The Pharma Innovation

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Constraints in adoption of clonal eucalyptus based intercropping agro-forestry model by farmers

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Abstract
Agro-forestry can improve the resilience of agricultural production to current climate variability as well as long-term climate change through the use of trees for intensification, diversification and buffering of farming systems. Agri-silviculture is the intercropping of timber and fuel wood species or fruit or other useful trees with vegetables and other crops in a common space. The implementation of the agro-forestry farming approach should be accompanied by organizing farmers into cooperatives in order to improve their capacity to negotiate better prices for their goods and avoid paying a percentage of their profits to intermediaries. However, the growers and practicing farmers of the area not adopting the recommended practice of Agri- silviculture as they have some constraints and problems. Jabalpur district which comprises 7 blocks. These blocks were selected purposively due to maximum number of respondents are under Clonal Eucalyptus based intercropping agro-forestry model (Agri-silviculture growers) and sole Pigeon pea growers. Out of which 3 blocks of Jabalpur district, in which 7 villages were selected purposively. On the basis of maximum number of respondents are adopted Clonal Eucalyptus based intercropping agro-forestry model (Agri-silviculture growers) and sole Pigeon pea growers. Finally the 70 respondents have been selected for the present study. The major problems reported were different categories of respondents (marginal, small, medium and large farmers) like lack of area, lack of money, lack of awareness, lack of security & market facilities, low risk bearing capacity, low level of knowledge, to grow shade loving crops, small shady effect, low management, slow decomposition rate of leaf, not grow high water & fertilizer consuming crop.

Keywords: Constraints, adoption clonal eucalyptus, agro-forestry, agri-silviculture

Introduction
Agri-silviculture is the intercropping of timber and fuel wood species or fruit or other useful trees with vegetables and other crops in a common space, at the same time. Agro-forestry can improve the resilience of agricultural production to current climate variability as well as long-term climate change through the use of trees for intensification, diversification and buffering of farming systems. Trees have an important role in reducing vulnerability, increasing resilience of farming systems and buffering agricultural production against climate-related risks. Trees are deep rooted and have large reserves as well as less susceptible than annual crops to inter-annual variability or short-lived extreme events like droughts or floods. Thus, tree-based systems have advantageous for maintaining production during adverse situation. Secondly trees improve soil quality by adding more organic matter to soil fertility by contributing to water retention and by reducing water stress during low rainfall years. Tree-based systems also have higher evapo-transpiration rates than crops or pastures. Hence it maintain aerated soil conditions by pumping excess water out of the soil profile more rapidly than other production systems if there is sufficient rainfall/soil moisture.

The implementation of the agro-forestry farming approach should be accompanied by organizing farmers into cooperatives in order to improve their capacity to negotiate better prices for their goods and avoid paying a percentage of their profits to intermediaries. Joining cooperatives gives farmers the status of organised producers, facilitating access to larger markets and fair trade certification. As a result, farmers' income can be rised significantly. Farmers should also receive training on management issues, decision-making and participation in local administration.

However, the growers and practicing farmers of the area not adopting the recommended practice of Agri-silviculture as they have some constraints and problems. Therefore these problems need to be identified so that the solutions or alternates may be provided for them.

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Keeping the above facts in view the present study was conducted.

Methodology

A study on constraints analysis of Agri- Silviculture growers was conducted to find out problems or difficulties in details, which limit the process of technology adoption and increasing productivity of crops under Agri- Silviculture in Jabalpur district of Madhya Pradesh. Jabalpur district which comprises 7 blocks namely Patan, Shahpura, Majholi, Sihora, Panagar, Kundam and Jabalpur blocks. These blocks were selected purposively due to maximum number of respondents are under Clonal Eucalyptus based intercropping agro-forestry model (Agri-silviculture growers) and sole Pigeon pea growers. Out of which Panagar, Shahpura and Sihora block of Jabalpur district, in which 7 villages Urdwa khurd, Umariya choubey, Pipariya, Maili, Kunakheda, Muskura and Mohtara were selected purposively. On the basis of maximum number of respondents are adopted Clonal Eucalyptus based intercropping agro-forestry model (Agri-silviculture growers) and sole Pigeon pea growers. Out of 35 respondents Agri-silviculture growers and 35 respondents sole Pigeon pea growers have been selected through proportionate random sampling method, from the same villages. Finally the 70 respondents have been selected for the present study.

Results and Discussion

The data presented in Table 1 shows the distribution of respondents according to their age. In case of Agri-silviculture growers, 34.28% belongs to young age group, 40.00% with middle age group and 25.72% to old age group. Similarly, in case of sole Pigeon pea growers, 28.57%, 37.15% and 34.28% belongs to young, middle age and old age group, respectively. Jatav (2010) [12] reported that majority of beneficiaries belong to middle age.

Table 1: Distribution of respondents according to their Age

S. No.	Categories	Frequency (%) Agri-Silviculture	Frequency (%) Sole Pigeon pea
1	Young age (18 to 35 years)	12 (34.28)	10 (28.57)
2	Middle age (36 to 50 years)	14 (40.00)	13 (37.15)
3	Old age (Above 50 years)	9 (25.72)	12 (34.28)
	Total	35	35

Table 2 shows the education of Agri-silviculture growers and sole Pigeon pea growers, In case of Agri-silviculture growers, 5.71% of the respondents had no education, while 2.87% of the respondents could read only, 5.71% of the respondents could read & write both, 11.42% of the respondents had education up to primary school, 20.00% had education up to middle school, 22.85% of the respondents had up to high school and 17.15% up to higher secondary school. Only 8.58% and 5.71% of the respondents had education up to graduation and post graduation respectively.. Similarly, In case of sole Pigeon pea growers, 11.42% of the respondents could no education, while 8.58% of the respondents could read only, 11.42% of the respondents could read & write both. 20.00% of the respondents had education up to primary school, 14.28% had education up to middle school, 17.15% of the respondents had up to high school, 8.58% of the

respondents had up to higher secondary school, 5.71% of the respondents had education up to graduation and about 2.87% of the respondents had education up to post graduation. Jatav (2010) [12] reported that majority of beneficiaries belong to middle age, medium level of education and medium size of land holding.

Table 2: Distribution of respondents according to their Education

S. No.	Categories	Frequency (%) Agri-Silviculture	Frequency (%) Sole Pigeon pea
1	Illiterate	2 (5.71)	4 (11.42)
2	Can read only	1 (2.87)	3 (8.58)
3	Can read & write both	2 (5.71)	4 (11.42)
4	Up to Primary school	4 (11.42)	7 (20.00)
5	Up to Middle school	7 (20.00)	5 (14.28)
6	Up to High school	8 (22.85)	6 (17.15)
7	Up to Higher secondary school	6 (17.15)	3 (8.58)
8	Up to Graduate	3 (8.58)	2 (5.71)
9	Up to post Graduate	2 (5.71)	1 (2.87)
	Total	35	35

The data in Table 3 shows the distribution of respondents according to their Caste. In case of Agri-silviculture growers, 11.43 percent belonged to Schedule Tribe, 17.14 percent belonged to Schedule Caste, 37.14 percent belonged to Other Backward Classes and 34.29 percent belonged to general category Similarly, In case of sole Pigeon pea growers, 31.43 percent belonged to Schedule Tribe, 20.00 per cent belonged to Schedule Caste, 28.57 percent belonged to Other Backward Classes and 20.00 per cent belonged to general category of caste. Verma (2013) [13] observed that majority of the beneficiaries belonged to middle high school level of education.

Table 3: Distribution of respondents according to their Caste

S. No.	Categories	Frequency (%) Agri-Silviculture	Frequency (%) Sole Pigeon pea
1	Schedule Tribe	4 (11.43)	11 (31.43)
2	Schedule Caste	6 (17.14)	7 (20.00)
3	Other Backward Classes	13 (37.14)	10 (28.57)
4	General	12 (34.29)	7 (20.00)
	Total	35	35

The data presented in table 4 indicates percentage distribution of respondents according to their size of land holding. In case of Agri-silviculture growers, 8.57 percent had marginal size of land holding, 20.00 percent had small, 42.85 percent had medium and 28.58 percent had large size of land holding. Similarly, in case of sole Pigeon pea growers, 22.85 percent had marginal size of land holding, 34.28 percent had small,

25.72 percent had medium and 17.15 percent had large size of land holding.

Table 4: Distribution of respondents according to their size of land holding

S. No.	Categories	Frequency (%) Agri- Silviculture	Frequency (%) Sole Pigeon pea
1	Marginal farmers (up to 1 ha)	3 (08.57)	8 (22.85)
2	Small farmers (1.01 to 2 ha)	7 (20.00)	12 (34.28)
3	Medium farmers (2.01 to 4 ha)	15 (42.85)	9 (25.72)
4	Large farmers (more than 4 ha)	10 (28.58)	6 (17.15)
	Total	35	35

The percentage distribution of respondents according to their annual income are presented in Table 5. In case of Agri-silviculture growers, 20.00 percent had low income, 45.71 percent had medium income and 34.29 percent had high income. Similarly, in case of sole Pigeon pea growers, 42.85 percent had low income, 40.00 percent had medium income and 17.15 percent had high income.

Table 5: Distribution of respondents according to their annual income

S. No.	Categories	Frequency (%) Agri- Silviculture	Frequency (%) Sole Pigeon pea
1	Low income (up to Rs.40,000)	7 (20.00)	15 (42.85)
2	Medium income (Rs. 40,001 to 2.5lakh)	16 (45.71)	14 (40.00)
3	High income (more than Rs.2.5lakh)	12 (34.29)	6 (17.15)
	Total	35	35

Table 6 indicates the percentage distribution of respondents of Agri-silviculture growers and sole Pigeon pea growers according to their social participation. In case of Agri-silviculture growers, 17.15 percent were having low social participation, 51.42 percent had medium social participation, while 31.43 percent were having high social participation. In case of sole Pigeon pea growers, 54.28 percent were having low social participation, 25.72 percent were having medium social participation, while 20.00 percent were having high social participation.

Table 6: Distribution of respondents according to their Social participation

S. No.	Categories	Frequency (%) Agri- Silviculture	Frequency (%) Sole Pigeon pea
1	Low Social participation (up to 8 scores)	6 (17.15)	19 (54.28)
2	Medium Social participation (9 to 16 scores)	18 (51.42)	9 (25.72)
3	High Social participation (more than 16 scores)	11 (31.43)	7 (20.00)
	Total	35	35

Table 7 shows the percentage distribution of respondents of Agri-silviculture growers and sole Pigeon pea growers according to their contact with extension agencies. In case of Agri-silviculture growers 22.85 percent had low contact,

while 45.72 percent had medium and 31.43 percent had high contact. Similarly in case of sole Pigeon pea growers 37.15 percent had low contact, while 42.85 percent had medium and 20.00 percent had high contact.

Table 7: Distribution of respondents according to their contact with extension agencies

S. No.	Categories	Frequency (%) Agri- Silviculture	Frequency (%) Sole Pigeon pea
1	Low Contact (up to 6 scores)	8 (22.85)	13 (37.15)
2	Medium Contact (7 to 12 scores)	16 (45.72)	15 (42.85)
3	High Contact (13 to 18scores)	11 (31.43)	7 (20.00)
	Total	35	35

Table 8 shows the percentage distribution of respondents according to their area uses under model and sole crop. In case of Agri-silviculture growers, 100 percent were having marginal area under agro-forestry model because demonstration covers 1 ha area only, while other category of farmers were having 00.00 percent. Similarly, in case of sole Pigeon pea growers, 48.57 percent had marginal area, 25.71 percent had small area under sole Pigeon pea growers, 17.15 percent had medium and 8.57 percent had large area uses under sole Pigeon pea growers.

Table 8: Distribution of respondents according to their area uses under model and sole crop

S. No.	Categories	Frequency (%) Agri- Silviculture	Frequency (%) Sole Pigeon pea
1	Marginal farmers (up to 1 ha)	35 (100.00)	17 (48.57)
2	Small farmers (1.01 to 2 ha)	0 (0.00)	9 (25.71)
3	Medium farmers (2.01 to 4 ha)	0 (0.00)	6 (17.15)
4	Large farmers (above 4 ha)	0 (0.00)	3 (8.57)
	Total	35	35

Table 9 shows the marginal farmers (up to 1 ha) 3 respondents in which 100.00% of respondents had lack of area, lack of money, low risk bearing capacity and uprooting of trees while lack of awareness, lack of security & market facilities and low level of knowledge had 66.66%.

Table 9: Distribution of respondents according to problems faced by the Marginal farmers under clonal eucalyptus based inter-cropping agro-forestry model

S. No.	Categories	Frequency	Percentage	Rank
1	Lack of area	3	100.00	I(A)
2	Lack of money	3	100.00	I(B)
3	Lack of awareness	2	66.66	II(A)
4	Lack of security & market facilities	2	66.66	II(B)
5	Low risk bearing capacity	3	100.00	I(C)
6	Low level of knowledge	2	66.66	II(C)
7	Uprooting of trees	3	100.00	I(D)

Table10 shows the small farmers (1.01 to 2 ha) 7 respondents in which 42.85% respondents had lack of money, Insect (termites), Low management and Lack of awareness 57.14%, Small shady effect 100.00% and 71.42% respondents had

Low risk bearing capacity and uprooting of trees.

Table 10: Distribution of respondents according to problems faced by the Small farmers of the clonal eucalyptus based inter-cropping agro-forestry model

S. No.	Categories	Frequency	Percentage	Rank
1	Lack of money	3	42.85	IV(A)
2	Low risk bearing capacity	5	71.42	II(A)
3	Low management	4	57.14	III(A)
4	Small shady effect	7	100.00	I
5	Lack of awareness	4	57.14	III(B)
6	Insect (termites)	3	42.85	IV(B)
7	Uprooting of trees	5	71.42	II(B)

Table 11 shows the medium farmers (2.01 to 4 ha) 15 respondents, in which 66.66% respondents had slow decomposition rate of leaf, To grow shade loving crops 60.00%, Allelopathic effect on crops 46.66%, Insect (termites) 40.00% and 53.33% respondents had uprooting of trees.

Table 11: Distribution of respondents according to problems faced by the Medium farmers of the clonal eucalyptus based inter-cropping agro-forestry model

S. No.	Categories	Frequency	Percentage	Rank
1	Slow decomposition rate of leaf	10	66.66	I
2	Growing of shade loving crops	9	60.00	II
3	Allelopathic effect on crops	7	46.66	IV
4	Insect (termites) attack	6	40.00	V
5	Uprooting of trees	8	53.33	III

Table 12 shows the large farmers (more than 4 ha) 10 respondents in which 80.00% respondents had to grow shade loving crops, Not grow high water & fertilizer consuming crop like sugarcane, cotton etc.100.00%, Slow decomposition rate of leaf 20.00%, Allelopathic effect on crops 60.00%, Insect (termites) 30.00% and 40.00% respondents had uprooting of trees.

Table 12: Distribution of respondents according to problems faced by the Large farmers of the clonal eucalyptus based inter-cropping agro-forestry model

S. No.	Categories	Frequency	Percentage	Rank
1	Growing of shade loving crops	8	80.00	II
2	Not grow high water & fertilizer responding crop like sugarcane, cotton etc.	10	100.00	I
3	Slow decomposition rate of leaf	2	20.00	VI
4	Insect (termites)	3	30.00	V
5	Allelopathic effect on crops	6	60.00	III
6	Uprooting of trees from the field	4	40.00	IV

Table 13 shows the suggestions made by Agri-silviculture growers. The table clearly indicates that 100.00% of the respondents suggested that collect the information from all the sources for like plant materials, marketing and technical information etc, followed by uprooting of trees by jcb machine 80.00%, Proper tillage for aeration and decomposing of leafs 74.28%, 57.14% respondents suggested that to grow only suitable crops, 42.85% used of proper decomposed F.Y.M., 17.14% respondents suggested that Plantation of trees on the farm bunds.

Table 13: Distribution of respondents according to their suggestions for making the clonal eucalyptus based inter-cropping agro-forestry model more effective

S. No.	Suggestions	Frequency	Percentage	Rank
1.	Plantation of trees on the farm bunds	6	17.14	VI
2.	Proper tillage	26	74.28	III
3.	To grow only suitable crops	20	57.14	IV
4.	used of Proper decomposed F.Y.M.	15	42.85	V
5.	Collect the information from all the sources	35	100.00	I
6.	Uprooting of trees by jcb machine	28	80.00	II

Conclusion

The socio economic status and constraints face by respondents have been studied that in both Agri-silviculture growers and sole Pigeon pea growers belongs to, higher percentage middle age group, education up to high school, while in case of sole Pigeon pea growers, high percentage had education up to primary school. Higher percentage of the Agri-silviculture growers belonged to Other Backward Classes, while in case of sole Pigeon pea growers, high percentage had Schedule Tribe. Higher percentage of the Agri-silviculture growers had medium size of land holding and higher percentage of sole Pigeon pea growers belonged to small size of land holding. Higher percentage of the Agri-silviculture growers had medium income and higher percentage of sole Pigeon pea growers belonged to low income. Thus maximum of Agri-silviculture growers had medium social participation, while maximum of sole Pigeon pea growers had low social participation. The major problems reported were different categories of respondents (marginal, small, medium and large farmers) like lack of area, lack of money, lack of awareness, lack of security & market facilities, low risk bearing capacity, low level of knowledge, to grow shade loving crops, small shady effect, low management, slow decomposition rate of leaf, not grow high water & fertilizer consuming crop. Allelopathic effect on crops, Insect (termites) and uprooting of trees. Majority of the respondents of Agri-silviculture growers suggested that collect the information from all the sources for like plant materials, marketing and technical information etc, uprooting of trees, Proper tillage for aeration and decomposing of leafs, to grow only suitable crops, use of proper decomposed F.Y.M., Plantation of trees on the farm bunds.

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