained by a respondent}}{\text{Possible maximum score}} \times 100$$

Finally, the respondents were classified into low, medium and high based on the index value using cumulative frequency method. item wise percentage analysis was also done for meaningful interpretation of the results.

3. FINDINGS AND DISCUSSION

3.1 Awareness and Adoption of the Rationalized ITKs by the Tribes Cultivating Tea

Totally there were 26 ITKs rationalized in tea crops. These ITKs were further classified into seven categories for easy interpretation of the results. The findings are given in Table 1.

Table 1. Awareness and adoption of the rationalized ITKs among the tea growing tribes (n=60)

S.No	Rational technologies	Awareness		Adoption	
		No	%	No	%
I	**Field preparation and soil management**				
1	Stone wall construction to a height of 2' across the slope before establishing Tea plantation.	45	75.00	27	45.00
2	Growing tea at higher elevation.	50	83.33	60	100.00
3	Raising 'Etham' grass in bunds across the slope	47	78.33	32	53.33
II	**Seeds and sowing**				
1	Tea seedlings raised from seed require less water or irrigation during the initial stage of establishment.	37	61.67	22	36.67
2	Direct planting of younger seedlings raised from seeds having the age of less than six months without making any cut at stem.	33	55.00	21	35.00
3	Collection of the matured and dried reddish colour seeds in the tea plants	32	53.33	24	40.00
4	Tea plantations raised using seedlings from seeds	38	63.33	34	56.67
5	Tea seedlings raised from cuttings require more water during the initial stage of establishment.	42	70.00	39	65.00
III	**Transplanting**				
1	Transplanting of the tea seedlings in 1x1x1 pit and filling the pit with the top soil at bottom and bottom soil at the top.	41	68.33	21	35.00
2	Transplanting of seedlings with better root growth.	32	53.33	24	40.00
3	Transplanting of the Tea seedlings in the polythene bags to the field after peeling the bottom of the bags only.	38	63.33	26	43.33
4	Placing the seeds above one layer of sand, covering with one layer of sand and water spraying for three weeks	39	65.00	21	35.00
IV	**Intercultural operations**				
1	Cleaning of bushes, weeds and trees in the field, drying for a month, burning the dried clearings and spreading the ash collected over the entire field before establishing Tea plantation.	45	75.00	18	30.00
2	Covering the Tea plants by ferns during winter	31	51.67	26	43.33
3	The interval of pruning increases crop growth	37	61.67	34	56.67
4	Pruning when the tea plants have well established roots and	44	73.33	33	55.00

S.No	Rational technologies	Awareness		Adoption	
		No	%	No	%
	more number of branches.				
5	Heavy pruning once in 7 years for the plants raised from seeds.	34	56.67	28	46.67
6	Heavy pruning once in 5 years for the plants raised from cuttings and maintaining 18-22" height of the Tea plants.	39	65.00	31	51.67
7	Presence of Thavi plants in the field indicates higher moisture level in soil	39	65.00	28	46.67
V	**Manures and manuring**				
1	Placing the sprouted seeds in pockets or trench/pit having sand, soil and cow dung mixture in 1:1 ratio and keeping for one year. The sprouted seeds are placed in such a way, the sprouting leaf is at bottom and the remains of seed is in the upper side.	43	71.67	36	60.00
2	Application of cow dung and lime powder after 2-3 months of planting of Tea seedlings	42	70.00	21	35.00
VI	**Cropping system**				
1	Intercropping of Coffee variety "Cauvery" with tea plantation.	33	55.00	22	36.67
2	Raising Silver Oak (Grevillea robusta) tree for tea Plantations at higher elevations.	40	66.67	29	48.33
VII	**Harvest and post-harvest technologies**				
1	Cultivation of tea crop fetches frequently	33	55.00	18	30.00
2	Keeping the plucked leaves in the loose jute bags containing more holes.	31	51.67	19	31.67
3	Non-application of fertilizers and manures frequently	32	53.33	27	45.00

3.1.1 Field preparation and soil management

There were three rationalized ITKs under field preparation and soil management. Most of the respondents (83.33%) were very much aware about growing tea at higher elevation helps to get a more yield and good quality tea. A vast majority of the respondents (78.33%) were very much aware about growing of 'Etham' grass in bunds across the slope in order to arrest the soil erosion in tea plantations. Almost a similar percentage of the respondents (75.00%) reported that they were aware about raising of stone wall to a height of 2'across the slope before establishing the tea plantations helps to save the crops from damages by the animals.

It is an appreciable fact that good majority of the respondents were very much aware of all the listed out rationalized technologies.

With regard to the adoption of rationalized technologies little, more than fifty percent of the respondents (53.33%) have raised 'Etham' grass in bunds across the slope and 45.00 percentage of the respondents have constructed 2' height stone wall across the slope before establishing the tea plantations. All the respondents have grown the tea crop in higher elevations even though their awareness level was little lower than the adoption level. The respondents are cultivating the tea crop at a higher altitude without even having awareness that the tea crop grows well in higher altitude and hence their awareness level is comparatively little lower than the adoption of this particular technology.

Even though the respondents have higher level of awareness about raising 'Etham' grass and construction of stone wall across the slope only around the half of the respondents have adopted these technologies.

3.1.2 Seeds and sowing

There are five rationalized technologies under seeds and sowing. A vast majority of the respondents (70.00%) were very much aware of the benefits of the tea seedlings raised from cuttings required more water during the initial stage of establishment and further such a technology helps to boost crop growth and further development. Majority of the respondents were aware of the tea plantations raised using seedlings from seeds (63.33%) and further they were aware that such a seedlings raised from seeds require less water during initial stage of establishment (61.67%). Little more than half of the respondents were aware of the practice of direct planting of less than six month old younger

seedlings will help to increase the crop growth (55.00%) and also the use of matured and dried red coloured seeds for raising seedlings (53.33%).

From the above findings it could be inferred that a majority of the respondents were very well aware of all the listed out ITKs pertinent to the seeds and sowing.

As regard the adoption of technologies, majority of the respondents raised their own tea establishments using the seedlings prepared out of the cuttings (65.00%). The seedlings raised from seeds were used by around a sixty percent of the respondents (56.67%) followed by fourty percent of the respondents used well matured and dried red colour seeds for raising the seedlings. Only around one third of the respondents raised their tea establishment using the seedlings developed from the seeds with the intention to conserve the irrigation of water (36.67%) and directly planted less than six months old younger seedlings raised from seeds (35.00%).

It could be concluded from the above findings that majority of the respondents have raised their tea establishments using the stem cuttings. The seedlings raised from the seeds were used by a majority of them in order to save the crop from the adverse conditions like drought, heavy rain and frost. Few respondents have adopted the seed based seedlings for water conservation purpose.

3.1.3 Transplanting

The findings revealed that a good majority of the respondents were very much aware of transplanting of the tea seedlings in 1x1x1 sized pits filled with top soil at the bottom and bottom soil at the top (68.33%), followed by raising the seeds in between two layers of sand and spraying water for three weeks (65.00%).

About sixty percent of the respondents (63.33%) were well aware of transplanting the tea seedlings by planting the seeds raised in polythene bag after removing the bottom layer of the bag which helps in soil, water and nutrient conservation. About half of the respondents (53.33%) were aware of transplanting seedlings with better root growth.

From the above findings it could be concluded that a good percentage of respondents were aware about all the list out ITKs related to transplanting.

The findings reveals that even though their awareness level on above technologies is good, the respondent was lagging far behind in adopting the same. Only around fourty percent of the respondents have adopted the above rationalized technologies even though they have their own merits in better crop establishment.

3.1.4 Intercultural operations

A vast majority of the respondents (75.00%) were well aware about the merits of cleaning the bushes, weeds in the field and drying the field for a month and subsequently burning the dried clearings and spread the ash generated over the entire field. Almost a similar percentage of the respondents (73.33%) were aware about the practice of pruning when the tea plants have developed profused roots and more number of branches. Sixty five percentage of the respondents were aware about the practice of heavy pruning once in five years from the plants raised from the cuttings and maintaining a height of 18-22” (inches) in order to increase the crop yield. Almost the same percentage of the respondents (65.00%) were aware that the presence of thavi plant indicates higher soil moisture level. About three fourth of the respondents (61.67%) were aware about the correct interval of pruning of the crop to generate more leafy growth. Little more than fifty percent of the respondents were aware of the practice of heavy pruning once in seven years for the plants raised from the seeds (56.67%) in order to increase the leafy growth and to get more economic returns.

About half of the respondents (51.67%) knew the technique of covering the tea plants with ferns during winter to prevent the frost damage.

From the above findings, it could be concluded majority of the respondents were very much aware of all the listed out ITKs related to intercultural operations.

As regard the adoptions of above ITKs, more than fifty percent of the respondents have given appropriate pruning intervals, pruning the tea plants only when the crop established profused roots and more number of branches, heavy pruning once in five years for cuttings based tea crop and seven years for the plants raised from the seeds. Nearly half of the respondents

(46.67%) were found adopting irrigation management practices based on the presence of 'thavi' plant in the field. The presence of 'thavi' plants indicates the sufficient soil moisture level in the field The practice of covering the tea plant by fern during winter was adopted by little more than two fifth of the respondents (43.33%). Only thirty percent of the respondents have adopted the practice of clearing the bushes, burning them and spreading their ash over their field.

3.1.5 Manures and manuring

There is an interesting practice being followed in the tribal ecosystem of placing the sprouted seeds in a packet containing soil and cow dung mixture in 1:1 ratio for about one year in such a way the sprouted leafy portion faces the bottom and remains of the seed faces the upper soil. This technique was well aware by 71.67 percent of the respondents. The practice of application of cow dung and lime powder after 2 to 3 months of planting was aware by seventy percent of the respondents.

As regard their adoption, the practice of placing the seeds in 1:1 ratio of cow dung + sand mixture was well adopted by sixty percentage of the respondents but cow dung and lime powder application was adopted by about one third of the respondents (35.00%).

3.1.6 Cropping system

At higher elevation, the tea growing tribes raised 'Silver Oak' for providing shade for the tea crops. About seventy percent of the respondents (66.67%) were aware of this practice. Further, fifty five percent of the respondents were also aware of the practicing the intercrop coffee (Cauvery) with tea plantations.

Little less than fifty percent of the respondents have raised the 'Silver Oak' in the tea plantations but the intercropping with the coffe (Cauvery) was adopted by only around one third of the respondents (36.67%).

3.1.7 Harvest and post harvest technologies

Little more than half of the respondents were well aware of the cultivation of tea crop 'fetches' (55.00%), followed by the application of fertilizers and manures frequently (53.33%) and keeping the plucked leaves in the loosely knitted jute bags containing more openings (51.67%).

With regard to their adoption, fourty five percent of the respondents have not applied the fertilizers and manures frequently. Only around thirty percent of the respondents have gone for cultivation of tea crop 'fetches' and kept their plucked leaves in the loosely knitted jute bags.

An overall analysis of the above findings revealed that the good majority of the respondents were aware about almost all the rationalized technologies but their adoption was not appreciable hence the authorities concerned that should take initiatives to promote such standard technologies among the tribal ecosystem.

3.2 Overall Awareness and Adoption of the Rational Technologies in Tea

The findings pertinent to overall awareness and adoption are given in Figs. 1 and 2 respectively.

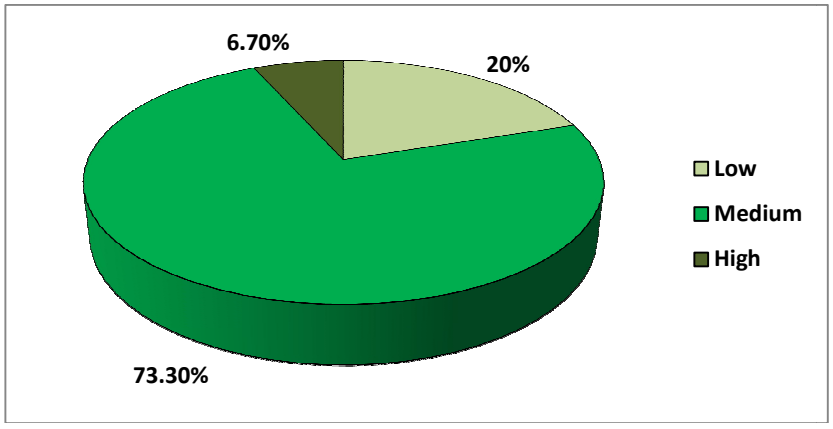

Fig. 1. Overall awareness about the rational technologies in tea (n=60)

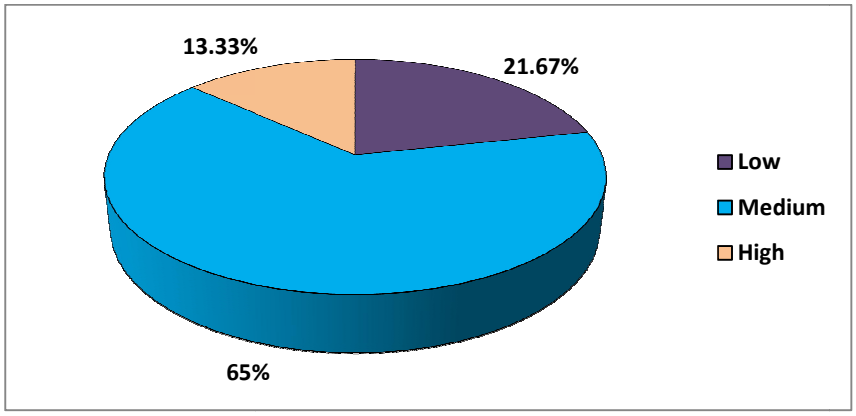

Fig. 2. Overall adoption of the rational technologies in tea (n=60)

An analysis of the findings are given in Fig. 1 reveals that a vast majority of the respondents (73.30%) were seen with medium level of awareness followed by low (20.00%) and high (6.70%) levels. Hence it could be understood that most of the respondents were found distributed between medium to low level of awareness about technologies.

This findings are in accordance with the findings of [4] Marimuthu.

With regard to their overall adoption of rationalized technologies, the findings in the Fig. 2 shows that sixty five percentage of the respondents were seen in the medium level, followed by low (21.67%) and high (13.33%) levels.

This findings is in accordance with the findings of [7] Venkatesan.

Hence, it could be concluded that most of the respondents were found distributed between medium to low level of adoption.

4. CONCLUSION

Based on the judges opinion received from the subject matter specialists it could be observed that a vast majority of the ITKS followed by the tea growing tribes of the Nilgiris district were rational. Majority of the respondents had a medium to high level of awareness regarding the ITK practices prevailing in their agricultural system. Similarly, medium level of adoption was observed with respect to the rationalised ITK practices in tea cultivation.

This medium level of adoption was possibly due to their level of conservatism and fatalism held among the tribal system. However, significant percentage of the non- adoption could be due to the reasons such as the results acquired from inorganic and scientific technologies were very much fast, observable, and measurable. Whereas, observability of the results due to ITK application is time consuming. The adoption of the ITK practices involves laborious process and resource consuming. Hence the adoption level was found to be low in comparison with the awareness less of the tribal tea growers. Based on the results of the study the following implications were suggested.

Every ITK followed by the tribes were backed with scientific support, hence, efforts should be made to preach the scientific benefits to the tribes to increase the level of adoption. Common infrastructures and common interest groups could be developed to overcome the resource constraints of the tribal farmers in ITK adoption. Promotional activites like exhibitions, farmers day, field days could be employed focusing the ITK technologies. The grass root level extension workers should be empowered with principle knowledge regarding the local ITKs.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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