Farmers' Perceptions of Adopting Agroforestry Practices in the Moradabad District of Western Uttar Pradesh.

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Abstract: The study was performed to learn about farmers' perceptions and socioeconomic analyses of adopting agroforestry methods in villages in Moradabad district, western Uttar Pradesh. A standard questionnaire was used to gather and analyse data on respondents from eight villages across four tehsils in Moradabad district. A total of 400 respondents were recruited, with 50 from each community. The majority of respondents were young (<30 years), middle-aged (30-55 years), and elderly (>55 years), with 72% being male. The majority of workers (82.17%) were locals. More than 75% of them had adopted an agri-silviculture system. Most of them grew poplar and eucalyptus alongside other crops such as wheat, rice, maize, and sorghum. Farmers faced a variety of obstacles, including poor marketing systems/channels, low commodity prices, reduced crop productivity, and a lack of family support, among others.

Keywords:
Perception, agribusiness, limits, and marketing systems.

INTRODUCTION

Agriculture is the largest sector of the Indian economy, accounting for around 19.9% of GDP and employing between 50 and 60% of the labor force. Rapid population expansion has increased demand for finite resources such as agricultural, forest, and land resources. To meet the needs of a rising population, it is critical to determine the best way to produce more agricultural commodities and forest products while making the greatest use of limited resources. Agroforestry is a hybrid of traditional and contemporary land use that involves the comprehensive management of trees, crops, and animal production. Agroforestry is defined as an agricultural system designed to integrate the interplay of shrubs, trees, and crops so that they may be handled holistically as a single unit rather than separately. Simply said, agroforestry is the process of combining forestry with agriculture. J. Russell Smith, an American economist, defined agroforestry in his book Tree Crops: A Permanent Agriculture (1929). Smith envisioned tree-based "permanent agriculture" as a solution to the damaging erosion that often accompanied sloping soil farming. However, throughout the 1960s green revolution and the subsequent and more inclusive farming systems research/extension (FSR/E) development strategy in the early 1970s, his work were largely ignored in the search for sustainable agricultural solutions. The development of sustainable agricultural methods receives a lot of attention these days. While pursuing the goal of sustainable farming, agroforestry is becoming increasingly important for reducing pressure on natural forests and mitigating climate change. Agroforestry is recognized to enhance the environment by delivering a variety of ecosystem services (Jose, 2009; Nair et al. 2009).Agroforestry is seen as an alternative paradigm for rural development worldwide that is centered on species-rich, low input agricultural techniques, including a diverse array of new indigenous tree crops, rather than high-input monocultures with only a small set of staple food crops (Bijalwan et al., 2017).

MATERIALS AND METHODS

As part of a research project, the current study was conducted in eight villages in Uttar Pradesh's Moradabad district. A total of 400 respondents were questioned utilizing a questionnaire. The villages that were chosen were Manoharpur, Ratanpurkalan, Bhnadri, Karanpur, Daryapur, Kumria Jibla, Abdullahpur Ledar, and Akberpur. A questionnaire was developed to measure farmers' perceptions and socioeconomic analyses of adopting agroforestry methods in villages in the Moradabad area of Western Uttar Pradesh. Data were gathered using a direct interview schedule and recorded in a questionnaire.

Study Area Based on the objectives of the survey work the location for the baseline survey was purposively selected on the basis of the availability of the different categories of the farmers. The farmers selected in the

area were widely distributed and adopted diversified cropping system. It is also considered mobility and road rapprochements to individual households in the location. Selection of different village of Moradabad District (Uttar Pradesh) This is made based on objective of the study, agroforestry systems and intensive farming system adopted by farmers. Different villages from Moradabad district were selected. Moradabad district have 4 tehsils, two villages from each tehsil were selected. From each village 50 respondents were chosen randomly and questionnaire were given to know information about the perception of famers adopting agroforestry practices.

Selection of villages: The villages were randomly selected for the purpose of data collection by considering the number of households, type of farmers, type, crops being cultivating and forestry aspects like which tree species they are planting and also about the crops being grown in between trees. The number of villages and Gram Panchayat were selected based on the nearness to the Gram Panchayat Head Quarter, forest cover along with distribution of forest tree species which will form the basis to study agroforestry systems and intensive farming system.

Selection of Farmers: The farmers were selected based on their land holding, their cosmopolitans, and the number of crops being cultivated by them etc., were considered while selection of the farmers. The selection of farmers was varying from village to village based on the number of households in the village. Hence, farmers were randomly selected from different villages of Moradabad district. A total of 50 farmers from each village were selected where most of the farmers were practicing agroforestry system.

Collection of Primary and Secondary data: The information was obtained through personal interview by using the structured questionnaire. The additional information is collected through secondary data available from different sources/departments like department of agriculture, Forest Department, district information and statistics, Gram Panchayat, etc., the information collected about area occupied by different crops, cultivable area, irrigated/dry land, water sources, forest area, entrepreneurship activities, population, literacy level etc., the information were obtained through personal interview method.

Data collection criteria
Study of different agroforestry practices in the region. Data were required on nature and extent of agroforestry practices, land-holding under each agroforestry practice type, preferred plantation patterns, components of agroforestry (tree crop) and their adopted combination in farm fields (agroforestry models), plantation pattern wise distribution of trees and management of tree and crops. Surveys were conducted to collect the required data during which, agroforestry households were asked to evaluate information about different agroforestry types in their field, major components of agroforestry and their plantation pattern, including cultivated crops.

To organize and conduct socio-economic study, the survey and data collection need to be systematic and largely unbiased. Criteria for socio-economic analysis were first developed by reviewing available literature and preliminary exploratory field survey followed by testing of questionnaires. Minz and Quli (2000), Mughal and Bhattacharya (2002), Kumar et al. (2004); Sood et al. (2008), Karemulla et al. (2005) and W.A.C (2012) have provided description of sample characteristics like household conditions, common farming practices, labour, crop, tree production, major tree species planted by the farmers which have been utilized for data collection in this study. The data required to achieve this objective include the sociodemographic characteristics and distribution of adopters (adopters) and non-adopters (nonadopters). To obtain information, a number of questions having individual, sociodemographic plus economic attributes like age, gender, caste, family size, social status, level of education, land-holding, economic characteristics like main occupation, income and training were included in the questionnaire format. Besides, some other questions like knowledge and experience of agroforestry, decision making in farm decisions were also asked from the informants so that they could clearly explain the adoption of agroforestry. Surveys were undertaken to collect the required data. The questionnaires were designed and used to collect information on farmers" socio-economic status by using the individual and socioeconomic indicators.

METHODOLOGY OF DATA ANALYSIS

Scientific analysis of the data was performed to extract the required information in an appropriate form such as diagrams, reports or tables (Mc Donald, 2008). The present study is done keeping in the view that different agroforestry practices are prevalent in the area, the socio-economic factors influence adoption of agroforestry by the farmers and the agroforestry

models are profitable to the farmers practicing agroforestry in Haridwar district. The analysis is based on feedback obtained from the farmers themselves. The statistical analysis of data collected by the different questionnaire surveys, therefore, comprises of three aspects: 1. Study of different agroforestry practices in the region

Inferential analysis was applied to test a working hypothesis and to prove the significance of studied socio-economic variables mentioned in contingency table. It was done by bi-variate analysis by means of a x^2 test of independence at (α=0.05) 5 percent level of significance as this method was also applied by Clark and Cooke (1992) Lwayo and Martin (2005) (Bryman and Cramer (2009) and Kabwe et al. (2009). x^2 (Chi-square) test of independence: The use of a x^2 test of independence helps us to decide whether two variables studied (dependent or independent) are related in a population. This test also determines if a conspicuous discrepancy exists between the observed and expected counts (Lwayo and Martin, 2005). In this study, Chi-square test was employed as an analytical method to test whether the explanatory socio-economic variables were related to adoption, or not. x^2 is used when participants can be classified into different categories and can be used for any kind of variable.

After calculating a x^2 calculated test value (TV), which helped in obtaining a probability that any differences seen between, expected and observed numbers are simply due to chance because number of variables supposed to influence the adoption of agroforestry practices by farmers. We can say farmers can be or expected to be influenced by these factors while adopting agroforestry in their fields. Precedents of x^2 test of independence analysis are found to be supporting in the relevant available literature (Adedayo and Oluronke, 2014, Singh et.al., 2009) to this study which confirms it as accepted method of analysis. x^2 test of independence was computed at 5 percent (α=0.05) level of significance. x^2 calculated values were used for different attributes that had been calculated by using the formula given below

(Eq. 1): x^2 statistic = Σ [(observed frequency – expected frequency)2 / expected frequency] Or x_c^2 = Σ [(fo-fe) 2 /fe]
(Eq. 1) Where x^2 =x^2 statistic (Test value or TV) Fo =observed frequency Fe= expected frequency the subscript "c" is the degree of freedom The formula is used to obtain a test static of Chi-square.

Terms used in interpretation of x^2 test of independence Related terms/values used in hypothesis testing and data interpretation are elaborated in next paragraphs:
☐ Degree of freedom: The x^2 distribution is based on the degrees of freedom often expressed by "υ". The degree of freedom is calculated by using following formula (Eq. 2). υ =(r-1) (c-1) (Eq. 2) Where, r= number of rows c= number of columns.

RESULT AND DISCUSSION

Earlier studies, different forms of agroforestry practices have been reported to be existed in India by many scientists and scholars. In the study, focus is given to agroforestry practices prevalent in different villages of Moradabad district of Uttar Pradesh state of India. During surveys conducted in the study area, it was found that out of total 400 farmers selected from eight villages, 332 farmers were practicing different agroforestry practices. The major forms of agroforestry in the area have been classified based on their structures. In results, emphasis is on type of components and arrangement of such components. Data from 400 selected farmers in eight villages of different tehsils of Moradabad district were analyzed to fulfill the objectives of the present investigation. On adoption basis; these farmers were divided into two groups namely; adopters i.e., farmers practicing agroforestry in their field and non-adopters i.e., farmers not practicing agroforestry practices in their fields from all four tehsils of the district. Result revealed that out of 400 farmers, 332 (83%) respondents had been practicing different agroforestry types in their fields. Agroforestry adopters" percentage wise distribution has been evaluated to know farmers" choice of agroforestry practice types in their field. On the basis of adopter counts, table‑ has shown frequency and percentage (distribution) of different agroforestry practices adopters under each practice. This result contained the percentage of those adopters who follow more than one agroforestry practice in their fields.

The result (Table 2) has shown that in study area, out of total 175 agroforestry farmers maximum adopters (47.75 %) had been practicing Agri- silviculture practice in their field.

Studies on individual and social factors and their association with adoption

Age

Age is a variable which represents the age of sample farmers in years. In the study area, farmers from

different age group were included in the sample. On basis of their responses, these farmers were further categorized into; young (<30 years), middle (30-55 years) and old aged (>55 years). Majority of respondents were middle age (30-55 years).

Farmers" choice on the usefulness of tree species and its influence upon adoption of agroforestry

The result has indicated that Poplar (95.89% adopters, 50.82% non-adapters) and Eucalyptus (63.56% adopters and 44.26% non-adapters) were the most favored species observed in the area. Mango (69.59% adopters and 59.02% non-adapters) was third most favored tree species to fulfill their requirement. Tree species are favored by agroforestry adopters than that of non-adopters which shows how many farmers are interested in tree growing in their farms.¹ Analysis has resulted in a higher calculated TV (19.32) than its CV (12.59) that further indicates significance association between tree species and agroforestry adoption.

CONCLUSION

The present survey was conducted in different villages of Moradabad district. Eight villages were selected from four tehsils of Moradabad district. Most of the farmers were growing Poplar and Eucalyptus due to favourable conditions. Most of the farmers having positive attitude towards statements.

Agroforestry improves the living standard of rural people by way of sustained employment opportunities ensure higher aggregate income from farm through sustained production It intensifies land use and recharges ground water table by increasing infiltration of water. Agroforestry is a tool for forestry development but for small land holding provide less scope for Agroforestry local resources can be effectively used and Soil and water conservation can be achieved through Agroforestry. The findings of present study concludes that the type of farmers adopting agroforestry practices is differing significantly and insignificantly. The findings of present study concludes that farmers approach to forest and its association with adopting of agroforestry practices was significant. The study indicates that training programme attended by the farmers and its association with adoption of agroforestry practices was significant. The study indicates that large farmers were adopting agroforestry practices and test applied was significant.

The findings faced by the farmers in the region and their influence upon agroforestry practices was not significant. The land holdings and size distribution among sample farmers and its association with adoption of agroforestry practices was significantly associated and influenced adoption. The farming as main or secondary occupation and its association with adoption of agroforestry was significantly associated. The findings of present study concluded that the income of the farmers in different villages is differing significantly and significantly.

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Studied socio-economic factors and association with adoption of agroforestry practices.

Sr no.	Factors/Attribute	^{2}TV	^{2}CV	U	Remarks
A.	Individual and social factors				
1	Age	14.15	5.99	2	S
2	Gender	1.36	1.84	1	NS
3	Marital status	30.3	5.99	2	S
4	Family size	2.19	5.99	2	NS
5	Level of education	12.48	14.06	7	NS
6	Labour (working) resource type	13.16	7.81	3	S
7	Approach to forest	12.28	3.84	1	S
8	Knowledge about schemes/programmes	4.09	3.84	1	S
9	Training programme attended by farmers	8.32	3.84	1	S
10	Total farming experience	20.56	7.81	3	S
11	Knowledge about agroforestry practices	9.89	7.81	3	S
12	Reason for farming practice	23.05	7.81	3	S
13	Farm-level decision making	2.53	7.81	3	NS
14	Farming output	9.43	3.84	1	S
15	Availability of resources	30.76	3.84	1	S
16	Farmers" choice on usefulness of trees pecies	19.32	12.59	6	S
17	Constraints faced by the farmers	3.56	14.07	7	NS
B.	Economic factors				
1	Land-holding/farm size	10.39	7.81	3	S
2	Farming as main/secondary occupation	3.92	3.84	1	S
3	Monthly income of farming household	22.36	12.59	6	S
4	Source of income/occupation	13.4	12.59	6	S
5	Land ownership type	17.67	7.81	3	S
6	Number of earning members in the family	2.86	9.49	4	NS
7	Timber/pruned wood use as source of fuel	3.87	3.84	1	S
8	Income from farm produces	4.61	3.84	1	S
9	House type	11.21	7.81	3	S
10	Importance of farm income	12.97	9.49	4	S

Table 1 Distribution of agroforestry and non-agroforestry farmers in the study area.

Village	Sample	Adopters		Non-adopters		Total
	Respondents	Frequency	Percentage	Frequency	Percentage	
Manoharpur	50	46	92	4	8	50
Ratanpurkalan	50	42	84	8	16	50
Bhnadri	50	39	78	11	22	50
Karanpur	50	41	82	9	18	50
Daryapur	50	45	90	5	10	50
Kumria jibla	50	40	80	10	20	50
Abdullahpur ledar	50	41	82	9	18	50
Akbarpur	50	38	76	12	24	50

Total	400	332	83	68	17	400

Table 2 Distribution of agroforestry practices adopters (N=332) in study area.

Agroforestry practice	Frequency	Percentage	Rank
Agri-silviculture	175	43.75	1
Silvi-pastoral	58	14.5	2
Agri-silviculture and silvi-pastoral	35	8.75	3
Agri-silvi-pastoral	31	7.75	4
Agri-silvi-horticulture	11	2.75	5
Woodlots	9	2.25	6
Agri-silvi-olericulture	5	1.25	7
Agri-silviculture and silvi-horticulture	5	1.25	8
Silvi-olericulture	3	0.75	9
Total	332	83	-