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## Knowledge and adoption of paddy based agroforestry practices

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### Abstract

The study assessed farmers' knowledge and adoption of paddy based agroforestry practices in Bhandara district of Maharashtra state in Vidarbha region. A sample of 100 paddy based agroforestry practising farmers was selected by proportionate random sampling method. An exploratory research design of social research was used. After analysis, the results on knowledge revealed that, 60.00 per cent of the respondents had medium level of knowledge about paddy based agroforestry practices. On the other hand, the results on adoption reported that, majority of the respondents (66.00%) had low adoption of the paddy based agroforestry practices.

**Keywords:** knowledge, adoption, paddy based agroforestry practices.

### Introduction

The widespread deforestation and increasingly intensive use of land to sustain a growing population has increased soil erosion, lowered soil fertility and reduced agricultural productivity in India. This has raised concern over sustainability of the farming system. There is growing evidence that agroforestry can be a potential solution to these problems.

Agroforestry is a dynamic, ecologically based natural resource management system that, through which the integration of trees/woody perennials in farm and rangelands, diversifies and sustains production for increased social, economic and environmental benefits (Leakey, 1996) [4]. Agroforestry can play a major role in bringing the desired level of diversification along with sustainability. The farm industry linkages have also helped the systems to be more sustainable than the traditional cropping systems. (Karemulla *et al.* 2005).

The paddy based agroforestry practices recommended by All India Co-ordinated Research Project of Agroforestry, College of Agriculture, Nagpur were considered in the present study.

### Material and Methods

The investigation was carried out in Bhandara district of Maharashtra state. For the study of knowledge and adoption of paddy based agroforestry practices, exploratory research design was used. Bhandara district was considered purposively as the paddy growers were using more paddy based agroforestry practices. Four tehsils namely, Bhandara, Lakhani, Pauni and Sakoli were selected purposively based on higher area under agroforestry in Bhandara district. Five villages, from each selected tehsil were selected for the study. Therefore, 20 villages were selected from selected four tehsils. From selected each village five farmers who are practicing paddy based agroforestry practices from last three years were selected and considered as respondents. Thus, total sample of 100 respondents were selected by proportionate random sampling method. The data were collected with the help of schedule developed by interviewing the respondents. The responses were analysed by using frequency and percentage.

### Results and Discussion

#### Knowledge of paddy based agroforestry practices

The distribution of the respondents on their knowledge about paddy based agroforestry practices presented in the Table 1.

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**Table 1:** Distribution of respondents according to their practices wise knowledge about paddy based agroforestry practices

Sr. No.	Agroforestry Practices	Knowledge (n=100)	
		Yes Freq. (%)	No Freq. (%)
1	Plantation of Teak, Eucalyptus, Shivan and Maharukh is recommended on Paddy base at distance of 1.5 to 2 mtrs.	58 (58.00)	42 (42.00)
2	Plantation of tree species on bunds is recommended in East-West direction.	100 (100.00)	00 (00.00)
3	Plantation of fruit trees on bunds is recommended in North-South direction.	90 (90.00)	10 (10.00)
4	Canopy pruning of tree species recommended at the beginning of Monsoon (May-June)	27 (27.00)	73 (73.00)
5	Plantation of non-schedule tree species Eucalyptus, Casulina (Saru), Maharukh, Babul, Neem are recommended on Paddy bunds.	41 (41.00)	59 (59.00)
6	Weeding, singling, fertigation, plant protection are recommended as tending operations in agroforestry.	48 (48.00)	52 (52.00)
7	For maximum wood production on Teak establishment of narrow base contour bunds along with vegetative barrier at horizontal interval of 30 m is recommended.	31 (31.00)	69 (69.00)
8	In agroforestry, construction of Gabian check dam with clay blanketing for storage of runoff and loose rock dams for control of gully erosion are recommended.	60 (60.00)	40 (40.00)
9	For maximum timber production in ill drained soils, planting of Sissoo can be recommended at 40 to 60 isobath.	38 (38.00)	62 (62.00)
10	Before planting Teak seedlings should treated with IBA at the concentration of 1500 ppm solution for 12 hours.	28 (28.00)	72 (72.00)
11	In the Paddy field, Teak plantation on the bunds of field is resulted more economic.	67 (67.00)	33 (33.00)
12	For maximum yield of wood, Eucalyptus should be planted at spacing of 2x1 m.	19 (19.00)	81 (81.00)
13	Harvesting (Cutting) of Eucalyptus should done at age of 8 years.	28 (28.00)	72 (72.00)
14	Plantation of Anjan grass or Stylo grass along with Babul trees to prepare a pasture on a barren land.	14 (14.00)	86 (86.00)
15	Planting seedlings with 1 meter height is suitable for early establishment of trees.	49 (49.00)	51 (51.00)
16	Application of Nitrogen 100 gm, Phosphorus 50 gm and Potash 100 gm is suitable in first and second year of plantation.	26 (26.00)	74 (74.00)
17	Planting of seedlings with scalping of Paddy bund is suitable.	15 (15.00)	85 (85.00)
18	Pruning of Teak trees after 4 years is recommended.	20 (20.00)	80 (80.00)
19	Cultivation of fodder grass like Siratro, Stylo are suitable for stabilization of Paddy bunds and tree crop diversification.	34 (34.00)	66 (66.00)
20	Application of Bourdeaux mixture on tree trunk was found effective in controlling damages to tree trunk by sun scorching.	72 (72.00)	28 (28.00)
21	Copping of Subabul tree before fruit set is recommended.	69 (69.00)	31 (31.00)
22	For biomass farming, planting of Subabul, Casulina, Kini, Maharukh, Eucalyptus found more suitable.	22 (22.00)	78 (78.00)
23	Direct sale of forest produce by avoiding middleman is more profitable.	79 (79.00)	21 (21.00)
24	For schedule trees (like Teak, Sissoo etc.) during cutting and transport permission is mandatory.	59 (59.00)	41 (41.00)
25	In agroforestry, for maximum production of timber Teak clone PDKV/AF/1 is recommended for planation.	35 (35.00)	65 (65.00)
26	Teak clone NC-21 and NE are recommended for cultivation in agroforestry.	33 (33.00)	67 (67.00)
27	Under agroforestry, in the composite unit of aquaculture may consisted of Paddy, vegetables, large cardamom and fish culture besides bean cultivation on bund area of pond.	70 (70.00)	30 (30.00)
28	Multiple cropping system of rice-fallow: an alternative system of intensive cropping, namely Paddy-Potato+Wheat (grown in 1:1 ratio)-Green gram on irrigated medium land.	44 (44.00)	56 (56.00)
29	<i>Gliricidia</i> plantation with Ragi and Paddy in kharif season under rainfed condition on alley cropping.	48 (48.00)	52 (52.00)

Figures in parenthesis indicates percentage

Freq- Frequency

It was evident from the Table 1 that, cent per cent of the respondents had knowledge about the plantation of the tree species on the bunds in East-West direction and 90.00 per cent of respondents knows about plantation of the fruit trees on the bunds in North-South direction, followed by 79.00 per cent of the respondents knows that the direct sale of the forest produce by avoiding middleman was more profitable. Majority of the respondents (72.00%) had knowledge about the application of the bourdeaux mixture on tree trunk to protect it from damages by sun scorching, followed by the 70.00 per cent of them had knowledge that composite unit of aquaculture may consisted of paddy, vegetables, large cardamom and fish culture besides bean cultivation on bund area of pond.

The Table 1 shows that, the majority of respondents (69.00%) had knowledge about the copping of the Subabul trees before fruit setting followed by knowledge about teak plantation on bunds of paddy fields (67.00%), construction of gabian check dam with clay blanketing (60.00%), permission is mandatory during cutting and transportation of the schedule trees (59.00%) and plantation of Teak, Eucalyptus, Shivan and

Maharukh at 1.5 to 2 meters on paddy base (58.00%), respectively.

While majority of the respondents (86.00%) had no knowledge about plantation of Anjan grass or Stylo grass along with Babul trees to prepare a pasture on a barren land followed by planting of seedlings with scalping of paddy bund (85.00%), for maximum yield of wood, Eucalyptus should be planted at spacing of 2x1 m (81.00%), pruning of Teak trees after 4 years (80.00%), for biomass farming, planting of Subabul, Casulina, Kini, Maharukh, Eucalyptus (78.00%), application of Nitrogen 100 gm, Phosphorus 50 gm and Potash 100 gm is suitable in first and second year of plantation (74.00%), canopy pruning of tree species recommended at the beginning of Monsoon (May-June) (73.00%), respectively.

#### Overall knowledge of paddy based agroforestry practices by the respondents

Knowledge is the information possessed by the respondents which may provide base for adoption. The distribution of the respondents according to their overall level of knowledge

possessed about paddy based agroforestry practices has been presented in Table 2.

**Table 2:** Overall knowledge of paddy based agroforestry practices by the respondents

Sr. No.	Knowledge	Respondents (n=100)	
		Frequency	Percentage
1	Low	30	30.00
2	Medium	60	60.00
3	High	10	10.00
Total		100	100.00

It was observed from the Table 2 that, majority of the respondents (60.00%) had overall medium knowledge about the paddy based agroforestry practices, followed by low level (30.00%) and high level (10.00%). Thus, the study concluded that, majority of the respondents had medium knowledge about the paddy based agroforestry practices. These findings of study were supported by Behera *et al.* (2013)<sup>[1]</sup>.

#### Adoption of paddy based agroforestry practices

The distribution of the respondents on their adoption about paddy based agroforestry practices presented in the Table 3.

**Table 3:** Distribution of respondents according to their practices wise adoption about paddy based agroforestry practices

Sr. No.	Agroforestry Practices	Adoption (n=100)		
		FA Freq. (%)	PA Freq. (%)	NA Freq. (%)
1	Plantation of Teak, Eucalyptus, Shivan and Maharukh is recommended on Paddy base at distance of 1.5 to 2 mtrs.	02 (02.00)	46 (46.00)	52 (52.00)
2	Plantation of tree species on bunds is recommended in East-West direction.	68 (68.00)	11 (11.00)	21 (21.00)
3	Plantation of fruit trees on bunds is recommended in North-South direction.	42 (42.00)	40 (40.00)	18 (18.00)
4	Canopy pruning of tree species recommended at the beginning of Monsoon (May-June)	02 (02.00)	08 (08.00)	90 (90.00)
5	Plantation of non-schedule tree species Eucalyptus, Casulina (Saru), Maharukh, Babul, Neem are recommended on Paddy bunds.	00 (00.00)	22 (22.00)	78 (78.00)
6	Weeding, singling, fertigation, plant protection are recommended as tending operations in agroforestry.	15 (15.00)	36 (36.00)	49 (49.00)
7	For maximum wood production on Teak establishment of narrow base contour bunds along with vegetative barrier at horizontal interval of 30 m is recommended.	04 (04.00)	12 (12.00)	84 (84.00)
8	In agroforestry, construction of Gabian check dam with clay blanketing for storage of runoff and loose rock dams for control of gully erosion are recommended.	08 (08.00)	45 (45.00)	47 (47.00)
9	For maximum timber production in ill drained soils, planting of Sissoo can be recommended at 40 to 60 isobath.	00 (00.00)	32 (32.00)	68 (68.00)
10	Before planting Teak seedlings should treated with IBA at the concentration of 1500 ppm solution for 12 hours.	00 (00.00)	06 (06.00)	94 (94.00)
11	In the Paddy field, teak plantation on the bunds of field is resulted more economic.	34 (34.00)	15 (15.00)	51 (51.00)
12	For maximum yield of wood, Eucalyptus should be planted at spacing of 2x1 m.	00 (00.00)	17 (17.00)	83 (83.00)
13	Harvesting (Cutting) of Eucalyptus should done at age of 8 years.	00 (00.00)	23 (23.00)	77 (77.00)
14	Plantation of Anjan grass or Stylo grass along with Babul trees to prepare a pasture on a barren land.	04 (04.00)	35 (35.00)	61 (61.00)
15	Planting seedlings with 1 meter height is suitable for early establishment of trees.	10 (10.00)	25 (25.00)	65 (65.00)
16	Application of Nitrogen 100 gm, Phosphorus 50 gm and Potash 100 gm is suitable in first and second year of plantation.	00 (00.00)	25 (25.00)	75 (75.00)
17	Planting of seedlings with scalping of Paddy bund is suitable.	00 (00.00)	24 (24.00)	76 (76.00)
18	Pruning of Teak trees after 4 years is recommended.	00 (00.00)	18 (18.00)	82 (82.00)
19	Cultivation of fodder grass like Siratro, Stylo are suitable for stabilization of Paddy bunds and tree crop diversification.	28 (28.00)	37 (37.00)	35 (35.00)
20	Application of Bourdeaux mixture on tree trunk was found effective in controlling damages to tree trunk by sun scorching.	33 (33.00)	21 (21.00)	46 (46.00)
21	Copping of Subabul tree before fruit set is recommended.	46 (46.00)	31 (31.00)	23 (23.00)
22	For biomass farming, planting of Subabul, Casulina, Kini, Maharukh, Eucalyptus found more suitable.	00 (00.00)	19 (19.00)	81 (81.00)
23	Direct sale of forest produce by avoiding middleman is more profitable.	04 (04.00)	29 (29.00)	67 (67.00)
24	For schedule trees (like Teak, Sissoo etc.) during cutting and transport permission is mandatory.	08 (08.00)	29 (29.00)	63 (63.00)
25	In agroforestry, for maximum production of timber Teak clone PDKV/AF/1 is recommended for planation.	21 (21.00)	00 (00.00)	79 (79.00)
26	Teak clone NC-21 and NE are recommended for cultivation in agroforestry.	14 (14.00)	00 (00.00)	86 (86.00)
27	Under agroforestry, in the composite unit of aquaculture may consisted of paddy, vegetables, large cardamom and fish culture besides bean cultivation on bund area of pond.	00 (00.00)	28 (28.00)	72 (72.00)
28	Multiple cropping system of rice-fallow: an alternative system of intensive cropping, namely Paddy-Potato+Wheat (grown in 1:1 ratio)-Green gram on irrigated medium land.	00 (00.00)	33 (33.00)	67 (67.00)
29	<i>Gliricidia</i> plantation with Ragi and Paddy in kharif season under rainfed condition on alley cropping.	00 (00.00)	41 (41.00)	59 (59.00)

FA- Full Adoption, PA- Partial Adoption, NA- No Adoption, Figures in parenthesis indicates percentages

It was evident from the Table 3 that, majority of the respondents (68.00%) had full adoption of plantation of tree species on bunds in East-West direction followed by 46.00 per cent of respondents were fully adopted practice copping of Subabul trees before fruit setting. 42.00 per cent of the respondents had full adoption of plantation of fruit trees on bunds in North-South direction, then the percentages of respondents fully adopting agroforestry practices were, Teak planation on bunds of paddy fields (34.00%), application of bourdeaux mixture on tree trunk for controlling damages to tree trunk by sun scorching (33.00%), cultivation of fodder grass like Siratro, Stylo are suitable for stabilization of paddy bunds tree crop diversification (28.00%) and use of Teak clone PDKV/AF/1 for plantation (21.00%), respectively.

The respondents were partially adopting paddy based agroforestry practices were, plantation of Teak, Eucalyptus, Shivan and Maharukh on paddy bunds at distance of 1.5 to 2 meters (46.00%) followed by construction of Gabian check dam with clay blanketing (45.00%), *Gliricidia* plantation with ragi and paddy in kharif season under rainfed condition on alley cropping (41.00%), plantation of tree species on bunds in East-West direction (40.00%), cultivation of fodder grass like Siratro, Stylo for stabilization of paddy bunds and tree crop diversification (37.00%), weeding, singling, fertigation, plant protection like tending operations (36.00%).

The great majority of the respondents not adopting paddy based agroforestry practices were Teak seedlings should be treated with IBA at concentration of 1500 ppm (94.00%), followed by canopy pruning of tree species recommended at the beginning of monsoon (90.00%), cultivation of Teak clone NC-21 and NE in agroforestry (86.00%), establishment of narrow base contour bunds with vegetative barriers at 30 m (84.00%), for maximum yield of wood, plantation of Eucalyptus at spacing 2x1 meter (83.00%), pruning of Teak trees after 4 years of plantation (82.00%), for maximum production of timber planting of Teak clone PDKV/AF/1 (79.00%), planting of non schedule tree species on paddy bunds (78.00%), harvesting of Eucalyptus at age of 8 years (77.00%) and planting of tree seedlings with scalping of paddy bunds (76.00%), respectively.

#### Overall adoption of paddy based agroforestry practices by the respondents

The use of paddy based agroforestry practices by the respondent farmers on their farm is referred as adoption of these practices. The distribution of the respondents according to their level of adoption of paddy based agroforestry practices has been given in Table 4

**Table 4:** Overall adoption of paddy based agroforestry practices by the respondents

Sr. No.	Adoption	Respondents (n=100)	
		Frequency	Percentage
1	Low	66	66.00
2	Medium	31	31.00
3	High	03	03.00
Total		100	100.00

It was observed from the Table 4 that, the majority of the respondents (66.00%) had low adoption of the overall paddy based agroforestry practices, followed by medium adoption (31.00%) and high adoption (03.00%). From the above result, it concluded that large majority of the respondents had low level of adoption of agroforestry practices. This finding was supported by Lambert and Ozioma (2011) [3].

#### Conclusion

The findings of study indicated that relatively higher per cent of the respondents (60.00%) had medium level of knowledge about paddy based agroforestry practices. Despite this, adoption of paddy based agroforestry practices is relatively low. To enhance the level of adoption, extension personnel should arranged more number of exhibitions, farmers' rallies, training programmes, establish rapport with respondents to convince advantages of paddy based agroforestry practices regarding environmental sustainability and more economical benefits. Government should provide special attention by providing different type of schemes and subsidies so that area under agroforestry will increase and the adoption gap will be ultimately reduced.

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