Rationality and adoption of indigenous cultivation practices of Finger millet *(Eleusinecoracana*(L.)Gaertn.**) by the tribal farmers of Tamil Nadu**

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Abstract
Finger Millet (Eleusinecoracana(L.)Gaertn.)has been cultivated in India from as far back as 4000 years ago. The tribal people of Kolli hills of Namakkal district in Tamil Nadu, Malayalis, possess rich tradition, heritage and experience in Finger millet cultivation. This paper discusses about the practice wise rationality and adoption of Indigenous Agricultural Practices (ITAPs) on Finger millet cultivation by tribal farmers.
About 32 ITAPs on Finger millet were collected from 140 aged farmers from selected seven cluster villages based on the geographic area. After deleting the cluster specific practices, 16 ITAPs were selected for further study. Two closed ended questionnaires were prepared, one for assessing the rationality of crop production aspects (15 ITAPs)and another one on crop protection aspects (1 ITAPs)of Finger milletand were referred to the 50 scientists respectively, by rating them on a four point continuum scale. ITAPs with their rationality scores was undertaken for further analysis to test verify their extent of adoption with 210 tribal farmers.
Out of 16 ITAPs in Finger millet, 15 ITAPs were rational and one ITAP was found to be irrational as rated by the scientists. Overall extent of adoption of ITAPs was found to be more than 50 per cent, as they were practiced for quite long time.
The rational ITAPs should be blended into the technology package for transfer of technology in other region with same agro eco system, so that the agricultural development will be sustainable.

Keywords: Adoption, Finger millet, Indigenous Tribal Agricultural Practices, Rationality, Tribal farmers.

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Introduction

Minor millets are small-seeded crops grown for food and fodder. With up to three times more calcium than rice, high amounts of iron, fibre and other micronutrients, millets are far more nutritious than rice and wheat. The important millets cultivated inKolli hills include Finger millet, Little millet, Foxtail millet, Barnyard millet, Proso millet and Kodo millet, which have been cultivated and conserved because of their grain characteristics productivity, adaptability and significance and use in cultural dishes.

Tamil Nadu State in India is a treasure land of indigenous tribal technical knowledge in agriculture and allied activities. The *Malayali* tribal groups in Tamil Nadu, mostly found in Kolli Hills, have rich cultural and agricultural heritage which is situated in the Namakkal district of Tamil Nadu, South India. The tribal farmers in Kolli Hills are more traditional in nature having faith in the practices of the local communities. They managed their livelihood through agriculture and maintained a traditional life style through their indigenous knowledge system.

Moreover Finger millet*(Eleusinecoracana*(L.) Gaertn.)is a significant crop in Kolli hills. They follow many indigenous practices in the cultivation of Finger millet with the knowledge acquired over years of association with these resources is on the brink of total disappearance. This had made the tribal to depend on the indigenous technologies/practices existing in their location and known to them from their ancestors.

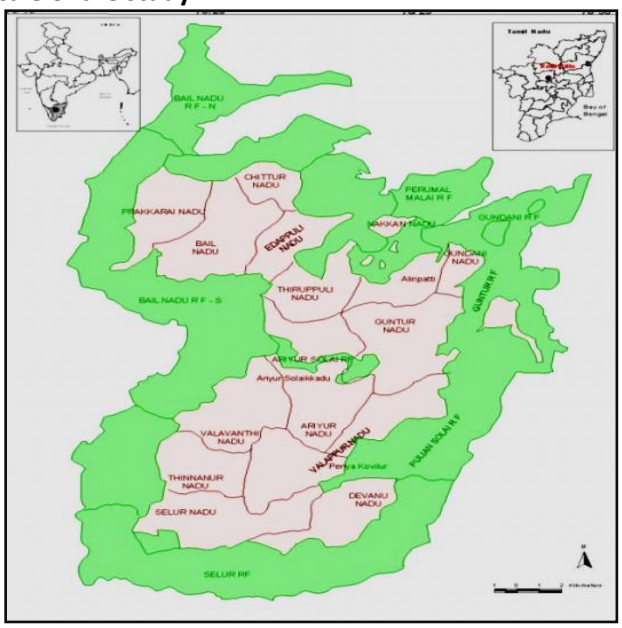
The on-going practice of using such knowledge by ethnic communities established the belief that traditional knowledge used was fruitful for the people. Keeping this in view, a study on the rationality and adoption of Indigenous Tribal Agricultural Practices (ITAPs) on Finger milletcultivation was carried out.

This paper discusses about the practices wise rationality and adoption of indigenous practices on Finger millet cultivation by tribal farmers in Kolli hills of Tamil Nadu.

Materials and methods

Kolli Hills is situated in the Namakkal district of Tamil Nadu, South India (78^0 17' 05" E to 78^0 27'45" E and 11^0 55' 05" N to 11^0 21'10" N) are a low ranging hills of Eastern Ghats spread over an area of 441 sq.km. Kolli Hill has an area of 282. 92 sq.km. It stretches 29 kms from north to south and 19 km from east to west. The Mean annual temperature ranges from 14°C to 28°C.The area receives an average of 1440 mm of annual rainfall distributed fairly over the two seasons. The elevation ranges between 1000 and 1350 meters MSL. The soils are deep to very deep, non- calcareous and developed from weathered genesis.

Fig.1 Locale of the study



Each village of the settlement is called 'oor'. A group of ten to fifteen 'oor' constitutes a 'nadu', clusters of villages. For this study, seven clusters of villages were selected from the total 14 clusters of villages (Nadu), in Kolli hills of Namakkal district. Seven cluster villages *viz*., *Ariyur Nadu, Bail Nadu, Gudini Nadu, Gundur Nadu, Selur Nadu, Thinnanur Nadu and Valappur Nadu* were selected based on the geographical

area covered in agriculture under the farming systems. In each of the selected villages, 20 aged and experienced farmers were contacted through informal interview method for collecting indigenous practices associated with Finger millet cultivated there. Thus, a total of 140 farmers were contacted based on the geographic area. ITAPs were also collected from secondary sources *viz*., M.S.Swaminathan Research Foundation, State Department of Agriculture and previous studies, apart from the above mentioned farmers. Thus, a total of 32 ITAPs on Finger millet were collected.The collected ITAPs on Finger millet were then classified systematically based on the two cropping systems and twelve technological dimensions.

In the second phase after deleting cluster specific practices, 16 ITAPs of Finger millets were selected for further study. Two closed ended questionnaires were prepared, one for assessing the rationality of crop production aspects (15 ITAPs)and another one on crop protection aspects (1 ITAPs)of Finger milletand were referred to the 50 scientists in each of the respective disciplines. Forty threeAgronomists and forty one crop protection scientists responded by rating them on a four point continuum ranging from 4 to 1.

Rational means explainable with scientific reasons or established facts, based on long time experience; irrational means something/practice that cannot be scientifically explained or supported with long time experience (Sastikannan, 2002). Testing the rationality of the indigenous knowledge items is essential, as it has been envisaged to test the adoption of such knowledge by the farmers. In this study, rationality refers to the degree to which ITAPs can be explained or supported with scientific reasons, or established based on long time experience. Similarly, irrationality refers to the degree to which ITAPs cannot be explained or supported with scientific reasons, or cannot be established based on long time experience.

The rationality of indigenous technologies was assessed by using the scoring procedure adopted by Sakeer Husain (2010) as presented below in Table.1.

Table.1. Scoring procedure to assess the rationality of indigenous practices

Sl.No.	Responses	Scores
1.	Rational based on scientific evidence	4
2.	Rational based on experience	3
3.	Irrational based on experience	2
4.	Irrational based on scientific evidence	1

To find out the rationality of a ITAPs, the total score given by all the scientists to individual ITAP was calculated and based on the mean score, the indigenous technologies were classified into two categories *viz*., rational and irrational. If an ITAP scored, a mean score of 2.5 and above it was considered as a "rational". The ITAPs with a mean score of less than 2.5 were considered as "irrational".

During the third phase, using proportionate random sampling Two hundred and ten Finger millet cultivating farmers were selected based on the area under cultivation and importance of ITAPs on Finger millet available with them.Having identified and selected the list of ITAPs with their rationality scores, a structured interview schedule were prepared and administered to the tribal farmers to test verify their extent of adoption. The selected ITAPs were narrated to Two hundred and ten respondents one by one, each time enquiring whether they had adopted the practice, in the previous years. If the answer was 'Yes', a score of one was assigned and if the answer was 'No', zero score was given. The scores obtained for all the practices were summed up for each respondent and adoption score was arrived at. Then the adoption quotient for each individual was worked out by using the following formula as used by Sundaramari*et al*. (2003).

$$\text{Adoption Quotient} = \frac{\text{Number of Indigenous Tribal Agricultural Practices adopted}}{\text{Number of Indigenous Tribal Agricultural Practices applicable}} \times 100$$

Results

Two hundred and ten numbers of tribal farmers were contacted to assess their extent of adoption of 16 selected ITAPs on Finger millet cultivation. There were 16 ITAPs related to Finger millets cultivation, of which 15 (93.75 %) were rational and 1 (6.25 %) was irrational. The extent of adoption of individual ITAPs along with their rationality have presented in detail in the Table.2.

It could be seen from the Table.2, that 11 ITAPs were (1,2,3,5,7,9,10,11,14,15 and 16) adopted by more than 75 per cent of the farmers, of which 10 ITAPs were rational and one ITAP was (14) irrational.

There were 5 ITAPs (4, 6,8,12 and 13) adopted by 50-75 per cent of the respondents and all of them were rational.

In the crop production aspects about 15 ITAPs were selected, out of which 14 ITAPs were rational and only one ITAP (14) was noticed to be irrational.

Table.2.Rationality and adoption of ITAPs on Finger millet cultivation (n=210)

S.No.	ITAPs on Finger millet cultivation	Rationality score	Adoption	
			No.	%
A.	**Crop production**			
1.	Local landrace of Finger millet namely, *Kara Kevaragu* is grown in the season of June-December. It is resistant to drought, flood, pest and diseases, but susceptible to lodging and seeds have no dormancy period.	2.74 R	168	80.00
2.	Local landrace of Finger millet namely, *KaruMozhiyan* is grown in the season June-November, which is also drought resistant.	3.21 R	196	93.33
3.	Local landrace of Finger millet namely, *Kuruvaia* is grown in the season of June-November. It is shorter in duration, with good taste and tolerant to lodging during rainy season.	2.88 R	168	80.00
4.	Local landrace of Finger millet namely, *Muttakannu* is also shorter in duration, tolerant to pest and diseases with good taste.	3.28 R	154	73.33
5.	Local landrace of Finger millet namely, *Samba kevaragu* is also grown in the seasonJune-November with the character of long duration, susceptible to lodging and less productive.	2.81 R	175	83.33
6.	Local landrace of Finger millet namely, *SuruttaiKevaragu* is grown in the season of June-November with the character of tolerant to pest and diseases. It is also resistant to drought and flood.	3.09 R	147	70.00
7.	Local landrace of Finger millet namely, *VellaMozhiyan* is white in colour grown in the season of June-November with the character of tolerant to pest and diseases. It is also resistant to drought and flood.	2.86 R	161	76.67
8.	Finger millet is grown in clay soil (*Kali maan*)	2.72 R	154	73.33

9.	Finger millet is grown in uplands (*mettukadu*) with low water holding capacity, characterized by sandy soil in terrace cultivation.	3.37 R	196	93.33
10.	Generally Finger millet is grown without any chemical input, with a seed rate of 15 kg/acre encompassing duration of 5 months (June/July to Nov/Dec) or (May/June to Sept/Oct) fetching a yield of 800-100 kg/acre.	2.98 R	196	93.33
11.	Finger millet seeds are treated with cow urine at 1:10 ratio to enhance germination.	3.17 R	161	76.67
12.	In dry land Finger millet and Little millet are grown in crop rotation during the season Dec – Jan.	2.86 R	147	70.00
13.	Sometimes mixed cropping of Finger millet, Mustard, and Field beans in July- Aug is followed by Little millet and Vegetables in Dec- Jan as crop rotation.	3.16 R	147	70.00
14.	When a sample of dried Finger millet grain is chewed, metallic sound indicates its dryness.	2.48 IR	161	76.67
15.	Entire ear head of Finger millet with well-formed grains are selected during the harvest and kept aside as seed material.	3.37 R	182	86.67
B.	**Crop protection**			
16.	Farmers useneem(*Azadirachtaindica*L.) leaves andthumbai*(Leucasaspera*(Willd.)Linn.)leaves for thestorageofgrains.	3.07 R	168	80.00

Discussion

Practice wise rationality and adoption of ITAPs on Finger millet cultivation

Three ITAPs (2, 9 and 10) were adopted by 93.33 per cent of the respondents. With regard to ITAP 2, *Local landrace of Finger millet namely, KaruMozhiyan*was available in the study area in abundance and was suitable for that area. They followed the season wise practices as rendered by their ancestors. ITAP 9,was with higher adoption, since the upland area is suitable for Finger millet cultivation with low water holding capacity. ITAP 10 was adopted ,though the yield is comparatively low as compared to the latest high yielding varieties, the farmers are getting good profit, with lesser cost of cultivation and good CB ratio, and with conducive climatic condition prevailing in that area, hence thereby adoption is more.

ITAP 15, was with 86.67 per cent adoption, which might be due to fact that this practice required less labor involvement and facilitated quick harvest in the rainy season to save the produce.

ITAPs 1, 3, 4, 5, 6 and 7 were with 80, 80, 73.33, 83.33,70, 76.67 percentage of adoption respectively, since these traditional varieties of Finger millet (*Kara Kevaragu, Kuruvaia, Muttakannu, Samba kevaragu, SuruttaiKevaragu, VellaMozhiyan*) were highly adapted to the agro climatic condition of the study area and the tribal farmers also followed seed exchange system for the conservation of these drought resistant varieties.

The adoption percentage of ITAP 11, was found to be 76.67 percent, since the farmers might have perceived that cow urine do have growth regulator action and the uric acid present in cow urine is reported to enhance seed germination.

Though, ITAP 14,was irrational, was adopted by 76.67 percent of respondents because the farmers had experienced the taste and brittleness of dried Finger millet seeds, based on their experience over a period of years and moreover well dried seeds when chewed used to give metallic sound.

ITAP 8, was adopted by 73.33 per cent of the farmer respondents, as Finger millet is suitable for clay soil.

ITAP 12 and ITAP 13 were adopted by 70 per cent each of the tribal farmers, as mixed farming system facilitated in maximum utilization of land with higher profitization. The crop rotation as mentioned in ITAP 12 helped in maintaining the soil fertility, reduced nitrate leaching, reduced weed and pest and disease infestation.

One ITAP (16) on crop protection was rational with 80 per cent adoption by the farmer respondent as the neem based products had always repellent action with anti-feeding property.Thestrongodourkept awaythe storage pests like lesser grain borers (*Rhyzoperthadominica*), saw toothed beetle (*Oryzaephilussurinamensis*) and flat grain beetle (*Cryptolestesminutus*).

The overall practice wise adoption of ITAPs on Finger millet cultivation was high, since all the ITAPs (16) were found adopted by more than 50 per cent of the respondents.

The study of Purusottam*et al.*(2009) and AdikantPradhan*et al.*(2010) support the above finding that adoption of ITAPs on Finger millets cultivation was higher.

Conclusion

It could be concluded that the extent of adoption of ITAPs on Finger millet cultivation was high as all the ITAPs (16) were adopted by more than 50 per cent of the respondents. Indigenous Tribal Agricultural Practices have facilitated the people to farm intensively in a particular area for a long period of time without a significant deterioration of land or decline in crop production. Such stabilizing qualities of traditional agriculture must be supported and complemented by agro-ecological practices that enhance the soil, water and germplasm conservation potential of traditional technologies. That also provides diversification guide lines on how to assemble functional biodiversity.

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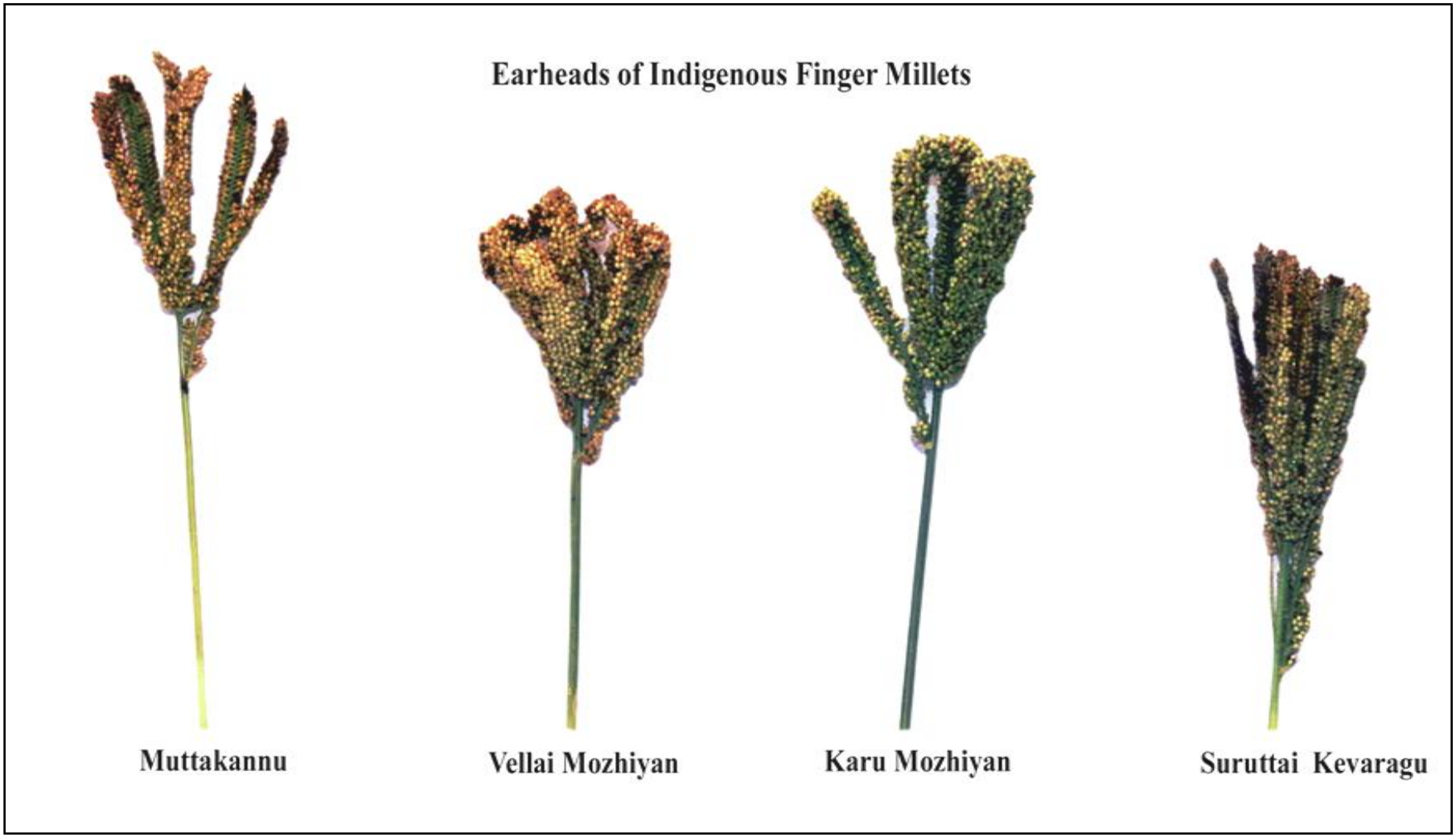
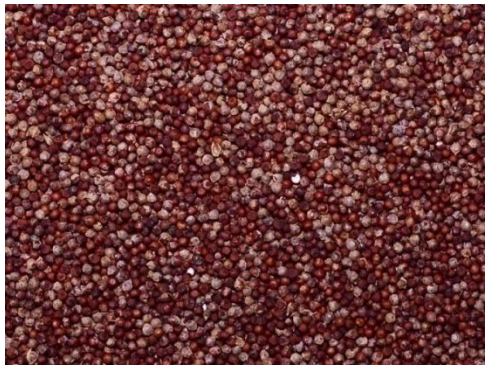
Fig.2. ITAPs on Finger Millet cultivation



Seeds of Indigenous Finger millets

Kara Kevaragu

KaruMozhiyan



Kuruvaia

Mixed cropping with other millets

Harvesting of earheads

Mixed cropping with Field beans