



Agroforestry Systems Practiced in Southern Part of Akola District of Maharashtra.

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ABSTRACT

The present study was undertaken in different agroforestry practices followed by the farmers in Akola district during 2013-15. 100 respondents from 10 villages of Patur tehsil were selected randomly with 10 farmers representing each village. Exploratory design of social research has been used. Vegetation analysis was done through quadrat sampling methods with 0.1% sampling intensity. The survey was conducted and data was collected by interview method using semi-structural questionnaire. Results revealed that the farmers are practicing eleven different agroforestry systems in their field namely: bund planting, boundary planting agri-silvi-pastoral and scattered plantation were only found in rainfed situation. Whereas horti-silviculture, agri-horti-silviculture, block plantation, planting along irrigation canal, kitchen garden and plantation near water sources were found in irrigated situation, except agri-silviculture which was found in both situation.

Key Words:

Agri-silviculture, Agro ecosystem, Block plantation, Boundary plantation, Bund plantation and Horti-silviculture.

INTRODUCTION

Cultivation of tree species in association with agricultural crops is an age old practice but use of term agroforestry to it is quite recent (Tewari 1995). It is collective name for land use systems and technologies where woody perennials are deliberately used on the same management units as agricultural crops and/or animals in some form of spatial arrangement or temporal sequence (Lundgren and Raintree 1982). Now a days this systems of farming has gained the attention of researchers and planners because of its potentials in providing multiple ecosystems services apart from giving livelihood security to the rural poor.

Agroforestry solutions are often location specific in their relevance, performance and farmer's acceptability (Pattanayak et.al. 2005). In the dryland ecosystems of Akola district the practice of agriculture. Hence, addition of tree components in dryland ecosystems will be helpful to improve the overall productivity and sustain it as well. Many models of different agroforestry systems are as followed by farmers in dryland such as boundary plantation, bund plantation, agrisilviculture etc.(Devaranavadi et al. 2010).

MATERIALS AND METHODS

The present study was conducted in Patur tehsil of Akola district in Vidarbha region of

Maharashtra. Akola is a central part of the Amravati division. The district boundary latitude are 20° 42' N latitude and 77° 02' E longitude . The climate is tropical with. temperature ranging from 10°C to 48°C and the annual rainfall from 750 to 950 mm. The total area of Akola district in Vidarbha region of Maharashtra is 54341 km . The district has seven tehsils namely, Akot, Balapur, Patur, Barshitakli, Murtizapur, and Akola. Out of seven tehsil, Patur tehsil has been purposively selected for the study, because of the abundance in the vegetation in and around villages. Ten villages from Patur tehsil namely Shirla Andhare, Aastul, Pastul, Kothari (Khurd), Kothari (Budruk), Khanapur, Deulgaon, Bodakha, Malrajura and Sawarkhed were selected for the study. For the present study exploratory design of social research was used.

A proforma was developed to collect the data from 10 farmers in each villages. A total of 100

farmers were interviewed using structured questionnaire. The data collected from various aspect related to agroforestry was expressed in term of per cent response from the respondent.

RESULTS AND DISCUSSION

The data pertaining to prominent agro forestry practices followed by farmers in Patur tahsil of Akola district are given in Table 1 and Fig 1. was observed that, most of the farmers are practicing boundary planting (84%) under rainfed situation in selected villages followed bund planting (72%) in rainfed situation and agri-silviculture (66%) whereas few farmers are practicing agri –silvi-pastoral (11%) and scattered planting(1%). However in Irrigated situation the farmers are practicing horti-silviculture systems is (69%) followed by , Agri-silviculture systems (9%), agri-horti-silviculture system and block plantation (1% each), Whereas Kitchen garden and Plantation along irrigation canal (27%) plantation near water sources (22%) .

Table 1. Agroforestry practices followed by farmers in Patur tehsil of Akola district under Maharashtra.

Sr. no	Agroforestry practices	Percentage of respondents following practices																					
		Aastul		Pastul		Kothari Kh		Kothari Bk		Khanapur		Shirla Andhare		Deulgaon		Bodkha		Malrajura		Sawarkhed		Average	
		R	I	R	I	R	I	R	I	R	I	R	I	R	I	R	I	R	I	R	I	R	I
1	Bund planting	100		100		80		40		100		80		100		20		10		90		72	0
2	Boundary planting	50				90		100		100		100		100		100		100		100		84	0
3	Agri – silviculture	100		100		60	40	100		50	50	40		10		100				100		66	9
4	Horti – silviculture		100		100		100		100		100		90		100							0	69
5	Agri-horti-silviculture						10															1	
6	Agri - silvi – pastoral															10		100				11	0
7	Block plantation												10									0	1
8	Scattered plantation						10															1	0
9	plantation along irrigation canal				10		40		20		50		80		70							0	27
10	Kitchen garden				40		30		30		40		60		70							0	27
11	Plantation near water sources				30		40		20		50		80									0	22

R – Rainfed Agroecosystem.

I – Iriigated Agroecosystem

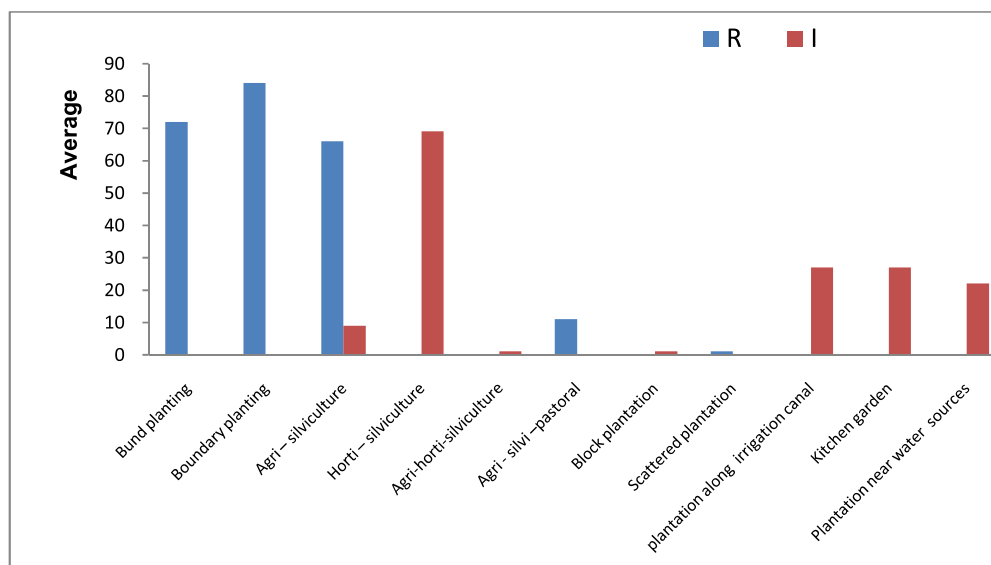


Fig. 1 Agroforestry practices followed by farmers in Patur tehsil of Akola district under Maharashtra.

The data pertaining to on composition of tree component on farm land in study area of Akola district is given Table 2 and Fig 2. *Tectona grandis* was the most frequently occurred tree species under both the conduct rainfed situations (99%) and irrigated situation (1%). Followed by *Azadirachta indica* was found in rainfed situations (26%). The other important tree species grown in agro forestry under rainfed situations included *Acacia arabica*, *Acacia catechu*, *Butea monosperma*, *Dalbergia sissoo*, *Terminallia bellerica*, *Aegle marmelos* and *Semicarpus anacardium*. Where as local grasses namely *Pennisetum purpureum* (5%)and *Dichanthium*

annulatum was observed under rainfed situations (6%). The other important fruit yielding species noticed were *Tamarindus indica* and *Emblica officinalis* (6% each), and *Ziziphus mauritiana* (9%) and *Mangifera indica* (5%) was observed under rainfed situations. Whereas *Citrus reticulata* (49%), *Punica granatum* (13%), *Citrus aurantifolia* (12%), *Mangifera indica* and *Annona squamosa* (4%), *Pisidium gujava* (3%), *Musa paradisica* (2%), were found in irrigated situations. These results are similar to the findings of Rai and Shivashankar (1994), Devaranavadi et al.(2007) and Behara and Dhir (2007).

Table 2. Composition of trees under different Agroforestry Systems

Sr. no	Composition	Percentage of respondents having components																					
		Aastul		Pastul		Kothari kh		Kothari bk		Khanapur		ShirlaAndhare		Deulagon		Bodkha		Malrajura		Sawarkhed		Average	
		R	I	R	I	R	I	R	I	R	I	R	I	R	I	R	I	R	I	R	I	R	I
1	<i>Azadirachia indica</i>	30		10		40		30		50		30		20		20		10		20		26	
2	<i>Tectona grandis</i>	100		100		100		100		100		90		100		100		100		100		99	
3	<i>Magnifera indica</i>		20			20				10		10		10		20						5	
4	<i>Musa paradistaca</i>											10		10		10						0	
5	<i>Citrus reticulata</i>	60		80		90		80		90		30		60		60						0	
6	<i>Ziziphus mauritana</i>		20			20		20		20		20		20		10				10		9	
7	<i>Psidium guajava</i>							10				10										0	
8	<i>Annona squamosal</i>																					0	
9	<i>Punica granatum</i>	40				10		10				20		80		80						0	
10	<i>Citrus aurranitifolia</i>							30		10		60		10		10						0	
11	<i>Pennisetum purpureum</i>													10				40				5	
12	<i>Dichanthium annulatum</i>																	60				6	
13	<i>Acacia catechu</i>	20				10		10		10												5	
14	<i>Acacia Arabica</i>	20		10		30		20		20		10		20		20		30		20		18	
15	<i>Tamarindus indica</i>	30				20		20		10												6	
16	<i>Butea monosperma</i>	10				20		10				20		10		10		10				8	
17	<i>Dalbergia sissoo</i>			20				10														3	
18	<i>Terminalia bellerica,</i>			30		10		10						20		20		10		10		9	
19	<i>Aegle marmelos</i>					20		10				20										5	
20	<i>Semecarpus anacardium</i>													20		10		10				2	
21	<i>Emblica officinalis</i>									20		10								10		6	

R-Rainfed Agroecosystem. I-Irrigated Agroecosystem.

Table 3. Agroforestry systems and their components.

Sr.no	Agroforestry practices	Tree Components	Fruit Tree Component	Agricultural Crop Components	
				Rabi	Kharif
1	Bund plantation	<i>Tectona grandis</i> <i>Azadirachta indica</i> <i>Tectona grandis</i> , <i>Azadirachta indica</i> , , <i>Terminalia bellerica</i> , <i>Dalbergia sissoo</i> , <i>Butea</i> <i>monosperma</i> , <i>Acacia</i> <i>catechu</i> , <i>Aegle marmelos</i> , <i>Tamarindus indica</i> , <i>Casuarina equisetifolia</i> , <i>Emblca officinalis</i> , <i>Acacia arabica</i> , <i>Ziziphus</i> <i>mauritiana</i> , <i>Semecarpus</i> <i>anacardium</i>			
2	Boundary planting				
3	Agri-silviculture	<i>Tectona grandis</i>	<i>Punica granatum</i> , <i>Magnifera indica</i> , <i>Citrus</i> <i>aunrantifolia</i> , <i>Psidium</i> <i>guajava</i> , <i>Citrus</i> <i>reticulata</i> , <i>Annona</i> <i>squamosa</i> , <i>Musa</i> <i>paradisiaca</i>		<i>Glycine max</i> , <i>Gossypium</i> ., <i>Triticum aestivum</i> , <i>Sorghum</i> <i>bicolor</i> <i>Cajanus cajan</i> and <i>Vigna radiata</i>
4	Horti-silviculture	<i>Tectona grandis</i>			
5	Agri-silvi-pastoral	<i>Tectona grandis</i> <i>Azadirachta indica</i> , <i>Pennisetum purpureum</i> and <i>Dichanthium</i>		<i>Allium Cepa</i> , <i>Gossypium</i>	<i>Sorghum bicolor</i> , <i>Cajanus</i> <i>cajan</i> , <i>Glycine max</i> , <i>Vigna</i> <i>radiata</i> and <i>Triticum aestivum</i>

6	Agri-horti-silviculture	<i>annulatum, Ziziphus mauritiana</i>	<i>Pisidium gujara, , Mangifera indica</i>	<i>Cajanus cajan, Curcuma longa</i>
7	Block plantation	<i>Tectona grandis</i>		
8	Scattered plantation	<i>Tectona grandis</i> <i>Butea monosperma</i> and <i>Azadirachta indica</i>	<i>Mangifera indica</i>	
9	Planting along irrigation canal	<i>Azadirachta indica</i>	<i>Pisidium gujara, , Mangifera indica and Ziziphus mauritiana</i>	
10	Kitchen garden	Rearing Poultry	<i>Mangifera indica, Punica granatum and Citrus aurantifolia</i>	<i>Solanum melongena, spinacea oleracia , Trigonella foenum graecum, Coariender Sativum, Cucumic sativus and Moringo oleifrea</i>
11	Plantation near water sources		<i>Citrus reticulata</i>	<i>Spinacea oleracia , Corriandrum sativum and Curcuma longa</i>

Agroforestry systems prevalent in the district along with their components are given in table 3. It was found that there were 11 different kinds of agroforestry practices.

1) Bund Plantation: Bund plantation is one of the agroforestry systems and most of the farmers adopted this practice growing trees along bunds namely *Tectona grandis*, and *Azadirachta indica*.

2) Boundary Plantation: Under boundary plantation large number of farmers adopted the practice of growing the trees species along their farm boundary to protect their farms. The major species are *Tectona grandis*, *Azadirachta indica*, *Terminalia bellerica*, *Dalbergia sissoo*, *Butea monosperma*, *Acacia catechu*, *Aegle marmelos*, *Tamarindus indica*, *Casuarina equisetifolia*, *Embllica officinalis*, *Acacia arabica*, *Ziziphus mauritiana* *Semecarpus anacardium* are grown on the boundary of the field. The practice of growing multipurpose trees on the boundary of the field may be due to full fill the local needs of the people at subsistence level.

3) Agri-silviculture systems: This system emphasizes rising of trees and cultivation of food crops in the available space between the trees. The conscious and deliberate use of land for the concurrent production of agricultural crops (including tree crops) and forest crops. The farmers are cultivating *Glycine max*, *Gossypium*, *Triticum aestivum* as cash crops and *Sorghum bicolor* as fodder and some farmer are growing *Cajanus cajan* and *Vigna radiata* on as agriculture components along with *Tectona grandis*.

4) Horti-silviculture System: This system is practiced generally on the slopes with irrigation facility. The main purpose of the systems is the production of fruit for marketing. Forest trees are grown on all the four sides of the orchard in a single or in double rows along the boundary. The purpose of these trees is wood packing of fruits, timber for construction and fuel wood production. Forest trees species are raised are *Tectona grandis*. Fruit trees include *Punica granatum*,

Mangifera indica, *Citrus aurantifolia*, *Psidium guajava*, *Citrus reticulata*, *Annona squamosa*, *Musa paradisiaca* etc. Reason is available for irrigation and people are aware about the benefits of intercropping there for horticulture crops grown along with tree crops. Similar kind of study was conducted by Verma et al (2007) in Himachal Pradesh.

5) Agri-silvipastoral System: In this system forest trees are grown which agricultural crops in combination with grasses. The farmers are growing tree species like *Tectona grandis*, *Azadirachta indica* and *Ziziphus mauritiana* for timber and fodder purpose along with grasses like *Pennisetum purpureum* and *Dichanthium annulatum* for fodder purpose. The agricultural crops like *Sorghum bicolor* are taken in between the strips of forest tree species.

6) Agri-horti-silviculture: It is systems in which fruit trees are grown in combination with agriculture crops and forest trees on the same land management unit. Tree component namely *Cajanus cajan*, and *Tectona grandis* are located.

7) Block plantation: Systematic monoculture plantations have been raised by large farmers on barren and waste land to some extent. Farmers are growing *Tectona grandis* on block plantation in study area. The farmers who have large land holding and long term goals they usually adopt block plantation practices

8) Scattered plantation: The data regarding scattered plantation are recorded in selected villages of Patur tahsil. Some farmers are maintaining scattered trees in their fields and the main species are *Butea monosperma*, *Mangifera indica* and *Azadirachta indica*.

9) Plantation along irrigation canal: Identified agroforestry systems in Patur tehsil namely; Planting along irrigation canal are observed due to availability of irrigation facility through canal systems in some areas. *Mangifera indica*, *Ziziphus mauritiana*, *Psidium guajava*, *Azadirachata indica*, tree species were observed along the irrigation canals. These species grown

for multipurpose practices and *Pisidium guajava*, *Mangifera indica* grown for fruit crops purpose and *Ziziphus mauritiana* for fruit and fodder purpose *Azadirachta indica* naturally regenerated maintained nearly canal and used for fuel and pesticides.

10) Kitchen Garden: Fruit trees along vegetable crops are grown in kitchen garden to fulfill the nutrition requirements at subsistence level species included in this systems are *Solanum melongena*, *Spinacea oleracia*, *Trigonella foenum graecum*, *Coariender sativum*, *Cucumic sativus* and *Moringo oleifrea*. *Mangifera indica*, *Punica grantum* and *Citrus aurantifolia* and rearing of Poultry.

11) Plantation near water sources: The agroforestry practices near water sources were also observed and mostly fruit crop like *Citrus reticulata* are prominent along with vegetable crop *Spinacea oleracia* and *Corriandrum sativum*, *Curcurma longa* are grown by the farmer's according to availability water sources.

The finding of the study are similar with Devaranavdgi (2007), Behera and Dhir (2013) and Illorkar (2007). Dhyani et al. (2009), Dwivedi et al. (2010) and Alao and Shuaibu (2011)

CONCLUSION

The agroforestry practices like bund planting, boundary planting, agri-silviculture, agri-silvi-pastoral and scattered plantation were only found in rainfed situation. Whereas agri-horti-silviculture, horti-silviculture, block plantation, planting along irrigation canal, kitchen garden and plantation near water sources were found in irrigated situation, except agri-silviculture which was found in both situation. *Tectona grandis* the most frequently occurred trees followed by *Tectona grandis*, *Azadirachta indica*, *Terminalia bellerica*, *Dalbergia sisoo*, *Butea perma*, *Acacia catechu*, *Aegle marmelos*, *Tamarindus indica*, *Casuarina equisetifolia*, *Emblica officinalis*, *Acacia arabica*, *Ziziphus mauritiana* *Semecarpus anacardium* Fruit trees include *Punica garanatum*, *Magnifera indica*, *Citrus*

aurantifolia, *Psidium guajava*, *Citrus reticulata*, *Annona squamosa*, *Musa paradisiaca* etc. optimum representation of all component is lacking besides the less yield agriculture crops.

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