



## Research Article

# CONSTRAINTS AND PROSPECTS IN AGRO-FORESTRY FARMING SYSTEM FOR SUSTAINABLE LIVELIHOOD

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**Abstract-** The study was undertaken in two districts of Haryana state namely, Yamuna Nagar and Kaithal and a total no. of one hundred twenty respondents were interviewed. The findings further revealed that (64.20%) of respondents perceived medium prospects of Agro-forestry, whereas, (33.30%) respondents perceived low and (2.5%) respondents perceived high prospects of Agro-forestry. The study concluded that most of the respondents believed to have medium level of technical prospects (96.70%), economical prospects (61.70%), social prospects (97.50%) and ecological prospects (94.2%) regarding Agro-forestry. They also believed to have low level of entrepreneurial prospects (56.70%). Problems encountered by the respondents in adoption of Agro-forestry revealed that there were 56.7% of respondents who believed to have medium problems regarding Agro-forestry adoption such as financial, technical, production, input management and other problems.

**Keywords-** Greenhouse Gases Causes, Losses, Remedial Measures, and Sustainable Agriculture.

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## Introduction

Trees play an important role in ecosystem in all terrestrials and provide a range of products and services to rural and urban people. In addition, in this era of global warming, fast degradation of land productivity and other environmental hazards, Agro-forestry is indeed a stake for natural resources and socio-economic sustainability. Agro-forestry is found to be the most desirable strategy for maintaining social, economic and ecological sustainability in India. Agro-forestry is an agriculture enterprise and subject to all the associated seasonal problems i.e. drought, fire, pests, diseases and floods. Most tree growers only plant, tend and harvest once in a lifetime, therefore often lack forest management and marketing expertise. The role of Agro-forestry in protecting the environment and providing a number of ecosystem services is a key benefit for integrating trees into farming systems. Other such benefits include regulation of soil, water and air quality, enhancement of biodiversity, pest and disease control, and climate change mitigation and adaptation.

## Materials and Methods

The present study was conducted in Haryana state and two districts Yamuna Nagar and Kaithal were selected, randomly. From each district, two blocks were selected randomly. Further, two villages were selected from each block making eight villages. From each village, fifteen respondents were selected randomly, making a total sample of 120 respondents. Hence, one hundred twenty respondents were interviewed for the study. The data were collected personally by the researcher through a well-structured interview schedule containing items pertained the objective of the study.

## Result

### Overall Prospects of Agro-forestry

The overall results of Agro-forestry prospects received by the respondents were presented below in Table. It was revealed that, 64.2 per cent of respondents who

believed to have medium prospects of Agro-forestry followed by 33.3 per cent respondents have low and 2.5 per cent of respondents perceived high prospects of Agro-forestry. This shows that about two third of the respondents perceived medium to high level of Agro-forestry prospects, hence the future of Agro-forestry is bright under these circumstances.

**Table-1 Overall Prospects of Agro-forestry (n=120)**

Sr. No.	Category(s)	Frequency of Respondent (s)	Percentage (s)
1	Low (62-103)	40	33.30
2	Medium (104-145)	77	64.20
3	High (146-186)	3	02.50

### Aspect-wise Prospects of Agro-Forestry

This section is concerned with the prospects of agro-forestry about various aspects i.e. technical prospects, economical prospects, social prospects, ecological prospects and entrepreneurial prospects. The aspects wise prospects has been presented and discussed in this section.

### Technical Prospects

It was found that most of the respondents (96.7%) perceived medium level of technical prospects of agro-forestry and 3.30 per cent perceived to have low level of prospects regarding agro-forestry. However, none of the respondents perceived high level of technical prospects of agro-forestry. The findings of the study are in consonance with the study of **Jose (2004)** [3] who reported that the deeper rooting tree component of an agro-forestry system is able to intercept nutrients leached out of the crop rooting zone, thus reducing pollution and, by recycling nutrients as leaf litter and root decomposition, increasing nutrient use efficiencies.

### Economical Prospects

The study concluded that two third (61.07 %) of farmers perceived medium level of economical prospects followed by low (38.30 %) level of prospects and none of farmers perceived high economical prospects, respectively in agro forestry practicing respondents. These results are supported by Garrity (2010) [2] and Dhillon et. al. (2000) [5] who reported that economic benefits of poplar plantation in Yamunanagar (Haryana) is very high and sensitivity analysis indicates that this system is not risky. These findings of the study are also in consonance with the study of Pattanayak et al. (2003) [4].

**Table-2 Aspect-wise Prospects of Agro-Forestry (n=120)**

Sr. No.	Category (s)	Frequency (s)	Percentage (s)
<b>A. Technical Prospects</b>			
1	Low (13-21)	4	3.3
2	Medium (22-30)	116	96.7
3	High (31-39)	0	0
<b>B. Economical Prospects</b>			
1	Low(11-17)	46	38.3
2	Medium(18-25)	74	61.7
3	High(26-33)	0	0
<b>C. Social Prospects</b>			
1	Low (14-23)	3	2.5
2	Medium (24-33)	117	97.5
3	High (33-42)	0	0
<b>D. Ecological Prospects</b>			
1	Low (12-20)	7	5.8
2	Medium (21-29)	113	94.2
3	High (30-36)	0	0
<b>E. Entrepreneurial Prospects</b>			
1	Low (11-17)	68	56.7
2	Medium (18-25)	45	38.2
3	High (26-33)	7	5.8

### Social Prospects

The study also revealed that a most of the respondents (97.50%) perceived that the medium level of social prospects regarding agro-forestry and few of them (2.50%) perceived low-level social prospects. None of them perceived high level of social prospects. The results are supported by Garrity (2010) and Dhillon et al. (2000) [2, 5] who reported that economic benefits of poplar plantation in Yamunanagar (Haryana) is very high and sensitivity analysis indicates that this system is not risky.

### Ecological Prospects

The study future elaborates the ecological prospects of agro-forestry perceived by respondents. This shows that most of the respondents (94.20%) perceived medium level of prospects regarding agro-forestry and 5.80 per cent respondent has perceived low ecological prospects. These findings of the study are also in consonance with the study of Chaturvedi et. al. (2011) and Pattanayak et. al. (2003) [1, 4].

### Entrepreneurial Prospects

It was found that a great majority of the respondents (56.70%) perceived low prospects regarding entrepreneurial aspects of agro-forestry followed by (38.2%) respondents had medium and (5.80%) respondents had high entrepreneurial prospects regarding agro-forestry. This shows that most of the respondents perceived low to medium level of prospects of entrepreneurial aspects of agro-forestry. The results are supported by Pretty (2005) [6] and Volk (2006) [7] found that diversifying the range of products produced locally benefits the local community in a number of ways.

### Correlation between independent variable and prospects Agro-forestry

The zero order correlation was computed to determine the relationship between background variable of respondents with the prospects of Agro-forestry. The study indicated that the age ( $r=-0.2869$ ) had negatively and highly significant correlation (at 0.01 level of probability) with prospects of Agro-forestry. However, the correlation coefficients of education ( $r=0.3025$ ), extension contact ( $r=0.2425$ ) and

mass media exposure ( $r=0.2121$ ) were positively and highly significant (at 0.01 level of probability) correlation with prospects of Agro-forestry. While the correlation coefficients of social participation ( $r=0.1941$ ), economic motivation ( $r=0.1924$ ) and scientific orientation ( $r=0.2157$ ) were found to be positive and significant at 0.05 per cent of probability. The Correlation coefficients of land holding ( $r=0.0614$ ), irrigation facility ( $r=0.0761$ ) and risk orientation( $r=0.1692$ ) were found to be non-significant

**Table-3 Correlation Coefficient of Independent Variables with Agro-forestry Prospects (n=120)**

Sr. No.	Independent variable(s)	Prospects
1	Age	-0.2869**
2	Education	0.3025**
3	Social participation	0.1941*
4	Land holding	0.0614
5	Extension contact	0.2425**
6	Mass media exposure	0.2121**
7	Irrigation facilities	0.0761
8	Risk orientation	0.1692
9	Economic motivation	0.1924*
10	Scientific orientation	0.2157*

\*Significant at 0.05 level of probability

\*\*Significant at 0.01 level of probability

### Multiple Regression Coefficients of Respondents' Independent Variable with Agro-forestry's Prospects

To predict the contribution of background variables on the prospects of Agro-forestry, the data were subjected to multiple regression analysis. The results are presented in below Table. The partial regression coefficients of education were highly significant (at 0.01 level of probability) but age, social participation and mass media

Exposures were found to be significant (at 0.05 level of probability). The remaining variables viz. land holding, extension contact, irrigation facility, risk orientation, economic motivation and scientific orientation were not found to be significant. The data also showed that all the variables included in the study collectively explained 53.00 per cent variation in prospects of Agro-forestry, when other factors kept constant.

**Table-4 Multiple Regression Coefficients of Respondents' Independent Variable with Agro-forestry's Prospects (n=120)**

Sr. No.	Independent Variable (s)	Regression Coefficients	t' value (s)
1	Age	-0.7852*	0.4389
2	Education	1.9051**	3.0091
3	Social participation	1.4120*	0.2409
4	Land holding	0.2093	0.0968
5	Extension contact	-0.7858	0.2985
6	Mass media exposure	0.1897*	2.1806
7	Irrigation facilities	0.6381	1.6735
8	Risk orientation	-0.7508	0.5120
9	Economic motivation	-0.3774	0.2740
10	Scientific orientation	1.2972	0.2538

$R^2=0.5291$

\*Significant at 0.05 level of probability

\*\*Significant at 0.01 level of probability

### Problems encountered by the respondents in adoption of Agro-forestry

In the light of the objectives of the study, it was imperative to determine the technical problem encountered by respondents in adoption of Agro-forestry. To identify the seriousness of problems encountered by the respondents in adoption of Agro-forestry a schedule consisting of 36 statements had been determined with the help of weighted score, the respondents were asked to give their responses on three point continuum i.e. very series, series and not so series about the nature of the problem and the weights of 3, 2 and 1 were assigned, respectively. The score so obtained on all the items were summed up. The summed score was the respondents' problem score. Accordingly, on this the respondents were distributed in low, medium and high problem categories. Scores for each statement were also worked out, the mean score of each problem calculated, ranks were assigned

accordingly, and data are presented as under:

### Financial problems encountered by the respondents in adoption of Agro-forestry

It is apparent from [Table-5] that among problems related financial aspects in adoption of Agro-forestry the statement 'Marketing risks for Agro-forestry produce' was found to be highest as it ranked first with mean score = 2.22, followed by the statement 'Lack of respondent's knowledge about credit sources' (mean score=2.21). The problem 'Lack of collateral security to secure loans to support farming' (mean score=2.21) occupied IIIrd position. The statement 'Problem of proper market for small scale AFS' (mean score=2.1) occupied IVth position. Other important problems perceived by the respondents in adoption of Agro-forestry were 'High initial cost of AFS' (mean score = 1.8), 'No provision of subsidy for AFS' (mean score = 1.46), 'Cost of tree production is very high' (mean score = 1.42) and 'Protection of trees from animals require a lot of labour cost' (mean score = 1.35) were secured Vth, VIth, VIIth and VIIIth, ranks, respectively.

The study got strength from **Current and Scherr (1995) [9]** who found that lack of financial credit is not a major constraint to adopting Agro-forestry practices because of the small size of farms and scale of operations, the incremental approach that respondents use to plant trees and the desire of most respondents to avoid risks.

**Table-5 Financial Problems Encountered by the Respondents in Adoption of Agro-Forestry (n=120)**

S.No.	Statement	W.M	C.F	RANK
1	Marketing risks for Agro-forestry produce	267	2.22	I
2	Lack of respondent's knowledge about credit sources	266	2.21	II
3	Lack of collateral security to secure loans to support farming	260	2.16	III
4	Problem of proper market for small scale AFS	252	2.1	IV
5	High initial cost of AFS	216	1.8	V
6	No provision of subsidy for AFS	176	1.46	VI
7	Cost of tree production is very high	171	1.42	VII
8	Protection of trees from animals require lot of labour cost	163	1.35	VIII

### Technical problems encountered by the respondents in adoption of Agroforestry

The results pertaining to the technical problems encountered by the respondents in adoption of Agro-forestry are presented in [Table-6] The data in table revealed that 'Marketing risks for Agro-forestry produce' got 1st rank with mean score= 3.0 followed by 'Lack of respondent's knowledge about credit sources' (mean score = 2.6). Third rank was secured by problem 'Lack of collateral security to secure loans to support farming' (mean score=2.49). The statement 'Problem of proper market for small scale AFS' (mean score= 2.25), 'High initial cost of AFS' (mean score= 2.22), 'No provision of subsidy for AFS' (mean score= 2.0), 'Cost of tree production is very high' (mean score = 1.88) and 'Protection of trees from animals require lot of labour cost' (mean score= 1.69) were occupied IVth, Vth, VIth, VIIth and VIIIth ranks, respectively.

**McGinty et al. (2008) [10]** supported this study and **Giller et al. (2009) [8]** found in Bahia (Brazil) revealed that the respondents were unable to adopt and maintain Agro-forestry without external financial and technical support.

### Production problems encountered by the respondents in adoption of Agro-forestry

An examination of the data presented in [Table-7] indicates that production problems namely, 'Lack of interest among respondents due to long duration of return' (mean score=2.65) was ranked first with highest mean score followed by the statement 'Farming risks for Agro-forestry produce' (mean score= 2.16). 'Lack of availability of market for AF produce at local level' (mean score= 2.12) occupied IIIrd position. 'Lack of knowledge regarding Agro-forestry' (mean score= 2.01) and 'Lack of awareness of right stage of harvesting of trees' (mean score=1.76) secured IVth and Vth ranks, respectively.

**Table-6 Technical Problems Encountered by the Respondents in Adoption of Agro-Forestry (N=120)**

Sr. No	Statement	W.M	C.F	RANK
1	Lack of awareness about proper direction of rows of trees for better crop production	361	3.00	I
2	Lack of awareness of the respondent about modern farming methods	312	2.6	II
3	Lack of availability of quality of planting Material	299	2.49	III
4	Lack of knowledge about pruning of trees	271	2.25	IV
5	Lack of knowledge about proper selection of tree and crop combination for respondent's field conditions	267	2.22	V
6	Lack of awareness about proper spacing of different tree species	241	2.00	VI
7	Lack of knowledge of tree management Practice	226	1.88	VII
8	Lack of awareness about availability of quality planting materials	203	1.69	VIII

**Table-7 Production Problems Encountered by the Respondents in Adoption of Agro-Forestry (N=120)**

Sr. No	Statement	W.M	C.F	RANK
1	Lack of interest among respondents due to long duration of return	318	2.65	I
2	Farming risks for Agro-forestry produce	260	2.16	II
3	Lack of availability of market for AF produce at local level	255	2.12	III
4	Lack of knowledge regarding Agro-forestry production technology	242	2.01	IV
5	Lack of awareness of right stage of harvesting of trees	212	1.76	V

### Input Management problems encountered by the respondents in adoption of Agro-forestry

It is apparent from [Table-8] that main input management problems of Agro-forestry were 'Lack of quality seedling for AFS' (mean score= 2.16), followed by 'Lack of knowledge about proper finishing of wood for market' (mean score=2.16) and 'Non availability of wood harvesting and processing implements at village level' (mean score=2.16). Fourth and fifth ranks were occupied by problems 'Lack of knowledge about application of fertilizer and irrigation schedule for trees' (mean score=2.16) and 'Lack of knowledge of proper size of wood for fetching higher market price' (mean score=2.16), respectively.

**Table-8 Input Management Problems Encountered by the Respondents in Adoption of Agro-forestry (N=120)**

Sr. No	Statement	VS (3)	S (2)	NS (1)	W.M	C.F	RANK
1	Lack of quality seedling for AFS	141	62	42	245	2.04	I
2	Lack of knowledge about proper finishing of wood for market	16	86	45	227	1.89	II
3	Non availability of wood harvesting and processing implements at village level	93	70	54	217	1.80	III
4	Lack of knowledge about application of fertilizer and irrigation schedule for trees	93	66	56	215	1.79	IV
5	Lack of knowledge of proper size of wood for fetching higher market price	84	86	49	290	1.28	V

### Miscellaneous problems encountered by the respondents in adoption of Agro-forestry

So far miscellaneous problems of Agro-forestry were concerned it was evident from [Table-9] that 'Lack of interest among respondents due to long duration of return' (mean score=2.55) and 'Inadequate compensation for destroyed trees' (mean score=2.43) consider as major technical constraint and assigned 1st and

11th ranks, respectively. 'Lack of storage facilities' (mean score=2.38), 'Allelopathy effect on main crop' (mean score=2.38) and 'Seasonal occurrence of plant diseases' (mean score = 2.16) were (score=1.83), 'Increase damage to crops due to pests for which the tree serve as alternate hosts' ranked were occupied 11th, 12th and 13th ranks, respectively. The problems of 'Lack of extension service in AF' (mean score=2.13), 'Damage to main crops during tree harvest operation' (mean score=2.11), 'Reduction in main crop yields due to interference of trees' (mean score=1.82) and 'Damage to trees during the burning of crop residues' (mean score = 1.80) were got 14th, 15th, 16th, 17th, 18th, 19th and 20th ranks, respectively.

**Table-9** Miscellaneous problems encountered by the respondents in adoption of Agroforestry

Sr. No	Statement	W.M	C.F	RANK
1	Lack of interest of respondents to replace the food crops with trees, especially where land is scarce	307	2.55	I
2	Inadequate compensation for destroyed trees	292	2.43	II
3	Lack of storage facilities	286	2.38	III
4	Allelopathy effect on main crop	281	2.34	IV
5	Seasonal occurrence of plant diseases	260	2.16	V
6	Lack of extension service in AF	256	2.13	VI
7	Damage to main crops during tree harvest Operation	254	2.11	VII
8	Reduction in main crop yields due to interference of trees	220	1.83	VIII
9	Increase damage to crops due to pests for which the tree serve as alternate hosts	219	1.82	IX
10	Damage to trees during the burning of crop residues	217	1.80	X

## Conclusion

Keeping in view the results of study it is concluded that timely training should be imparted to increase the awareness among the farmers regarding prospects of agro forestry. We have to adopt agriculture forest farming system to maintain the sustainability of natural resources because it is eco-friendly and proper land use system, which is scientifically sound, economically desirable and acceptable to the farmer. For the best results from this practice or to maintain the sustainability, we should select well suitable or compatible trees. There should also extension services to agro forestry as like agriculture.

The study conducted on problems encountered by the respondents in adoption of Agro-forestry revealed that there were 56.7% of respondents who believed to have medium problems regarding Agro-forestry adoption such as financial, technical, production, input management and other problems. For the best results from this practice or to maintain the sustainability measures are required to overcome lack of planting materials (seeds, seedlings or cuttings) and respondents should select well suitable or compatible trees. The study further indicated that a significant majority of the respondents had not adopted the recommended Agro-forestry practices. Therefore, it would be worthwhile for the government functionaries to organize training, demonstration and take up appropriate educational programs so that the respondents can get required information and skills to adopt the new methods and practices time to time.

## Conflict of Interest: None declared

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