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Farmer's Response to Agroforestry in Jhansi District under Bundelkhand Region of U.P.

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Abstract – **A study was laid in Bundelkhand region during 2007 to 2009 of Babina and Badagaon Blocks falling in Jhansi district the findings of the present study have several practical implications, mostly in the nature of suggestions to the policy makers, planners, trainers and all other concerned officials for the promotion of agroforestry programme. Due stress should be given to promote function illiteracy especially to the poor and weaker section of the society. Forest extension agency should extend its support to create awareness and to motivate the rural people to adopt agroforestry practices. Forest department in collaboration with the NGO's and other suitable organization should arrange short term training programmes for the rural people to gain technical competencies. Government should provide incentive and subsidy to the participants of agroforestry pra--ctices. Entrepreneurship development programme (EDP's) should be encouraged by selecting the young entrepreneurs who can shoulder more responsibilities and excel in the field of endeavour. Establishment of private nurseries should be promoted so as to meet the demands of suitable and healthy plants/ seedlings at reasonable price and at optimum time of planting. Farmers should be trained adequately in terms of plant protection, management and their after care. Proper marketing infrastructures should be developed in the locality, so that the participants should be able to get requisite benefits in time. Forestry/ agroforestry education should be promoted at school, college and university levels. A compulsory exercise/ project in nursery rising should be incorporated in course curriculum and the participating students should be given their share of benefits.**

Keywords – **Farmers, Agroforestry, Education Level, Social Responsibility and Response to Forestry.**

I. INTRODUCTION

Forest cover only about 23.81% as against 33% of country's land area in 2012 enunciated in the National Forest Policy. But only about 14% of the land area is under production forestry to meet the country's need for timber and other forest products. The rest of the forestland has been classed as potentially utilizable or vacant. About 13% of the land area is estimated to be under potentially productive wasteland. A planned extension of regular forests would therefore, be essential to meet the above need. Shrinkage of arable land on one hand and deforesta--tion on the other owing to the population explosion, expending urbanization, and rapid industrialization and accelerated pace of development of the country and countrymen as well has resulted to the problem of environmental pollution. Conservation is the management of human us of the biosphere so that it may yield the greatest sustainable benefit to present generations while maintaining its potential to meet the needs and aspirations of future generations. Thus, conservation is positive embracing, preservation, maintenance, sustainable utilization, restoration and enhancement of the natural environment. Living resources conservation is specifically concerned with plants, animals and micro-organism and with that non-living of the environment on which they depend. Agroforestry which generally means raising of trees species and development of pasture land either on the farmers own lands or public lands, has a very vital role to play in the up keep and improvement of environment. Active and direct involvement of the people is an essential pre-requisite in making the agroforestry programme success. Negi (1986) is also of the opinion that agroforestry is the forestry of the people and by the people. Trees and vegetation are the principal means for maintaining the healthy environment and well balanced ecological system in nature. The environment in our country is being very badly polluted by mushroom growth of industries, transport vehicles and township without proper planting and significant attention to control the atmospheric pollution. The tremendous increase in population in the recent past has rapidly accelerated the food and fuel wood demands several-folds. As a short-term measure the people found it much easier and conveniently clear the village forests and other vegetations which happen to situated the vicinity of village or urban population to meet these increase demands. Even the government encouraged it as at that time there were hardly any visible adverse effect of loss of village forests. But now a day the result of uninterrupted cutting of trees and the clearance of other vegetation is before us. Our environment has become so pollute that it has challenged the existence of every living things on the earth. That is why everybody is very much cautious and trying his best maintaining healthy environment and well balanced ecological system (Shah, 1981).

The clearance of these local forests has while on the one hand created all the scarcity regarding availability of fuel wood, fodder and various types of nutrients fruits in the villages, on the other hand it had led to creation of several other natural calamities. The annual floods and droughts, the increasing windstorms accelerated soil erosion and changes in the pattern of rainfall are the results of incessant cutting of forest/trees covers. The gradual disappearance of village forests in the areas where canal system is followed has created the problem of waste logging and formation of alkali. So long as village forests were present in these areas they acted as biological pump and prevented the formation of alkali soil and also helped in keeping areas free from water logging. The uses of cow dung by the villagers as main sources of energy instead of organic manures because of disappearance of village/ local forests have also adversely affected the agricultural

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productivity. All from creating the above crisis, the gradual run down in the area of low forests has also reduced the employment opportunities significant among the rural masses, Negi (1986).

II. RESEARCH METHODOLOGY

Systematic research methodology is the key to success of any research project, as it has direct bearing on the relevancy of research findings and drawing conclusions. Attempt has been made in this chapter to deal with the methods adopted for obtaining data and other relevant information for this study. This has been divided into the following heads:

1. Locale of the study.
2. Sampling technique.
a. Selection of forest ranges.
b. Selection of blocks.
c. Selection of villages.
d. Selection of respondents.
4. Pilot study.
5. The base-line survey.
6. Research design.
7. Identification of variables and their measurement.
8. Field procedure and data collection.
9. Statistical analysis.

The statistical measures which have been used in this study include quartile, percentage, 't' test, zero order correlation and multiple regression and multiple correlations

Quartile: For a grouped frequency distribution the quartiles were calculated by using the following formula.

$$Q_1 = l_1 - \frac{l_1 l_2}{f_1}(Q_3 - c)$$

Where,
Q_1 = Lower quartile.
l_1 = Lower limit of the group in which the lower quartile is situated.
l_2 = Upper limit of the group in which lower quartile is situated.
f_1 = Frequency of lower quartile class.
Q_3 = The number of $\frac{3(N-1)}{4}$ th item
N = Total frequency.
c = Cumulative frequency of the group lower than the one in which the upper quartile is situated. Values of Q_1 and Q_3 were calculated to classify the respondents in to different categories on selected variables under study.

Percentage:

Percentages were used for making simple comparisons. For calculating percentage, the frequency of a particular cell was multiplied by 100 and divided by the total number of the respondents in the particular to which the cell belonged.

't' Test:

This test was used in this study to test the significance of difference of mean scores obtained by participants and non-participants respondents on the selected dependent and independent variables. The following formula was used for calculating the value of 't':

$$t = \frac{[X - Y]}{\sqrt{S^2 - \left(\frac{1}{n_1} + \frac{1}{n_2}\right)}} \; d.f. n_1 + n_2 - 2$$

Where,
x = Mean of first sample.
y = Mean of second sample.
s^2 = Pooled mean sum of squares, or pooled variance.
n_1 = Size of first sample.
n_2 = Size of second sample.

Pooled variance of mean sum of squares is calculated by the following formula:

$$S^2 = \frac{(n_1 - 1)S_1^{\,2} + (n_2 - 1)S_2^{\,2}}{n_1 + n_2 - 2}$$

Where,
s_1^2 = Variance of first sample.
s_2^2 = Variance of second sample.

$$(n_1 - 1)S_1^{\,2} = \sum x^2 - \frac{(\sum X)^2}{n}$$
$$(n_2 - 1)S_2^{\,2} = \sum y^2 - \frac{(\sum Y)^2}{n^2}$$

Where,
$\sum x^2$ = Sum of all the squared value of each cell in first sample.
$\sum y^2$ = Sum of all the squired values of each cell in second sample.
$\sum X$ = Sum of all the cells in first sample.
$\sum Y$ = Sum of all the cells in second sample.

The significance of calculated 't' values was tested at 0.5 and 0.1 level of probability.

Coefficient of correlation: Co-efficient of correlation was used for ascertaining the relationship of selected independent variables personal profiles of respondents with dependent variables *i.e.,* level of knowledge, attitude and entrepreneurship of participants and non-participants respondents. The formula used for calculating co-efficient of correlation is as follows:

$$r = XY = \frac{N\sum XY - (\sum X)(\sum Y)}{\sqrt{[N\sum X^2 - (\sum X^2)][(N\sum Y^2) - (\sum Y^2)]}}$$

Where,
N = number of observations being correlated
$\sum XY$ = Sum of product of X and Y.
x and y = The variables being correlated.
$\sum X$ = Summation overall the cell entries of the first variable.
$\sum Y$ = Summation overall the cell entries of the second variable.

$\sum X^2$ = Sum of all the squared values of each cell of the first variable.

$\sum Y^2$ = Sum of all the squared values of each cell of the second variable.

The significance of calculated correlation co-efficient was tested at 0.05 and 0.01 level of probability.

Regression analysis: Regression is a measure of average relationship between variables. It involves comparison of the series. The purpose of regression analysis is to find whether 'Y' depends on 'X' or prediction of 'Y' forms 'X' may be the goal.

For the purpose of present study, the relationship between dependent variable 'Y' and selected predictor variables (X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, X_9, X_{10}, X_{11}, and X_{12}) was obtained by fitting the multiple regression equation as follows.

$$Y = a + b_1x_1 +, \text{----------} +b_nx_n$$

Where,

Y = Is the dependent variables.

A = Constant.

b_1 = Partial regression coefficient which represents the amount of change in 'Y' that can be associated with a given change in any one of the 'X' with the remaining predictor variables held fixed.

n = The total number of independent variables.

Test of significance of the partial regression coefficient (b_1):

Test of significance of the partial regression coefficient (b_1) can be done as follows:

$$t = \frac{b_1}{Se(b_1)}$$

Where,

b_1 = Partial regression coefficient.

$Se(b_1)$ = Standard error of the partial regression coeffici--ent.

The partial co-efficient or partial b's can not be compared as such to their relative strength in variation of dependent variables, unless a correction in made.

In the measurement of independent variables different measurement scales have been uses. For example, some of the variables are measured in terms of year, some in terms of scores and, many in other types of scales. The comparison of a unit change in one variable with a unit change in another is therefore, meaningless if partial b's are used, since they are function of the measurement scales.

The connection in the partial b's is made by the process of standardization of each partial b's values. Standardizati--on is accomplished by utilizing the standard deviation of each variable. A standardized or adjusted partial 'b' is called a beta weight. A beta weight is obtained by multiplying the comparable partial b (which is still a non-standard scale) by the ratio of the standard deviation of the dependent variables. Using statistical symbols the above can be stated in the formula:

$$\text{Beta weight} = \frac{\text{Standard deviation of independent variable}}{\text{Standard deviation of dependent variable}} \text{xPartial 'b'}$$

A comparison of any two beta weights in a set of multiple regression equation indicates the relative influence of the independent variables involved in contributing the variation in dependent variables

Multiple correlation coefficients (R): The multiple correlations are a measure of the strength of relationship between the dependent variable Y and all the independent variables X's jointly. It is denoted by 'R'

These are some important properties of R. It varies from 0 to 1. It increases, as the size of correlation between Y and X's increases. In addition, it increases, as the size of the inter-correlations of X's decreases. Another property of R is that it cannot be more than a simple correlation coefficient between Y and any X. The square of the multiple correlation coefficient, R^2 is known as the coefficient of multiple regression.

Test of Significance of R:

To test the significance of R or R^2, 'F' test was applied as follows:

$$F(K, N-K-1) = \left(\frac{R^2}{1R^2}\right)\left(\frac{N-K-1}{K}\right)$$

Where,

R = Multiple regression coefficient.

F = Analysis of variance value.

K = Number of predictor variables.

N - Number of respondents in the sample.

III. Findings and Discussion

Education:

Like age, education of the respondents was studied and the findings are presented in Table-1.

Table 1. Distribution of participants and non-participants on the basis of their education.

Educational status	Participant (N = 120)		Non-participants (N = 120)	
	Frequency	Percentage	Frequency	Percentage
Illiterate	10	8.33	38	31.67
Can read only	07	5.83	12	10.00
Can read and write	04	3.33	18	15.00
Primary	16	13.33	31	25.83
Junior high school	14	11.67	09	7.50
High school	19	15.83	07	5.83
Intermediate	33	27.50	03	2.50
Graduate	11	9.18	02	1.67
Post graduate and above	06	5.00	-	-

Majority of participants *i.e.,* 27.50 percent had education upto intermediate followed by high school, primary junior high school, graduate, illiterate can read only, can read and write and post graduate and above were 15.83, 13.33, 11.67, 9.18, 8.33, 5.83, 5.00 and 3.33 percent, respectively.

However in the case of non-participants majority were illiterate *i.e.,* 31.67 percent followed by primary, can read and write, can read only, junior high school, high school, intermediate and graduate *i.e.,* 25.83, 15.00, 10.00, 7.50, 5.83, 2.50 and 1.67 percent, respectively (Dandya et al, 2014).

The mean education scores of participants and non-participants were found to be 3.425 and 1.988, respectively. The difference between mean education scores of participants and non-participants was found to be significant at 0.01 level of probability. Hence, the hypotheses stated in null form Participants and non-participants do not differ significantly in respect of their education were rejected (Behera et al, 2013).

As compared to participants in agroforestry non-participants had significantly lower education status because they are generally economically handicapped and as such they cannot afford higher education for themselves and their children. On the contrary mostly participants possess better economic conditions and they spend a sizeable portion of their income for educating their children. This reason might be responsible for higher education of participants. These findings are in conformity with those found by Jha (1995).

Social Participation:

Majority of participants (55.83 percent) had membership in one organization followed by more than one, no member in any organization and office holder *i.e.,* 22.50, 17.50 and 4.17 percent, respectively. In the case of non-participants majority *i.e.,* 50.00 percent were not member in any organization. However, 42.50 percent were member of one organization followed be member of more than one and office bearer *i.e.,* 5.83 percent and 1.67 percent, respectively (Punam et al, 2011).

The lower social participation of non-participants of agroforestry may be explained on the basis of Pareek and Trivedi (1972) who had described social participation as one of the nine-factors determine socio-economic status command more influence over the society and ultimately their social participation was considerable higher. On the contrary, the non-participants had lower socio-economic status and hence they had very little influence over the other members of the society. Consequently their social participation was extremely poor.

Socio-Economic Status:

Like age, education and social participation, socio-economic status or the respondents was investigated and the findings are presented in table.

Table 2. Distribution of participants and non-participant on the basis of their socio-economic status.

Categories of socio-economic status	Participant (N = 120)		Non-participants (N = 120)	
	Frequency	Percentage	Frequency	Percentage
High	55	45.83	26	21.67
Medium	41	34.17	49	40.83
Low	24	20.00	45	37.50

Highest percentage *i.e.,* 45.83 percent amongst participants were found in high socio-economic status category followed by medium and low *i.e.,* 34.1 7 and 20.00 percent, respectively. However in the case of non-participants highest percentage (40.8.3 percent) was observed in medium socio-economic status category followed by low and high *i.e.,* 37.50 and 21.67 percent, respectively. The mean socio-economic status scores or participants and non-participants were found to be 39.387 and 26.253, respectively, Tiwari (1991). The calculated value of 't' was found to be 4.463 which was significant at 0.01 level of probability. Thus the hypothesis stated in null form participants and non-participants do not differ significantly in respect of socio-economic status was rejected. Socio-economic status is largely governed through land holding, education and social participation. Non-participants differed significantly in respect of land holding, education and social participation from participants. It might also have led cumulatively to differentiate the socio-economic status of participants and non-participants of agroforestry (Dwivedi, 2010).

Size of Family:

Table-3: Distribution of participants and non-participants on the basis of their size of family.

Size of family	Participant (N = 120)		Non-participants (N=120)	
	Frequency	Percentage	Frequency	Percentage
Small	20	16.67	63	52.50
Medium	69	57.50	38	31.67
Large	31	25.83	19	15.83

Majority of participants (57.50) percent had medium size of family followed by large and small *i.e.,* 25.83 and 16.67 percent, respectively. However, in the case of non-participants majority of the respondents (52.50 percent) had small size of family followed by medium (31.67 percent) and large size of family 15.83 percent. The mean scores of size of family of participant and non-participants were found to be 28.09 and 1.883, respectively the calculated value of 't' was to be 2.234 which were significant of 0.05 level of probability. Hence, the hypotheses stated in null-form participants and non-participants do not differ significantly in respect or their size or family was rejected. These findings indicated that the participants of agroforestry had larger size or family as compared to non-participants (Jha, 2003).

The significantly larger size of family of participants than those of non-participants might be because of the fact that in the sample area mostly amongst participants belonged to joint family. Whereas, non-participants related to nuclear family, due to this fact the participants had larger family as compared to non-participants (Thana, 1991).

Credit Behaviour:

Table 4. Distribution of participants and non-participants on the basis of their credit utilization.

No. of credit sources	Participant (N = 120)		Non-participants (N = 120)	
	Frequency	Percentage	Frequency	Percentage
Zero	08	6.67	05	4.17
One	32	26.67	23	19.16
Two	55	45.83	33	27.50
More than two	25	20.83	59	49.17

Majority of participants (45.83 percent) utilized two sources of credit followed by one, more than two and zero *i.e.,* 26.67, 20.83 and 6.67 percent, respectively. However, in the case of non-participant maximum percentage *i.e.,* 49.17 percent were observed in the category of utilization of credit sources more than two followed by two, one and zero *i.e.,* 27.50,19.16 and 4.17 percent, respectively. The mean credit utilization scores of participants and non-participants were found to be 2.145 and 3.832, respectively. The difference between participants and non-participants was found to be negatively significant at 0.05 level of probability. Hence, the hypotheses stated in null form Participants and non-participants do no differ significantly in their credit behaviour were rejected (Singh and Pathak 1990).

The significantly higher credit behaviour of non-participants than those of participants of agroforestry might be because of differential values held by farmers to borrow money. The participants belonged to higher socio-economic ladder of society, hence, as a matter of prestige they do not consider it proper to take loan for any purpose. At the same time the non-participants farming lower socio-economic status ladder of status have limited financial resources with in which they have to satisfy their needs. For various capital and even incidental requirement they have to borrow money from one source or the other. They are not ashamed or borrowing money when they are in need of it. Being on the lower-socio-economic ladder as well as prestige hierarchy, the non-participants are not afraid of being felt inferior it is also important to note here that most of the non-participant respondents borrow the money from non-institutional sources at higher rates of interest whenever, they needed (Maithani, 1994).

IV. Conclusion

Based on the experiences gained in this study, probable areas for future researches may be out lined as follows:

(1) Since, this study was confined to only one district of Bundelkhand Region of U.P.; a similar study is also conducted in other parts of the country.
(2) Cost benefit analysis in agro-forestry practices on the part of the participants may be conducted for highlighting the suitability of the progaramme, especially for small and marginal farmers.
(3) To the perception of the rural people, forestry, agriculture and animal husbandry are dependent to each other to support rural life and economy. Research may be conducted to understand the inter relationship of above mentioned enterprises and interactions though extension approaches.

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