

Scientific Rationality and Adoption of Indigenous Hill Banana Cultivation

P. Venkatesan¹ and M. Sundaramari²

1. Sr. Scientist (Ext. Systems Management), ICAR-National Academy of Agricultural Research Management, Rajendranagar, Hyderabad, 2. Prof. (Agril. Ext.) & Coordinator, Centre for Indigenous Knowledge in Agriculture, Gandhigram Rural Institute, Gandhigram, Dindigul.

Corresponding author e-mail: venkatesan@naarm.ernet.in

ABSTRACT

Indigenous Tribal Horticultural Practices (ITHPs) have facilitated intensive farming for a long period of time without significant deterioration of land or decline in crop production. The tribes of the Kolli hills of Namakkal district in Tamil Nadu possessed rich tradition, heritage and experience in agriculture. Their rich wisdom in ITHPs can effectively be utilized for sustainable agricultural development of tribal areas by appropriately blending the ITHPs with recommended production technological package. Hence, there is an immense need to collect, document, rationalize and refine those ITHPs before they become totally obsolete. In this context a study was done for collecting, classifying, documenting, analyzing the rationality, and studying the adoption of the selected ITHPs in Hill banana. About 26 ITHPs on Hill banana, in different clusters of villages of Kolli hills were documented. For assessing the rationality, the selected ITHPs were divided into two groups. The first group consisted of 22 ITHPs were related to crop production and the second 4 ITHPs were related to plant protection. Having identified and selected the list of ITHPs with their rationality scores, further analysis was undertaken to test verify their extent of adoption. The rational and effective ITHPs should be blended into the technology package for transfer of technology, so that the agricultural development will be sustainable.

Keywords: *Indigenous tribal horticultural practices; Tribal farmers; Rationality; Adoption;*

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, spread over an area of 441 sq.km at the tail end of the Eastern Ghats in the state of Tamil Nadu. The tribes in Kolli Hills were 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. The contribution of indigenous communities to the conservation and sustainable use of biological diversity goes far beyond their role as natural resource managers, their skills and techniques provide valuable information to the global community and a useful model for biodiversity policies. As on-site communities with extensive knowledge of

local environments, indigenous and local communities are most directly involved with conservation and sustainable use, their rigid social structure with lesser social mobility had kept them away from scientific and technological progress.

The on-going practice of using such knowledge by ethnic communities established the belief that traditional knowledge used was fruitful for the people. Hence, studying the Indigenous Tribal Horticultural Practices (ITHPs) of tribes in Kolli Hills will be helpful for proposing an action paradigm for preservation and diffusion of desirable horticultural technologies for the benefit of the tribal farming community. Keeping this in view, a study on scientific rationality and adoption of Indigenous Tribal Horticultural Practices on Hill banana was carried out. This paper discusses about the indigenous Hill banana cultivation practices adopted by tribal farmers in Kolli hills of Tamil Nadu.

METHODOLOGY

Kolli Hills is situated in the Namakkal district of Tamil Nadu, South India (78° 17' 05" E to 78° 27' 45" E and 11° 55' 05" N to 11° 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 14oC to 28oC. 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.

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 Hill banana cultivated there. Thus, a total of 140 farmers were contacted.

Indigenous Tribal Agricultural Practices 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 Indigenous Tribal Horticultural Practices on Hill banana were collected. The collected Indigenous Tribal Horticultural Practices on Hill banana were then classified systematically based on the two cropping systems and eight technological dimensions.

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*). In this study, rationality refers to the degree to which Indigenous Tribal Horticultural Practices can be explained or supported with scientific reasons, or established based on long time experience. Similarly, irrationality refers to the degree to which Indigenous Tribal Horticultural

Practices cannot be explained or supported with scientific reasons, or cannot be established based on long time experience. 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. For assessing the rationality, the selected 26 indigenous practices in Hill banana were bifurcated into two groups. The first group consisted of 22 indigenous practices related to crop production and the second, four indigenous practices related to plant protection. Two separate questionnaires were prepared, one for assessing the rationality of crop production aspects and another one on crop protection aspects of Hill banana and were referred to the 50 scientists in each of the respective disciplines, by rating them on a four point continuum ranging from 4 to 1. The rationality of indigenous technologies was assessed by using the scoring procedure adopted by *Sakeer Husain (2010)*.

To find out the rationality of an Indigenous Tribal Horticultural Practices (ITHPs), the total score given by all the scientists to individual ITHP was calculated and based on the mean score, the indigenous technologies were classified into two categories viz., rational and irrational. If a ITHP scored a mean score of 2.5 and above it was considered as a "rational". The ITHPs with a mean score of less than 2.5 were considered as "irrational". Thirty Hill banana cultivating farmers were selected using proportionate random sampling from the above clusters of villages, proportionate to the area under cultivation of Hill banana

Having identified and selected the list of ITHPs with their rationality scores, further analysis was undertaken to test verify their extent of adoption. The selected ITHPs were narrated to thirty 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 *Sundaramariet al. (2003)*.

$$AQ = \frac{\text{No. of ITH Practices adopted}}{\text{No. of ITH Practices Applicable}} \times 100$$

AQ=Adoption Quotient

ITH=Indigenous Tribal Horticultural Practices

RESULTS AND DISCUSSION

Practice wise rationality and adoption of ITHPs on Hill Banana cultivation : Hill banana cultivation had 26 selected ITHPs. Thirty tribal farmers of Kolli hills were contacted to assess their extent of adoption. The details on the extent of adoption of individual ITHPs along with their rationality have been presented in the Table 1. There are 26 ITHPs related to Hill banana cultivation, of which 24 (92.30 %) were rational and 2 (7.70 %) were irrational. It could be seen from the Table 1 that 24 ITHPs were (1,2,3,4,5,6,7,8,9,10,11,12,13, 14, 15,16,17,18,19,20, 21,24,25 and 26) adopted by more than 75 per cent of the farmers and all the ITHPs were rational. There were two ITHPs (22 and 23) adopted by only 40-50 per cent of the respondents and the same were reported to be irrational.

There were 22 ITHPs in crop production aspects, out of which 21 ITHPs were rational and only one ITHP (22) was noticed to be irrational.

ITHP 14, *Suckers, which are three foot in height and 5-6 kg. in weight are used for banana planting* was adopted by 96.67 per cent of the respondents, because the farmers in this area are growing Hill banana in rainfed condition. In order to suit the unexpected on set of rain, 3 feet sucker which is succulent in nature is planted. Eight ITHPs (2, 5, 7, 8,13,16,17 and 18) were adopted by 93.33 per cent of the respondents.

ITHPs 2, 5 and 7 were adopted by maximum extent of the farmers because as these traditional hill banana varieties (*Poovazhai, Nomaran, Sambalvazhai*) are suitable for this region and cultivation package is being used based on experimentation and standardization done in the past generations.

Local landrace, *Poovazhai* is a hardy variety, which can be grown on a wide range of soil and climatic conditions. It is highly amenable for ratooning. It is grown semi-perennially with one plant crop followed by two ratoons. The plant is tall and robust with a height of 2.5 to 3.0 m and 60-70 cm circumference at the base. The crop duration is 13-14 months. The average bunch weight is 20 kg and it has 10-13 hands with 130-180 fruits / bunch. The bunch is compact. The length of the fruit is 10-13 cm and girth is 9-10 cm. The fruits are medium sized with bottle necked tip. The fruits are acidic sweet in taste with firm flesh. The bunch is medium sized with closely packed fruits and has good keeping

quality. The fruit skin is medium thick. It is susceptible to Sigatoka leaf spot and fairly tolerant to nematodes. It is susceptible to the physiological disorder '*Kottavazhai*', fruits with enlarged ovaries.

Local *Nomaranis* tall statured local race of banana with 2.6 to 3.1 m height and 50-55 cm circumference at the base. The duration of the crop is 11 to 12 months. The average weight of the bunch is 15 kg with 8-9 hands and 100-120 fruits / bunch. The length of the fruit is 15.0 to 16.0 cm and girth is 10 cm. It has thick skin. This variety is susceptible to leaf spot, *Fusarium* wilt and Banana Bunchy Top Virus.

Local landrace of banana, *Sambalvazhai* is grown luxuriantly in medium soils. The plant is tall and robust. The duration of the crop is 14 months. The bunch is cylindrical and average bunch weight is 25 kg and 12 hands with 185 fruits / bunch. The length of the fruit is 12-15 cm and girth is 12 cm. The fruits are slightly ash coated with good keeping quality. The skin of the fruit is thin. Fruits have a long shelf life and suited for long distance transportation. The sweetish pulp is suited for the preparation of value added products. It is susceptible to wilt disease, tolerant to leaf spot and being drought tolerant, it is well suited for drought and salt affected areas.)

ITHP 8, *Hill banana is grown in the system of 'VazhaiyadiVazhai' i.e. every year field is not prepared and new suckers are not planted. After harvesting from mother trees, side suckers are removed leaving only one of them to be allowed to grow as mother tree in the next year. It is repeated every year,* was with higher adoption due to the reduced planting cost and retention of good yielding plants by the side suckers of the existing mother plant.

ITHP 13, *Banana suckers are trimmed and roots are removed from the corms before planting in order to induce fresh roots,* was being practiced with the scientific rationale and based on the previous experience. ITHP 16, *Removed dried leaves are applied as mulch* had higher adoption because the dried leaves cover the top soil and reduces the evaporation rate. ITHP 17, *Earthing-up is done once in two months to provide anchorage* was with higher adoption because the extra soil applied around the pseudo stem, prevents the danger of falling due to heavy wind flow. ITHP 18, *Soil around the banana plant is tilled with spades once in two*

Table 1. Rationality and adoption of ITHPs on Hill banana cultivation (N=30)

ITHPs on Hill banana cultivation	Rationality score	Adoption	
		No.	%
<i>Crop production</i>			
<i>Karuvazhai (Manoranjitham)</i> land race possessing a very good aromatic flavor is cultivated in Kolli hills.	3.68 (R)	25	83.33
Local landrace, <i>Poovazhai</i> is cultivated	3.58 (R)	28	93.33
<i>Nendranis</i> the local banana landrace which is being cultivated in this area.	3.21 (R)	27	90.00
<i>Sevvazhairace</i> of banana is predominant in Kolli hills.	3.63 (R)	26	86.67
Local landrace, <i>Nomaranis</i> cultivated.	3.71 (R)	28	93.33
<i>Monthanrace</i> of banana cultivated in Kolli hills.	3.66 (R)	26	86.67
Local landrace of banana, <i>Sambalvazhai</i> is grown luxuriantly in medium soils.	3.76 (R)	28	93.33
Hill banana is grown in the system of ' <i>VazhaiyadiVazhai</i> ' i.e. every year field is not prepared and new suckers are not planted.	3.50 (R)	28	93.33
The best season for planting banana is the Tamil Month ' <i>Aadi</i> ' (July-August).	3.05 (R)	27	90.00
Bananas are intercropped with tapioca and pepper.	2.89 (R)	26	86.67
Hill banana is grown as an intercrop in coffee or orange plantations.	3.76 (R)	27	90.00
On sloppy lands, hill banana is grown on terraces	3.24 (R)	26	86.67
Banana suckers are trimmed and roots are removed from the corms before planting in order to induce fresh roots.	3.50 (R)	28	93.33
Suckers, which are three foot in height and 5-6 kg. in weight are used for banana planting.	3.47 (R)	29	96.67
To improve the soil fertility in the banana fields.	2.84 (R)	27	90.00
Removed dried leaves are applied as mulch.	2.71 (R)	28	93.33
Earthing-up is done once in two months to provide anchorage.	3.26 (R)	28	93.33
Soil around the banana plant is tilled with spades once in two months.	3.11 (R)	28	93.33
Side suckers are uprooted (De-suckering) at monthly interval with long iron rods.	3.39 (R)	25	83.33
For fresh planting dried leaves, twigs, trashes etc. are burnt over the field to prepare it well.	3.18 (R)	26	86.67
For quick ripening and for festive occasions, bunches are stacked in bigger earthen pots in to which fuming incense sticks are kept and mouth is covered with clothes.	3.05 (R)	25	83.33
Neem leaves serve to ripen the fruits of Hill Bananas. The fruits to be ripened are kept in dark room and kept covered by neem leaves. This hastens the process of ripening.	2.45 (IR)	13	43.33
<i>Crop protection</i>			
Banana suckers are immersed for a while in 1 lit. of neem oil dissolved in 100 lit. of water before planting in order to prevent rhizome rot.	2.24 (IR)	14	46.67
Applying neem cake @ 140g./sucker in 3rd and 5th months to increase the yield without any soil borne diseases.	3.26 (R)	27	90.00
Dried, drooping leaves are removed once in three months to avoid shade effect which may produce black spots on fruits and to reduce wind damage thereby preventing lodging.	3.27 (R)	26	86.67
To control banana wilt, affected plants are removed and burnt and 1 -2 kg of lime is applied in each pit.	3.56 (R)	25	83.33

months, had good adoption percentage, since this practice facilitates in loosening the soil, increases the water percolation and improves the capillary action of water into the soil.

ITHP 3 (Local *Nendran*) and Two ITHPs i.e., ITHP 4 (*Sevvazhairace*) and ITHP 6 (*Monthanrace*) were adopted by 90 and 86.67 percent of the tribal

farmers respectively, as these varieties might have well adopted to their hilly area.

Nendranis the local banana landrace with duration of is 10-11 months. The average bunch weight is 10 kg with 4-5 hands. They are loosely packed with 40-50 fruits / bunch. Fruits are larger and plumpy with long pedicel. The length of the fruit is 20-25 cm and width is

15-16 cm. The pulp is orange in colour and remains starchy even after ripening. It is highly susceptible to nematodes, leaf spot diseases and borers (Rhizome borer and Pseudostem weevil). The widespread prevalence of Banana Bract Mosaic Virus in Nendran plantations has brought down the yield levels drastically. Nendran is also susceptible to 'Neervazhai', a physiological disorder with improper development of hands.

Sevvazhairace of banana in Kollihills, is tall and robust statured with 2.5-3.5 m height and 70-80 cm girth. The colour of the pseudostem, petiole, mid rib and fruit skin is purplish red. Crop duration of this variety is 16-18 months. The bunch weight is 20-25 kg with 6-7 hands and 80 fruits / bunch. The length of the fruit is 16-18 cm and girth is 15-16 cm. Fruits are sweet and pulp is orange yellow in colour with a pleasant aroma. The fruit skin is thick. It is popularly grown in perennial plantations and becomes vulnerable for the attack by *Fusarium* wilt, weevils, borer, nematodes apart from viruses like Banana Bunchy Top Mosaic Virus and Banana Bract Mosaic Virus.

Monthanrace of banana cultivated in Kollihills, is fairly tall and robust plant. The duration of the crop is 12 months. The average bunch weight is 20 kg and 4-6 hands with 50 fruits / bunch. The length of the fruit is 18-20 cm and girth is 18-20 cm. Fruits are large, plumpy and green in colour. The skin is thick. The plant is hardy and tolerant to drought. It is highly susceptible for marginal lands and it is highly susceptible to *Fusarium* wilt.)

Two ITHPs (9 and 15) were with 90 percentage of adoption. The ITHP 9, *The best season for planting banana is the Tamil Month 'Aadi' (July-August)* was with higher percent of adoption, since the planting being carried out before the onset of monsoon which helps in better establishment of the crop. The ITHP 15, *To improve the soil fertility in the banana fields, a practice of mulching of crop residues is in use. Crop residues are placed between rows in the banana field, at an early stage. These residues act as green leaf manures and increase soil fertility* had maximum percentage of adoption as the fact that green leaf manure improves the soil fertility has been well proven.

The adoption was noticed to be 90 per cent for ITHP 11, *Hill banana is grown as an intercrop in coffee or orange plantations* and 86.67 per cent for ITHP 10, *Bananas are intercropped with tapioca and pepper*, as the farmers might have wanted to utilize

the whole land area to fetch maximum CB ratio.

ITHP12, *On sloppy lands, hill banana is grown on terraces i.e. on stone wall structures built across the slope* and ITHP20, *For fresh planting dried leaves, twigs, trashes etc. are burnt over the field to prepare it well* were adopted by 86.67 per cent of the respondents each. ITHP 12 was being used in this study area, as the total landscape, is undulated and this practiced suited to their area. ITHP 20 was practiced as the ash helps in nutrient recycling and eradicating action towards pests and disease causing organisms.

ITHP 1, ITHP 19 and ITHP 21 were adopted by 83.33 per cent of the respondents.

The ITHP 1, *Cultivation of Karuvazhai (Manoranjitham)*, was practiced by 83.33 per cent of the farmer respondents, because, it is considered as the asset of Kolli hills and it was cultivated as a deity for their land. (Varietal Character: *Karuvazhai (Manoranjitham)* land race possess a very good aromatic flavour. Plant is very robust when growing at higher attitude and the fruits and also bigger in size. Pseudostem is green with dark black blotches; this extends up to the petiolar bases. Leaves dark green and the laminar base are asymmetric with one side pointed and other one is slightly rounded. Petiole canal is opened with pink lined margins. Peduncle is short, green and hairy nature. Bunch has 5-8 hands of fruits and slightly angular in position. Male bud is dark purple in colour and the bracts are ended with pointed tip. Male flowers are whitish to yellowish in colour. Bract scars are very predominant. Fruits are dark green; change into green yellow or yellow upon ripened and gives very pleasant aromatic odour. Fruits are almost rounded with blunt tip and they drop off easily from the very short pedicel. Pulp is soft, juicy and sweet. Fruit peel is very thin. This variety is very resistant to leaf spot diseases. The aroma components are flavones found accumulated in the inner thin layer of the skin. Up to 3 days after disposal of leaves, the fragrance is equivalent to the Manoranjitham flower (*Artabotrysuncinatus*)

The ITHP 19, *Side suckers are uprooted (De-suckering) at monthly interval with long iron rods*, was practiced to facilitate the growth of the main crop. The ITHP 21, *For quick ripening and for festive occasions, bunches are stacked in bigger earthen pots in to which fuming incense sticks are kept and*

mouth is covered with clothes, was found to be with higher adoption, since the closed pot induces high relative humidity and mild heat due to fumigation facilitates ripening of banana.

ITHP22, *Neem leaves serve to ripen the fruits of Hill Bananas. The fruits to be ripened are kept in dark room and kept covered by neem leaves. This hastens the process of ripening*, was reported to be irrational with 43.33 per cent of adoption only.

In the crop protection aspects, four ITHPs were selected and out of which ITHP 23 was noticed to be irrational with low adoption. There was 90 per cent adoption of ITHP 24, *Applying neem cake @ 140g./sucker in 3rd and 5th months to increase the yield without any soil borne diseases* as neem based products have been identified as pest repellents and with higher concentration, they have pesticidal action too.

ITHP 25, *Dried, drooping leaves are removed once in three months to avoid shade effect which may produce black spots on fruits* was adopted by 86.67 per cent of the respondents, as the dried waste drooping leaves serve as the reservoir for the pests and diseases and hence this was practiced

The ITHP 26, *To control banana wilt, affected plants are removed and burnt and 1 -2 kg of lime is applied in each pit* was with maximum rationality score and adoption rate of 83.33 per cent since pH gets altered and thereby wilt causing fungi does not survive in the alkaline condition.

ITHP 23, *Banana suckers are immersed for a while in 1 lit. of neem oil dissolved in 100 lit. of water*

before planting in order to prevent rhizome rot, was found to be irrational with only 46.67 percentage of adoption, since the farmers believe that neem is the best pesticide available naturally, they perhaps might not know the concentration part of neem oil, which is to be used.

In Hill banana, out of 26 ITHPs, 24 ITHPs were adopted by more than 50 per cent of the respondents and the remaining 2 ITHPs were adopted by less than 50 per cent of the respondents. Thus in Hill bananas, 76.92 percent of ITHPs were adopted by more than 50 percent farmers revealing their high level of adoption. The above finding is online with the research support from that of Purusottamet *al.* (2009) and Subba (2009).

CONCLUSION

It could be concluded that adoption of ITHPs on Hill banana cultivation was found to be higher as a majority of 24 out of 26 ITHPs were adopted by more than 50 per cent of the farmers. The tribes of the Kolli hills possessed rich tradition, heritage and experience in agriculture and horticulture. Their rich wisdom in ITHPs can be effectively utilized for sustainable agricultural development of tribal areas. It could also be concluded that the farmers have experiential wisdom which they use to conserve and select location specific indigenous varieties of Hill banana for obtaining sustainable yield. Such stabilizing qualities of traditional practices must be supported and complemented by agro-ecological practices that enhance the soil, water and germplasm conservation potential of traditional technologies.

Paper received on : October 01, 2014

Accepted on : December 23, 2014

REFERENCES

- PurusottamMohapatra.,Ponnurasan.N.and Narayanasamy.P.2009.Tribal pest control practices of Tamil Nadu for sustainable agriculture. *Indian Journal of Traditional Knowledge*,8(2):218-224.
- SakeerHusain.A, 2010.Knowledge, adoption and perceived effectiveness of Indigenous Horticultural Practices in Kerala, Ph.D. thesis, GRI (DU),Gandhigram, Dindigul, Tamil Nadu,.
- Sastikannan.A, 2002.A study on knowledge and adoption of indigenous plant protection practices in Madurai district, M.Sc. (Ag.) Thesis, Annamalai University, Annamalainagar, Chidambaram, Tamil Nadu,.
- Subba.J.R.2009. Indigenous knowledge on bio- resource management for livelihood of the people of Sikkim. *Indian Journal of Traditional Knowledge*, 8(1):56-64.
- Sundaramari.M and Ranganathan,T.T., 2003. In: Indigenous Agricultural Practices for Sustainable Farming, (Agrobios (India) Publishers, Jodhpur.

