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Adoption of indigenous paddy cultivation practices by tribal farmers of Tamil Nadu

P Venkatesan[1]*, M Sundaramari[2] & R Venkattakumar[3]

[1]Extension Systems Management Division, ICAR-National Academy of Agricultural Research Management, Rajendranagar, Hyderabad-500030;
[2]Faculty of Agriculture & Animal Husbandary, Gandhigram Rural Institute, Gandhigram, Dindigul-624302;
[3]Extension and Training, ICAR-Indian Institute of Horticultural Research, Hessaraghatta lake post, Bangalore-560089
E-mails: venkatesan@naarm.ernet.in; sundaramari@yahoo.co.in; venkattakumar@gmail.com

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Indigenous Tribal Agricultural Practices (ITAPs) 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 ITAPs can effectively be utilized for sustainable agricultural development of tribal areas by appropriately blending the ITAPs with recommended production technological package. In this context, a study was done for collecting, classifying, documenting, analyzing the rationality, and studying the adoption of the selected ITAPs in low land paddy. About 65 ITAPs on low land paddy, in different clusters of villages of Kolli hills were documented. For assessing the rationality, the selected ITAPs were divided into two groups. The first group consisted of 35 ITAPs were related to crop production and the second 30 ITAPs were related to plant protection. Having identified and selected the list of ITAPs with their rationality scores, further analysis was undertaken to test verify their extent of adoption. The rational and effective ITAPs should be blended into the technology package for transfer of technology, so that the agricultural development will be sustainable.

Keywords: Agricultural practices, *Malayali* tribal, Rationality, Adoption
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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 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 agricultural practices of tribes in Kolli Hills will be helpful for proposing an action paradigm for preservation and diffusion of desirable agricultural technologies for the benefit of the tribal farming community. Keeping this in view, a study on adoption of Indigenous Tribal Agricultural Practices (ITAPs) on low land paddy was carried out. This paper discusses about the indigenous paddy cultivation practices adopted by tribal farmers in Kolli hills of Tamil Nadu.

Research 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 km from North to South and 19 km from East to West. The Mean annual temperature ranges from 14 to 28 ^{o}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 m MSL. The soils are deep to very deep, non-calcareous and developed from weathered genesis.

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[1]. In this study, rationality refers to the degree to which ITAPs can be explained or supported with scientific reasons, or established based on long

*Corresponding author

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. 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. Also, nuances of traditional knowledge in utilization of rice landraces by a farming community in North-Eastern Thailand was studied by Satian Chunta *et al.*(2014)[2].

The rationality of indigenous technologies was assessed by using the scoring procedure adopted by Sakeer Husain (2010) [3] as presented in Table 1.

Two separate questionnaires were prepared, one for assessing the rationality of crop production aspects and another one on crop protection aspects of low land paddy 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. For assessing the rationality, the selected 65 ITAPs in low land paddy were bifurcated into two groups. The first group consisted of 35 ITAPs related to crop production and the second, 30 ITAPs related to plant protection.

To find out the rationality of 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".

Thirty low land paddy cultivating farmers were selected using proportionate random sampling from the clusters of villages.

Having identified and selected the list of ITAPs with their rationality scores, further analysis was undertaken to test verify their extent of adoption. The selected ITAPs 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 Sundaramari *et al*. (2003)[4].

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

Table 1—Scoring procedure to assess the rationality of indigenous technologies

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

Results and discussion

Rationality and adoption behavior of tribal farmers towards ITAPs (Figs. 1-13)

Local cultivars

The adoption % of tribal farmers of Kolli hills towards local landraces of paddy such as *Karu nellu* (Fig.1)*, Kuruvai nellu* (Fig.2)*, Mattakar nellu* (Fig.3) and *Samba nellu* (Fig. 4) was by 46.67, 60.00, 66.67 and 90.00, respectively (Tables 2 & 3). All these local cultivars were grown in the season of December-May. All are wet land paddy cultivars with drought and flood tolerant character. *Samba nellu* was adopted by maximum respondents as its straw has good yield, palatable to livestock and can be stored up to 3 yrs without any deterioration. The striking traits in this race are its resistance to pest and diseases, nutritional quality, taste and limited water requirement.

Soil

In Kolli hills 100 % of the farmers adopted cultivating paddy in clay soil (*p*H- 5.1 to 6.5) which was found to be rationale with the scoring of 3.74 R, since in paddy cultivation, the yield will be high when the *p*H of the soil is between 5 and 6.5 (Table 2).

Season

Crop rotation of low land paddy followed by banana was adopted by 80.00 % of the respondents, with scientific rationale of 3.55 R. In wetlands, paddy is cultivated in two seasons (Table 2). The first season is from January-February and May-June adopted by cent % of the respondents as the astral position linked with the commencement of the monsoon. Paddy cultivation is usually done during these two seasons using spring water as the source of irrigation which flows through the fields (Fig.5).

Seed rate and seed treatment

About 80.00 % of the respondents followed the seed rate of 20-25 kg per acre (*Kuruvai*) and 30-35 kg per acre (*Samba*) (Table 2). They (33.33%) soaked the paddy seeds in diluted cow's urine before sowing to reduce the incidence of leaf spot and rice blast.

Figs.1-13—Fig. 1-*Karu nellu* seeds; Fig. 2-*Kuruvai nellu* seeds; Fig. 3-*Mattakar nellu* seeds; Fig. 4-*Samba nellu* seeds; Fig. 5-Paddy cultivation done using spring water; Fig. 6-Elevated place identified for nursery; Fig. 7-Puddling and hoeing; Fig. 8-Plastering of bunds; Fig. 9-Hand weeding; Fig. 10-Green leaf manuring; Fig. 11-Thrashing of whole plant on the thrashing floor; Fig. 12-Trampling using bullock; Fig.13-Winnowing and dehusking

Nursery management

The farmers (60.00%) identified elevated place for raising nursery (Fig. 6). Wet seedbed is the common method practiced by 93.33 %. Likewise 93.33 % of the respondents went for the application of 2 to 3 t/ha farm yard manure in the nursery for better seedlings.

Main field preparation

Summer ploughing is very common practice during the month of April or May, adopted by 70.00 % of the respondents. Six ploughings were done in the main field before transplanting of paddy seedlings. Initially the land is ploughed thrice, leveled and irrigated. This practice was adopted by 83.33 % of the tribal farmers. About 76.67 % of the farmer respondents went for puddling (Fig.7) in wet land condition with cattle-drawn wooden plough, when the depth of the soil is minimum and the moisture content is low. If depth of the soil and moisture content was high, then the hoeing is done (100%) with help of indigenously designed hand hoe (blade of 20 x 25 cm attached to a long handle of 1 m) by 90% of farmers. Farmers position themselves at one place and carry out the operation of inverting the soil to a radius of 1 m around them. Then, a wooden leveling board is used to level the main field after ploughing just before transplanting to avoid small stagnant pools (63.33%), this process modifies the existing contours of land for efficient agricultural production system. Trimming (96.67%) and plastering (80%) is done to avoid weeds and to prevent seepage loss of water (Fig.8).

Transplantation

About 43.33 % of the respondents use to plant 6 or 7 seedlings per hill which was found to be irrational by the scientists as the increased number of seedlings

Table 2—Rationality and adoption of rational practices of ITAPs on Low land paddy cultivation (n=30)

Sl. No.	ITAPs on low land paddy cultivation	Rationality score	Adoption %	Scientific rationale
1	Local landrace of paddy, *Karunellu* is grown in the season of December-May.	3.20 R	46.67	Indigenous cultivar suitable for second season, using the spring water.
2	Local landrace of paddy, *Kuruvainellu* is grown in the season December-May.	3.11 R	60.00	Indigenous cultivar suitable for late season, when the water scarcity prevails.
3	Local landrace of paddy, *Mattakarnellu* is grown in the season of December-May.	2.83 R	66.67	Drought and flood tolerant indigenous paddy cultivar.
4	Local landrace of paddy, *Sambanellu* is also grown in the season of December-May.	2.81 R	90.00	Photosensitive and thermo-sensitive indigenous paddy cultivar.
5	Paddy is cultivated in clay soil.	3.74 R	100.00	The soil with *p*H 5-6.5 is highly suitable for paddy cultivation.
6	Low land paddy (one year) is followed by banana (two years) as crop rotation.	3.55 R	80.00	Crop rotation effectively makes use of nutrients present in the soil.
7	In wetlands, Paddy is cultivated in two seasons ie, January-February and May-June.	2.93 R	100.00	Astral position is linked with the commencement of the monsoon.
8	Paddy cultivation is usually done using spring water as the source of irrigation.	3.12 R	100.00	Utilization of the spring water in an appropriate manner.
9	A seed rate of 20-25 kg per acre (*Kuruvai*) and 30-35 kg per acre (*Samba*) is generally practiced.	3.28 R	80.00	The seed rate is optimum for both the seasons.
10	The elevated place in the field is identified for raising nursery.	3.51 R	60.00	Elevated place facilitates draining out excess water and irrigation.
11	In wetland paddy, wet seedbed is the more common method of nursery.	3.47 R	93.33	To avoid the percolation loss of water.
12	Application of 2 to 3 t/ha Farm yard manure in the nursery for better seedlings.	3.65 R	93.33	To enhance & increase the fertility of the soil.
13	Summer ploughing is a common practice done during the month of April or May.	3.60 R	70.00	To economize the water requirement for initial preparation of land.
14	Six ploughings are done in the main field before transplanting of paddy seedlings.	3.02 R	83.33	Facilitate transplantation of paddy seedlings by making the soil softer.
15	In the wetland, puddling is done with the help of cattle drawn wooden plough.	3.63 R	76.67	Puddling breaks up the clods and churns the soil.
16	If depth of the soil and moisture content is high, then the hoeing is done with help of spade.	3.65 R	100.00	To reduce the percolation losses by developing impervious layer in the field to create a good seedbed.
17	The indigenous hand hoes are effective in inverting the soils with stubbles in wet lands.	3.58 R	90.00	This hand hoe is useful in highly undulated areas.
18	A wooden leveling board is used to level the main field after ploughing.	3.79 R	63.33	It is being done to modify the existing contours of land.
19	Trimming of the field bunds during field preparation.	3.78 R	96.67	To reduce the weed infestation.
20	The bund is plastered twice i.e. one week before and on the day of transplanting.	3.44 R	80.00	Plastering rectifies the holes and prevents the seepage loss of water.
21	The top portion of seedling is clipped before transplanting.	3.65 R	43.33	To prevent the seedling getting uprooted by strong winds and also helps to remove stem borer and hispa eggs, if present.
22	Water is drained in the next day of transplanting.	3.05 R	90.00	To reduce the damping off problem.
23	Neem seed kernel powder is applied to the crop 2-3 times after transplanting.	3.21 R	66.67	To control earhead bug in paddy.
24	Hand weeding is the common method of weed control in wetland paddy.	3.72 R	70.00	Results in complete control of unwanted plants.
25	More water is maintained in the field during flowering stage.	3.44 R	73.33	This practice favours greater availability of P, Fe & Mn.
26	*Pala* (*Alstonia scholaris* L.) is used as green leaf manure at the rate of 100-150 Kg/acre.	3.09 R	76.67	Improves soil structure, increases water holding capacity.
27	*Thirukalli* (*Euphorbia tirucalli* L.), *Kattukottai* (*Jatropha curcas* L.) *and Vilari* (*Dodanaea viscosa* L.) *are used as green leaf manure* @ 100-150 Kg/acre each.	2.93 R	70.00	These plant residues have a clear positive effect on the growth, yield and yield components.

(*Contd.*)

Table 2—Rationality and adoption of rational practices of ITAPs on Low land paddy cultivation (n=30)—(*Contd*.)

Sl. No.	ITAPs on low land paddy cultivation	Rationality score	Adoption %	Scientific rationale
28	Green leaf manuring with pookuli [*Calpurnia aurea* (Ait.) Benth.]	302 R	26.67	Its low lignin content facilitates the early decomposition.
29	*Glycosmis macrocarpa* Wt. is used as green leaf manure during both seasons @ 100-150 Kg/acre.	3.00 R	33.33	To decrease the alkalinity / pH of alkali soils.
30	Leaves of Penathalai [*Cipadessa baccifera* (Roth).Miq.] are used as green manure.	3.09 R	73.33	It aid as manure to the soil in maintaining the soil pH, C & N.
31	*Melia* (*Melia azedarach* L.) is also used as green leaf manure @ 75-100 Kg/acre.	3.37 R	63.33	Additional nutrients from plant materials
32	*Gliricidia maculate* H.B.&K.is used as green leaf manure in both seasons @ 150-200 Kg/acre.	3.86 R	63.33	Improves soil physical properties, allows the water to infiltrate easily.
33	Application of *Calotropis gigantea* (L.) Dryand.as green leaf manure in the nursery.	2.80 R	73.33	Prevent thrips attack in the nursery.
34	*Melia azedarach* L. kernel (6 kg) powder is mixed with water (200 lit) and allowed to stand whole night undisturbed, filtered and sprayed next morning	3.02 R	46.67	Meliartenin is a strong insect antialimentary which controls brown plant hopper and green leaf hopper.
35	Neem leaves along with small stems are applied as green leaf manure in the field.	3.02 R	73.33	Neem has manurial and pesticidal value.
36	The leaves of *Calotropis gigantea* (L.) Dryand. are pressed and incorporated into the soil.	2.60 R	70.00	Controls brown plant hopper in the main field.
37	Spraying *Notchi* (*Vitex negundo* L.) leaf extract.	3.22 R	63.33	Prevents from the insect vector of rice tungro virus.
38	Datura leaves and stems are spread in the field, then blocked through bunds and then the decomposed leaves and stems are circulated throughout the field.	2.80 R	70.00	The smell as well as the bitterness of Datura leaves is the reason to distract the stem-borer pest from approaching the area.
39	Neem oil is mixed with water @ 30ml./lit. and sprayed.	3.73 R	23.33	Controls stem borer in rice
40	*Notchi* (*Vitex negundo* L.) leaf extract and Buttermilk spray	2.78 R	36.67	It is being used to control leaf folder.
41	*Adhatoda vasica* Nees. leaf extract and cow dung spray.	2.60 R	43.33	Used for the control of leaf folder.
42	*Melia azedarach* L. kernel (6kg per acre) powder is mixed with water (200:1). This solution is kept overnight undisturbed. It is filtered and sprayed on the next morning.	3.43 R	66.67	*Melia azedarach* L. kernel solution spray controls the pests like brown plant hopper and leaf hopper of the rice crop.
43	A paste neam leaf is boiled for half an hour and left for overnight and sprayed in the next morning by mixing with 200 liters of water.	2.73 R	23.33	This controls leaf folder in rice crop.
44	Paddy is harvested when the panicles turn to straw yellowish in colour and most of the grains get hardened.	3.88 R	70.00	An indicator for optimum harvesting time.
45	The whole plants are harvested near the ground level using sickle and threshed on the threshing floor by trampling using bullock around the material until the job gets over.	3.74 R	63.33	The whole plants were harvested as the farmers used the hay for feeding their cattle and threshing was done in an indigenous mode.
46	After harvest, paddy is sun dried well before storage.	3.74 R	73.33	Moisture content of 14 % or less is opting for storing.
47	Paddy grains are stored in *Kudhir*.	3.77 R	63.33	This indigenous storage structure provides excellent moist proofing.
48	Turmeric powder is mixed with paddy and then stored.	3.43 R	66.67	Turmeric powder controls weevils and stored grains.
49	*Vitex* leaf extract spray (or) *Vitex* leaves + neem leaf extract spray on the stored grains.	3.51 R	33.33	Rice weevil is controlled by practice.
50	The leaves of *notchi* (*Vitex negundo* L.), neem (*Azadirachta indica* L.) and *pungam* (*Pongamia pinnata* L.) are used along with the seeds of paddy to ward off storage pests.	3.60 R	83.33	*Notchi*, neem and pungam do have repellent action on storage pests.
51	Leaves of *Cipadessa baccifera* (Roth).Miq. are spread over the paddy seeds in the storage structure.	3.00 R	100.00	Repellent action over the storage pests.
52	20-30 red chillies are kept in one quintal of rice bag against the storage pests.	2.95 R	46.67	The pungent odour of red chillies acts as a repellent.

Table 3—Rationality and adoption of irrational practices of ITAPs on Low land paddy cultivation (n=30)

Sl. No.	ITAPs on low land paddy cultivation	Rationality score	Adoption %	Scientific rationale
Irrational practices				
1	Soaking the paddy seeds in diluted cow's urine before sowing.	1.95 IR	33.33	Reduces the incidence of leaf spot and rice blast.
2	Six or seven seedlings are planted per hill.	1.83 IR	43.33	This will lead to high vegetative biomass.
3	Applying 100 kg of pig manure / acre of at 10 days after planting.	2.40 IR	23.33	Phosphorus transformation increase of soil profile.
4	Growing or planting *Calotropis* at 12 feet interval on all sides of paddy fields.	2.34 IR	76.67	Controls the invasion of hoppers in paddy field.
5	Five lit of kerosene is mixed with soap solution and sprayed for 1 ha.	1.88 IR	30.00	Kerosenated soap water suffocates and kills the larvae of leaf folder and stem borer.
6	Dusting of ash on the standing crop of paddy.	2.37 IR	66.67	Sucking pest such as brown plant hopper in rice is controlled.
7	A mixture of 5 kg of common salt and 15 kg. of sand is applied for 1 acre.	1.63 IR	40.00	This practice helps to control brown spot disease.
8	*Agave americana* L. leaf with 2 -3 drops of lime juice (fermented for 4-5 days) is mixed with water and sprayed.	2.10 IR	13.33	This is done for the control of leaf folder in rice.
9	Lemon grass oil and *Ocimum sanctum* L. leaf extract with butter milk and cow urine are mixed with water and sprayed.	2.46 IR	26.67	This method controls sap feeders.
10	Fish (3kg) with Neem leaf (5kg) extract (or) common salt solution spray to control all pests in rice.	2.41 IR	50.00	Common salt creates abrasion on the skin of insect pests and neem leaf extract helps to control the sucking pests.
11	Paddy seeds are stored in a floor coated with cow dung slurry to avoid insect attack.	2.37 IR	50.00	This practice avoids insect attack in paddy grains.
12	Vessel filled with water is kept inside the store room to attract the insects and to reduce damage.	2.07 IR	63.33	This practice would attract and kill the rice moth (*Corcyra cephalonica* Stn.).
13	Pepper powder is used for the control of storage pest in paddy.	2.34 IR	43.33	Pepper smell drives away any storage pest.

consume more nutrients. The top portion of seedling is clipped before transplanting by only 43.33 % of the farmers. But this practice had a scientific rationale of 3.65 R, since this practice prevents the seedling from getting uprooted by strong winds, minimizes the transpiration losses and also helps to remove stem borer and hispa eggs. The water in the main field is drained in the next day of transplanting (90%), in order reduce the damping off problem. After transplanting, neem seed kernel powder is applied to the crop 2-3 times. This practice was adopted by 66.67 % of the farmer respondents, since this helped to control ear- head bug in paddy. 70 % of the tribal farmers went for hand weeding as this helped in complete control of unwanted plants (Fig. 9).

Soil nutritional management

The tribal farmers (23.33%) applied 100 kg of pig manure for one acre of rice crop at 10 days after planting to get higher yield. The green manures, viz. *Pala* (*Alstonia scholaris* L.) (76.67%), *Euphorbia tirucalli* L., *Jatropha curcas* L. and *Dodanaea viscosa* L. (70%), *Calpurnia aurea* (Aiton) Benth. (26.67%) *Glycosmis macrocarpa* Wt. (33.33%), *Cipadessa baccifera* (Roth). Miq. (73.33%), *Melia azedarach* L. (63.33%), *Gliricidia maculate* H.B. & K.(63.33%) were used in the paddy field as per the availability (Fig.10). These green manures improves organic matter content in the soil, improves soil physical properties, allows the water to infiltrate into the soil more quickly rather than run off the surface, increases water-holding capacity of the soil, reduces soil erosion, restores and improves the soil quality, increases crop yield, maintain the soil *p*H, carbon and the nitrogen contents, etc.

Pest and disease management

Application of *Calotropis gigantea* (L.) Dryand. in the nursery was followed by 73.33 % of the farmer's respondents to prevent thrips attack in the nursery. *Melia azedarach* L. kernel (6 kg) powder mixed with water (200 L) and allowed to stand whole night undisturbed, filtered and sprayed next morning and was adopted by 46.67 % of the respondents to control

brown plant hopper and green leaf hopper. About 73.33 % of the farmers used neem leaves along with small stems and applied in the field, to prevent the attack of pests and diseases in rice fields. The leaves of *Calotropis gigantea* (L.) Dryand. were pressed and incorporated into the soil in the available inter space in the main field (70.00 %) to control brown plant hopper. About 76.67 % of the farmers planted *Calotropis* at 12 feet interval on all sides of paddy fields to control the invasion of hopper. *Notchi* (*Vitex negundo* L.) leaf extract is sprayed by 63.33 % of the respondents to control rice *tungro* virus. Seventy % of the farmers spreaded *Datura metel* L. leaves and stems in the paddy field in water stagnate condition and circulated to control the stem-borer attack. Only 23.33 % of the respondents mixed neem oil with water @ 30 ml/ l and sprayed to control stem borer in rice field. To control leaf folder and stem borer in paddy 30.00 % of the farmers mixed 5 L of kerosene with soap solution and sprayed in 1 ha. To control sucking pest in rice 66.67 % of the farmers dusted ash on the standing crop of paddy and 50.00 % of the farmers adopted a practice of mixing fish (3kg), neem leaf (5kg) extract (or) table salt solution spray.

To control leaf folder in paddy 36.37 % of respondents adopted spray of *Notchi* (*Vitex negundo* L.) leaf extract with buttermilk spray, 43.33 % of the respondents adopted spraying of *Adhatoda vasica* Nees. leaf extract with cow dung and only 13.33 % of the farmers adopted the practice of spraying fermented *Agave Americana* L. leaf along with 2 to 3 drops of lime juice mixed with water. About 66.67 % of the respondents sprayed with a filtered solution of *Melia azedarach* L. kernel (6kg / acre) powder mixed with water (200:1) kept overnight undisturbed and 23.33 % of the farmers prepared a paste by grinding ten kg of neem leaf with 1lit of water, boiled for half an hour and left for overnight and sprayed in the next morning by mixing with 200 lit of water to control leaf folder.

Lemon grass oil along with *Ocimum sanctum* L. leaf extract, butter milk and cow urine were mixed with water and sprayed to control sap feeder by 26.67 % of the respondents.

Post-harvest management

Paddy is harvested when the panicles turn to straw yellowish in colour and most of the grains get hardened (70.00%). About 63.33 % of the farmers harvested the whole plant near the ground level using sickle and threshed on the threshing floor (Fig.11) by trampling using bullock (Fig.12). After harvest, paddy (Fig.13) is sun- dried well before storage (73.33%).

Paddy grains were stored in *Kudhir* by 63.33 % of farmers. To control rice weevils in the stored grains about 66.67 % of the farmer respondents mixed turmeric powder with paddy grains and 33.33 % of the respondents adopted *Vitex* leaf extracts spray. To avoid the insect attack, paddy seeds were stored in a floor coated with cow dung slurry by 50.00 % of the farmers. Vessel filled with water is kept inside the store room. This was adopted by 63.33 % of the respondents. To ward- off storage pests in stored paddy seeds, 83.33 % of the farmers used the leaves of *Notchi* (*Vitex negundo* L.*)*, neem (*Azadirachta indica* L.*)* and *Pungam* (*Pongamia pinnata* L.*)* along with the seeds of paddy, cent % of the respondents used the leaves of *Penathalai* [*Cipadessa baccifera* (Roth).Miq.], 46.67 % of the respondents kept 20-30 red chillies in one quintal of rice bag and 43.33 % used pepper powder.

The findings reported here are in agreement with those of Natarajan *et al.* (2006)[5], Narayanasami (2006)[6], Bidyalakshmi Chanu *et al.*(2010)[7] and Satian Chunta *et al.(*2014)[2].

Conclusion

From the selected 65 ITAPs on Low land paddy cultivation, 46 ITAPs (41 rational and 5 irrational) were adopted by more than 50 % of the respondents while the remaining 19 ITAPS (11 rational and 8 irrational) were adopted by less than 50 % of the respondents. Of them 80.00 % of ITAPs were rational and the remaining 20.00 % of ITAPs were found to be irrational.

Since most of the farmers of Kolli hills are oriented towards organic farming through the adoption of ITAPs, the extension functionaries may support them in organic certification. Researchers in indigenous agricultural systems must take an applied methodological approach which needs to ensure that the research project will help local people gain mastery of their natural and social environment, and that it will take actions needed to integrate local knowledge systems with the global technological knowledge system. Most of the indigenous paddy varieties are tolerant against disease and insect pest, and help to reduce the expenditure on farming and increase the benefit. These farming practices also provide opportunities to manage the gene flows

between different varieties and to conserve the genes for future crop improvement.

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