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Factors Influencing the Adoption of Agricultural Innovations in Azamgarh District

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Abstract

Technological innovations have been a key element in the growth of agriculture throughout the world (Dorner, 1983). India witnessed, after 1966 the agricultural production has increased to a large extent and the country has not only become self-sufficient in supply of food grains but also has some buffer-stock. This growth in agricultural production is attributed to the technological development and spatial diffusion of agricultural innovations. But neither the rate of agricultural growth nor the diffusion of agricultural innovations is uniform all over the country. It is due to varied physical environment, socio-economic conditions of farmers and their attitude towards adoption of new farm technologies.

Keywords: Agriculture, Technological Innovation, Socio-economic Condition of Indian Farmers.

Introduction

Agriculture is a product, not merely of physical conditions and human resources, but also as cultural constraints and irrigation facilities. These are the explanatory factors affecting adoption of technological and bio-chemical inputs and agricultural productivity in developing countries. (Singh, Sandhu and Gupta 1990)

The progress of Indian agriculture has been very impressive in many ways since independence. It can be realized by the improvement in crop production by four times from 50 million tonnes to 200 million tonnes at the end of the 20th century. Since 1948, a large number of new agricultural practices have been introduced in Indian farming with National Extension Scheme and supported by Community Development Programme. The last decades of the 20th century brought major changes in the farming practices almost in all parts of the country. These changes are mostly attributed to the technological changes brought into agricultural operations and their consequent diffusion in many rural areas of India. These innovations include new improved inputs, along with improved methods and practices of farm management and marketing. These practices though have brought major revolution in the field of agriculture but have also created wide disparities among the farmers. In Azamgarh district neither the rate of agricultural development nor the adoption of agricultural innovations is uniform. It is surely due to varied social, psychological, demographic and economic conditions of farmers which affect the process of technological change and diffusion of agricultural innovations. Hence, it is essential to identify and measure the impact of these factors on the adoption of new farm practices as well as to find out the relationship between socio-economic factors and level of adoption of agricultural innovations. In this paper an attempt has been made to identify the impact of these factors on adoption of new farm practices and resultant disparities in Azamgarh district.

Review of Literature

Pioneer studies on diffusion were made in the beginning of the 19th century by anthropologists, sociologists, economists etc. Kroeber (1930-34), a leading anthropologist, defined diffusion as unusual process through which the elements of cultural systems spread out. Linton (1936) Barnett (1953) Trade (1903) wrote about the process of diffusion within a society. Afterwards a few studies were made by rural sociologists like Rogers (1983).

T. Hager strand's work (1952) on diffusion was significant with regard to the spread of cultural elements through time. Although Hagerstrand was influenced by the rural sociologists, but differed from them by emphasizing the significance of space and time in the distribution analysis. According to him, "The diffusion of innovations meaning the origin and dissemination of cultural novelties is an area of study which concerns all sciences dealing with human activities including not least of all cultural and economic geography". Brown (1970), a leading geographer of diffusion studies, Ohio State University, worked out intensive studies of diffusion process.

But in India very few such studies were conducted. However, special mention may be made of Bose (1961) and Das Gupta (1963) who revealed that personal feeling of the farmer considerably hinder or instigate the adoption of innovations. But these studies indicate lack of economic and spatial aspects in diffusion. Only few studies conducted by economists are concerned with technological innovations, economic growth and development.

R.P. Misra (1968) has however, initiated a quantitative approach to the problem of spatial diffusion. Among other Indian geographers the name of Ramchandran (1975), Swaminathan (1980), Misra (1972), Sivagnanam (1978) and Noor Mohammad (1974) are worth mentioning. Shafi's "Assessment of Von Thunen's Land use analysis in India" (1977) is also notable in diffusion research.

Recently important works have been done in this context like in 2004, Gray and others have discussed the value of new ventures for assessing the commercial potential and agricultural innovations. Shamsul Haque Siddiqui and Nooruzzaman, (2005) have tried to find out the adoption level of agricultural technology among the farmers in West Champaran district of Bihar State. Sohal and Manjit (2006) have shown the changes in agricultural commercialization in Punjab during the period of 1980-1981 to 2000-01. Singh and Singh in 2007 have explained the relationship between agricultural productivity and irrigation in Mirzapur District. Hifzur Rahman in 2008 have discussed the agricultural productivity and productivity regions in Ganga-Yamuna Doab. Mumtaj Ahmad (2008) has tried to find out the impact of technology on the agriculture development in Uttarakhand, on the other hand Ali (2009) described the role of farm mechanization in agricultural crop productivity in West Bengal. Yeong Sheng Tey and Mark Brindal (2012) have tried to investigate the importance of policy implication and its relation with adoption of agricultural technologies. In further studies, world recognized work has been done by Liz Carlisle (2016), his study suggested some recommendations for a complementary approach like research, education, policy measures to overcome barriers of adoption of innovations in agriculture. Recently L.S. Prokopy, K. Floress and others (2019) discussed a comprehensive review on adoption of agricultural conservation practices in the United States between 1982 and 2017.

Significance of Study Area

The Azamgarh district is located in the eastern part of Uttar Pradesh, lying between 25º40´ N and 26º27´ N latitudes and 82º40´ E and 83º32´ E longitudes occupying an area of 4054 sq. km. (fig 1.1) with a total population of 46,12,134 persons. The average density of the study area is 1138 persons per sq. km. (2011). Administratively, the district is divided into eight tehsils and twenty two community development blocks.

The district slops very gentle towards the south-east. The district is a part of Indo-Gangetic plain and formed of alluvium of Quaternary age. The average annual rainfall is 901mm. with average temperature of 24ºC. The district has good transportation facilities. It is well connected by north-eastern railways, state highways and other roads. There are only few industries such as textile mills mainly silk sarees, agro based industries, light engineering, edible oil, glass ware and ceramic etc. Nizamabad is famous for black pottery. Agriculture and its allied activities are the main source of livelihood to majority of the people in district. The district's physical environment is very suitable for agriculture. Crops like rice, wheat, sugarcane, pulses, vegetables, etc. are grown on large scale. Good irrigation facility is provided by canals of the Ghaghara irrigation system. The average size of land holdings was 0.55 hectare in 2011. There are more than 606570 operational holdings in the district, out of which about 85% have less than one hectare.

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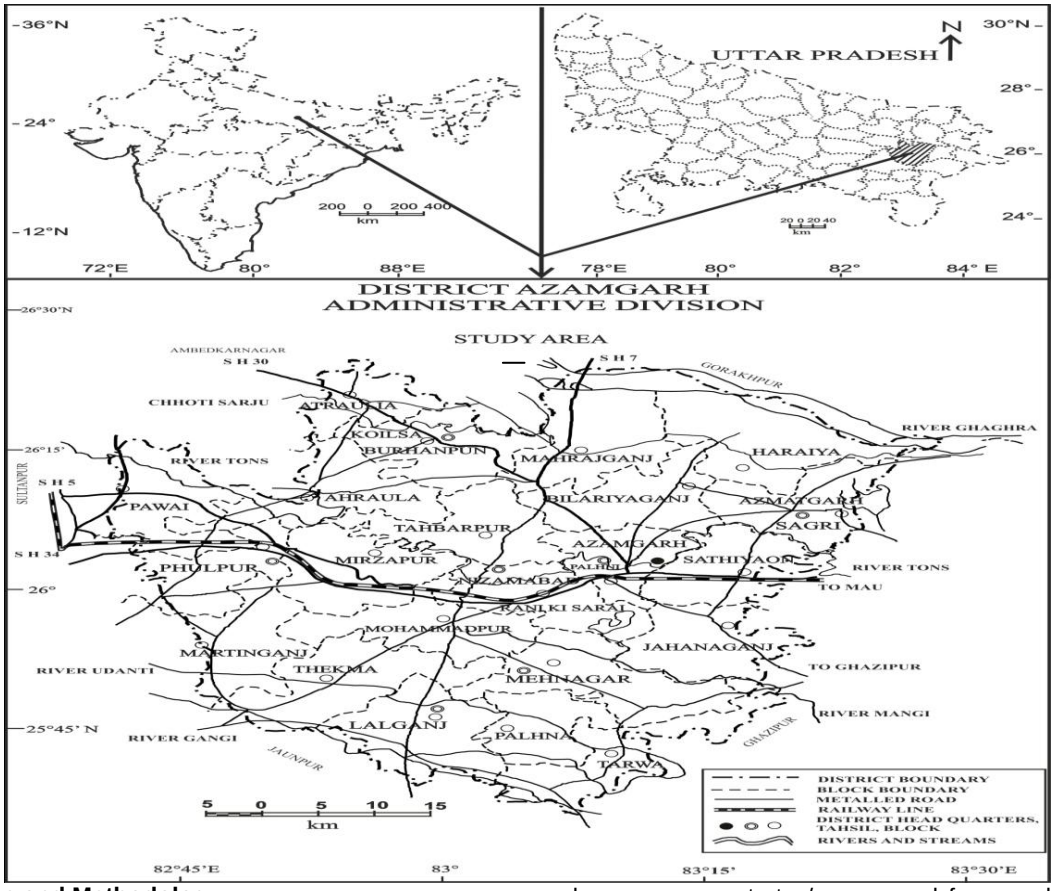
Location and Extent



Data Base and Methodology

The description of this paper is completely based on responses of 580 farmers selected through purposive sampling from different villages of the study area. The study region being spread over extensive area and having large size of population; practically it is not possible to collect primary data for the whole district. Therefore, firstly secondary data related to ten selected agricultural variables like agricultural productivity, irrigation intensity, cropping intensity, no. of tube-wells, fertilizer consumption, no. of fertilizer distribution centres, no. of credit societies, farm implements intensity, roads intensity, percentage share of cultivators in main working population were collected. They have been converted into comparable units by standardizing them with the help of the following formula:

$Zij = Xij-\overline{Xi} / SDXi$

Where,

Zij = Standardized value of i^{th} variable in j block.

Xij = Original value of i^{th} variable in j^{th} block.

Xi = Mean value of i^{th} variable.

SDXi = Standard Deviation of Xi variable.

After computing Z score for each variable in particular development block are added together and then divided by total number of variables, which gives the Composite Index of Agricultural Development (CIAD) of that particular block. Further, on the basis of CIAD the whole region has been divided into five homogeneous strata / zones and from each stratum two villages have been selected randomly.

It is known fact that several agricultural innovations have been introduced in the region till date, but only some important innovations have been taken into consideration to achieve the objectives. In fact, relevant informations have been collected from three important factors as institutional, technological and socio-economic together comprising of sub-factors such as age, social groups, education, family size, occupation and size of land holding. The field work was carried out in 2010 in both the agricultural seasons to obtain primary data personally through interviewing farmers. Simple scoring technique was adopted to measure the individual scores of all the respondents with respect to adoption of selected innovation. Individual scores of each respondent were calculated in order to group them according to the different variables on different levels. With the help of individual adoption score of respondent of each group, various statements have been given regarding the impact of different factors. For the analysis of data, a statistical scheme was prepared and Analysis of Variance (ANOVA) with post-hoc technique has been used to test the various statements.

Age Group and Adoption of Agricultural Innovations

Age composition of population plays a very important role in the process of adoption of innovations. It is a common notion that comparatively younger age people are more receptive to new ideas

and practices which is difficult in the case of old age people. To analyse the association between age group and adoption of innovations; sample farmers are put into following four age groups:-

Table 1.1: Age Groups of Respondents

Group	Age Group in Years	Class of Age Group assigned for Present Study	Percent of Total Respondent
A	< 30	Young Age	6.2
B	31- 40	Lower Middle Age	27.24
C	41- 50	Upper Middle Age	25.52
D	>50	Old Age	41.03

About 41 percent of the respondent farmers belong to the old age. The percentage of young group farmers is only 6.21 percent**,** but they are the instrumental in taking a decision regarding adoption of innovations. The corresponding figure for upper middle age and lower middle age groups are 25.52 and 27.24 percent respectively. Combinedly middle age group constitutes 52.75 percent of the total respondents. To find out the association between age group and adoption of innovations, individual scores of each respondent have been taken into consideration. Finally average adoption score of each group is applied. To test the statement, Analysis of Variance technique has been calculated. Table 1.2 shows the result, in which "F" value is greater than the tabulated value which indicates the significant group difference in their adoption index.

Table 1.2: Analysis of Variance Table for age group vs Adoption of Innovations

Sources	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	127.864	3	42.621	3.835	0.01
Within Groups	6402.164	577	11.115		
Total	6530.028	580			

*** Significant at 5% level of Significance.**

In order to understand more clearly the pattern in adoption of different age groups and the difference in their average adoption index one way analysis of variance with post-hoc was computed between age variable (independent variable) and the level of adoption (dependent variable) summarized in table 1.3. This table reveals significant group differences observed among four age groups. This type of pattern indicates that all the groups differ in terms of their adoption level. Table 1.3 shows that the average adoption index of young age farmers is highest (9.1944) whereas it is lowest among the old age farmers (7.5756). The average adoption index is slightly lower in upper middle aged farmers (8.2905) than the lower middle aged farmers. The above analysis shows that the farmers of the young age group are too courageous to take risk of adopting an innovation (Fig.1.2.A).

Table 1.3: Age Groups and Average Adoption Index

Sl. No.	Age Group	No. of Respon-dent Farmers	Average Adoption Index	Groups Compared	Difference in Average Adoption Index	Mean Difference	Std. Error	Sig.
1	A. < 30	36	9.1944	(A-B)	0.790	0.79571	0.615	0.568
2	B. 31- 40	158	8.3987	(A-C)	0.900	0.9039	0.619	0.463
3	C. 41-50	148	8.2905	(A-D)	1.610	1.61881*	0.596	0.034
4	D.> 50	238	7.5756	(B-C)	0.110	0.10819	0.381	0.992
				(B-D)	0.820	0.8231	0.342	0.077
				(C-D)	0.710	0.71491	0.349	0.172

*** The mean difference is significant at 5% level.**

Overall finding suggests that all four age groups differ in terms of adoption. However, the above analysis also proves that age composition by a large, is inversely related to the adoption of innovations, i.e. with increase in age, the index of adoption decreases and vice-versa, which proves our statement.

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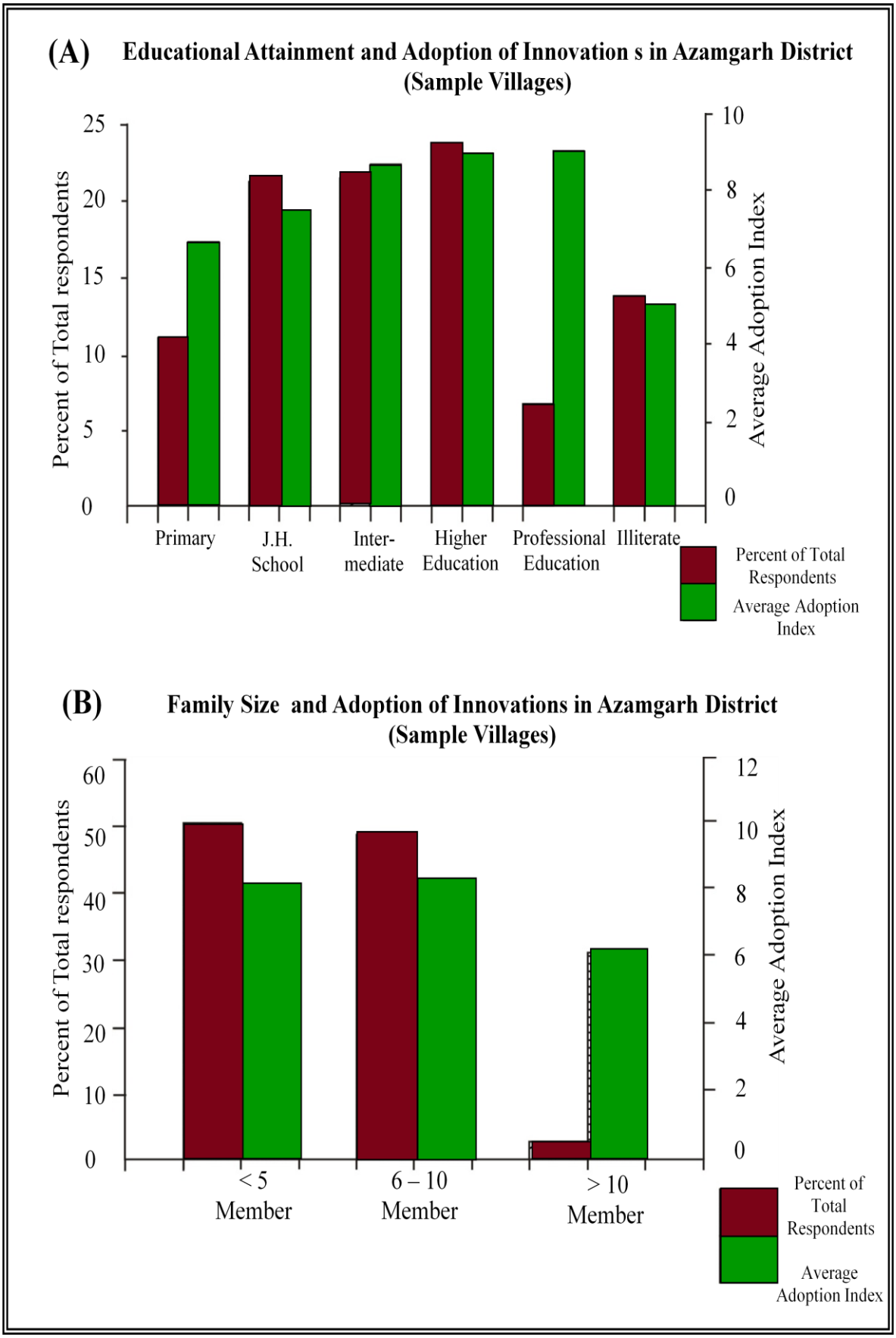

Social Groups and Adoption of Agricultural Innovations

In India's social system, social groups are as important as other aspects of life. The basic social institutions of Indian society are social groups, joint family and village community. In rural India social groups still plays an important role and influences technological change and adoption of agricultural innovations. Value orientation and behavior pattern of rural people are very much influenced by the ways of life of the respective social groups. Often we see that people of higher social groups are more progressive and modernized in their values and behavior than middle and low social groups people of the society. Hence, the following general statement is framed in this regard:

"Adoption of agricultural innovation is higher among general social groups people as compared to other groups."

Table 1.4: Analysis of Variance Table for Social Groups vs Adoption of Innovations

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	964.121	2	482.061	49.974	0.000
Within Groups	5565.906	578	9.646		
Total	6530.028	580			

* The mean difference is significant at the 0.001 level.

In order to verify this statement, the social groups composition of the sample farmers was worked out on the basis of Census of India criteria and respondents were classified into three groups, i.e. high (General), middle (OBC) and low (SC/ST). With the help of individual scores of respondents, the average adoption index of each social groups group is calculated and is given in table 1.5. For statistical testing, analysis of variance is used and the results are given in table 1.4. The "F" value is 49.97 which is much higher than "F" tabulated value and hence, the test proves the significant mean difference. Table 1.5 shows more clearly the pattern of adoption of different social groups and their difference in average adoption index.

Table 1.5: Social Groups and Average Adoption index

Sl. No	Social Group	No. of Respond-ent Farmers	Average Adoption Index	Groups Compared	Difference in Average Adoption index	Mean Difference	Std. Error	Sig.
1	A. Gen	166	9.6024	A-B	1.3229	1.32288*	0.309	0.00
2	B. OBC	254	8.2795	B-C	2.0857	2.08578*	0.313	0.00
3	C. SC	160	6.1938	C-A	3.4086	-3.40866*	0.344	0.00

*The mean difference is significant at the 0.05 level.

In order to understand more clearly the pattern of adoption of different social groupsand the difference in their average adoption index one way analysis of variance with post-hoc was computed between social groups variable (independent variable) and the level of adoption (dependent variable). Table 1.5 reveals significant group differences observed among three groups. This type of pattern indicates that all the groups differ in terms of their adoption level. It may further be observed from table 1.5 that the average adoption index of higher social groups farmers is 9.602 followed by a slight difference in adoption index of middle social groups farmers (8.2795) accounting for roughly 43 percent of the total respondents while it is lowest in the case of low social groups farmers (6.193). The result clearly reveals that adoption of innovation is more popular among the higher social groups people than the SC/ST farmers (fig.1.2.B).

Educational Attainment and Adoption of Agricultural Innovation

Education plays a vital role in decision making of farmers about adoption of innovations in any society. With the help of education, society socializes its members and brings desirable changes in the social life of its people. Education is, in fact, the aggregate of all the processes by means of which a person develops abilities, attitudes and other forms of behavior of positive values in the society in which he lives or it is a social process by which people are subjected to be influenced of selected and controlled environment so that they may attain social competence and optimum individual development (Bear, 1947).

Adoption process is still a learning process which involves knowledge, attitudes and skill of farmers regarding agricultural innovations. Many studies in India and abroad have been done regarding the technological change and diffusion of innovations, which have proved that there is positive and close relationship between the adoption of innovation and educational status of the respondents. So it is hypothesized that

"Adoption of agricultural Innovations is positively related with the educational status of the farmers."

In the present study only formal source of education has been considered. Various scores have been allotted for different stages of education. On the basis of their educational attainments farmers have been categorized into six categories listed below:

Table 1.6: Educational Status of Respondent Farmers

Sl. No.	Groups	Educational Status	No. of Respondent Farmers	Percentage of the Total Respondents
1	A	Primary School	62	10.69
2	B	Junior High School	126	21.72
3	C	Intermediate	129	22.24
4	D	Higher Education	138	23.79
5	E	Professional Education	30	5.17
6	F	Illiterate	95	16.37

According to the above groupings only 23.79 percent of the total respondents belong to higher education followed by 22 percent at intermediate level. However, about 16.37 percent of the respondents are illiterate and only 5.17 percent respondents come into the category of professional education. This data shows the satisfactory condition of education among the farmers. Mostly higher educated farmers are younger aged or lower middle aged. On the other hand primary educated and illiterate respondent farmers belong to old aged or upper middle aged which reveals that now farmer's families are becoming aware to educate their children.

The average adoption index for each educational group is worked out with the help of individual adoption scores of the respondents belonging to that group. In order to test the differences in the average adoption of different educational groups, the analysis of variance with post-hoc technique is used and the obtained results are given in table 1.7.

Table 1.7: Analysis of Variance Table for Educational Status vs Adoption of Innovations

Sources	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1356.228	5	271.246	30.093	0.00
Within Groups	5173.799	575	9.014		
Total	6530.028	580			

* The mean difference is significant at the 1% level.

The calculated value of "F" is 30.093 which is much higher than the value given in "F" test table and hence, the mean difference is significant at one percent level of significance. Table 1.7 shows the average adoption index of each educational status group. It is clear that average adoption index of the higher education group is 9.8406 which is much higher than the average adoption index of illiterate farmers (5.4737) which is also the lowest among all the educational groups. This shows a close relationship between educational level and adoption of new techniques. However, the average adoption indices for professionals and higher education group are 9.8667 and 9.8406 respectively which shows no any significant difference between these two groups (fig. 1.3.A). Thus it may be concluded that the educational status is the major determinants of the adoption of innovations.

Table 1.8: Education V. Average Adoption Index

Sl. No.	Educational Status Group	No. of Respon-dent Farmers	Average Adoption Index	Groups Compared	Difference In Average Adoption Index	Mean Difference	Std. Error	Sig.
1	A. Primary	62	6.8548	A-B	-0.7325	-0.73	0.47	0.62
2	B. J.H. School	126	7.5873	A-C	-1.9281	-1.92811*	0.46	0.00
3	C. Intermediate	129	8.7829	A-D	-2.9857	-2.98574*	0.46	0.00
4	D. Higher Education	138	9.8406	A-E	-3.0118	-3.01183*	0.67	0.00
5	E. Professional Education	30	9.8667	A-F	1.3812	1.38	0.49	0.06
6	F. Illiterate	95	5.4737	B-C	-1.1956	-1.19564*	0.38	0.02
				B-D	-2.2533	-2.25328*	0.37	0.00
				B-E	-2.2794	-2.27937*	0.61	0.00
				B-F	2.1136	2.11362*	0.41	0.00
				C-D	-1.0576	-1.05763*	0.37	0.05
				C-E	-1.0837	-1.08	0.61	0.48
				C-F	3.3093	3.30926*	0.41	0.00
				D-E	-0.0261	-0.03	0.60	1.00
				D-F	4.3669	4.36690*	0.40	0.00
				E-F	4.3930	4.39298*	0.63	0.00

* The mean difference is significant at the 5% and 1% level.

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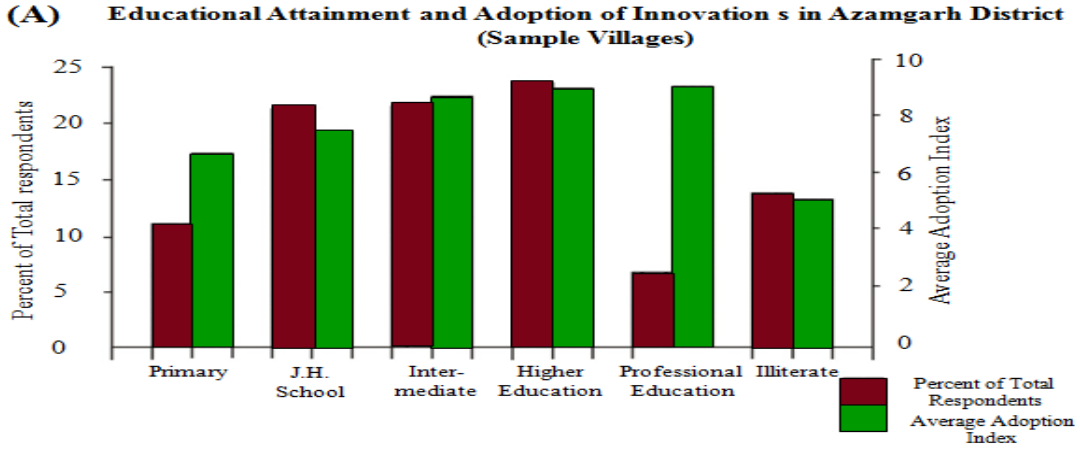

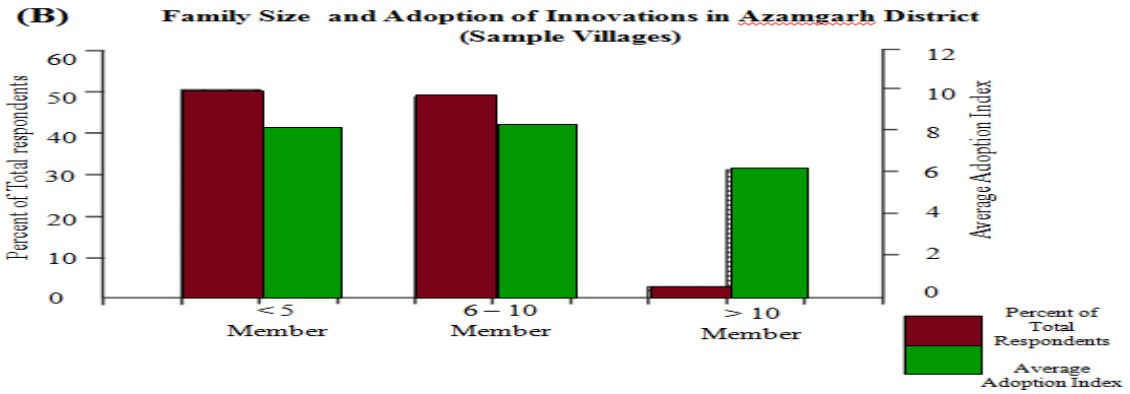

Family Size and Adoption of Agricultural Innovations

Old agrarian societies of the orient are characterized as familistic and the whole social organization and the values and beliefs of the people are centred around the social institutions, (Mohammad, 1992). In rural areas most of families are large in size or joint in composition. Parents live with their married sons and their children. The thought and action of an individual member in a family of large size are influenced by its family environment. Generally, a large family consisting of many members finds it difficult to arrive at a decision regarding the adoption of an innovation in comparison to a small or middle-size family.

With this view an attempt has been made to find out the relationship between the size of family and adoption of agricultural innovations. On the basis of number of members in a family, following three different groups have been classified:-

Table 1.9: Size Characteristic of Respondent's Family

Group	No. of Members in the Family	Size of Family	No. of Total Respondents	Percent of Total Respondents
A	< 5	Small	293	50.52
B	6 - 10	Medium	278	47.93
C	>10	Large	9	1.55

Again average adoption score for each family size was worked out and analysis of variance with post-hoc technique was applied to test the significance of statement of group differences. The findings are shown in table 1.10

. **Table 1.10: Analysis of Variance Table for Family Size vs Adoption of Innovations**

Sources	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	24.96	2	12.483	1.107	0.331
Within Groups	6505.06	578	11.274		
Total	6530.028	580			

* The mean difference is significant at the 5% level.

Table-1.10 reveals that the size of the family does not differ in adoption index. Though, it is evident from the Table- 1.11 that the minimum mean differences were observed between the groups. For example, the mean of the C group (large family size) differs from group A (small family size) i.e., (C-A =1.638) and mean of the C group (large family size) differs from group B (medium family size) i.e., (C-B = 1.693).Overall, the finding indicates that size of family does not have any influence in adoption of agricultural devices.

Table 1.11: Family Size and Average Adoption Index

Sl. No.	Family Size Group	No. of Respond-ent Farmers	Average Adoption Index	Groups Compared	Difference in average adoption index	Mean Difference	Std. Error	Sig.
1	A. Small	293	8.082	A -B	-0.055	-0.05478	0.281	0.98
2	B. Medium	278	8.137	A -C	1.638	1.63747	1.136	0.32
3	C. Large	9	6.444	B - C	1.693	1.69225	1.137	0.30

* The mean difference is significant at the 5% level.

Post hoc analysis was applied to assess the differences in average adoption index within the family size. It is evident from the Table 1.11 that the second medium size family group of sample farmers (6-10 members) accounts for 47.93 percent and their adoption index is highest (8.137) while about 50.51 percent of total respondents belongs to small family size (< 5 members) and its adoption index is slightly lesser (8.082) with very minute difference. In sample villages only 9 families were found having more than ten members in the family and also have the lowest adoption index (6.44), (fig. 1.3.B). In large size families responsibilities are divided upon different working persons and it is comparatively difficult to arrive at a common decision with regard to adoption of new ideas and practices. In the case of small and medium size families, decision makers are few and they don't have enough work force. Perhaps these may be the reasons for taking quick decision regarding change over to a new ideas or practices. However, from the above analysis it is clear that the relationship between the size of family and adoption of agricultural innovations is very poor.

Occupation and Adoption of Agricultural Innovations

Occupation is another dominant factor which may affects the adoption of agricultural innovations. Although, the majority of the respondents are farmers, but some of them are engaged in some other subsidiary occupations along with farming. Likewise, some of the family members of the respondents are engaged in services, business, transport, construction etc. However, on the basis of their occupations, the respondents have been classified in following groups and it was tried to find out the relationship between occupation and adoption of innovations.

Table 1.12: Occupational Groups of Respondents

Group	Occupation
A	Exclusively Farming
B	Farming and Service
C	Farming and Business
D	Farming and Other Occupation

It was observed that among the four above groups those who are engaged in farming with services show the highest adoption index. With the help of individual adoption scores of respondents, the average adoption index for each group has been worked out. By using the analysis of variance technique, a comparison has been made among these groups. The results have been given in table 1.13, in which calculated value of "F" is more than tabulated value indicating the significance of above statement. With the help of post-hoc technique the differences among groups are clearly shown and results are given in table 1.14. The results are significant at five percent level of significance in all cases except in case of B-C.

Table 1.13: Analysis of Variance Table for Occupation vs Adoption of Innovations.

Sources	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	901.259	3	300.42	30.742	0.00
Within Groups	5628.768	577	9.772		
Total	6530.028	580			

* The mean difference is significant at the 1% level.

Table 1.14 further shows that group A (exclusively farming) consists of 162 farmers (28% of the total respondents) and its average adoption index is 7.58 while about 34.31 percent of the respondents belong to the category of farming with service with highest average adoption index of 9.0352 which is more than that of even group C (farming and business). The adoption index of group B is highest because the members of this group who are in services generating extra-income which is supportive to farming and they also, come in the contact with other people who are aware about these innovations. They also assist their families in getting desired mechanical devices timely. The farmers of group D who account for 15 percent of the total respondents have lowest average adoption index of 5.50, (fig. 1.4.A).

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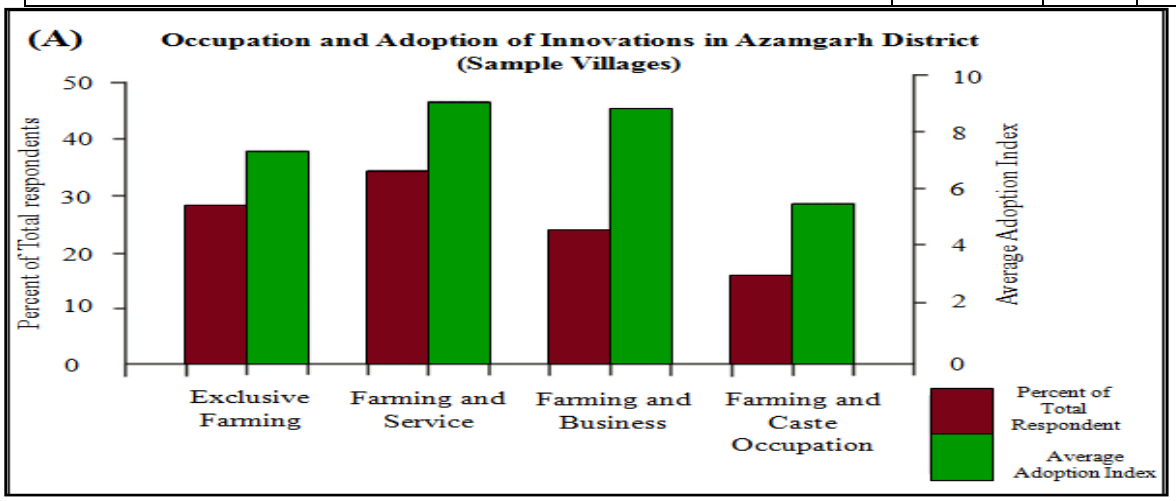
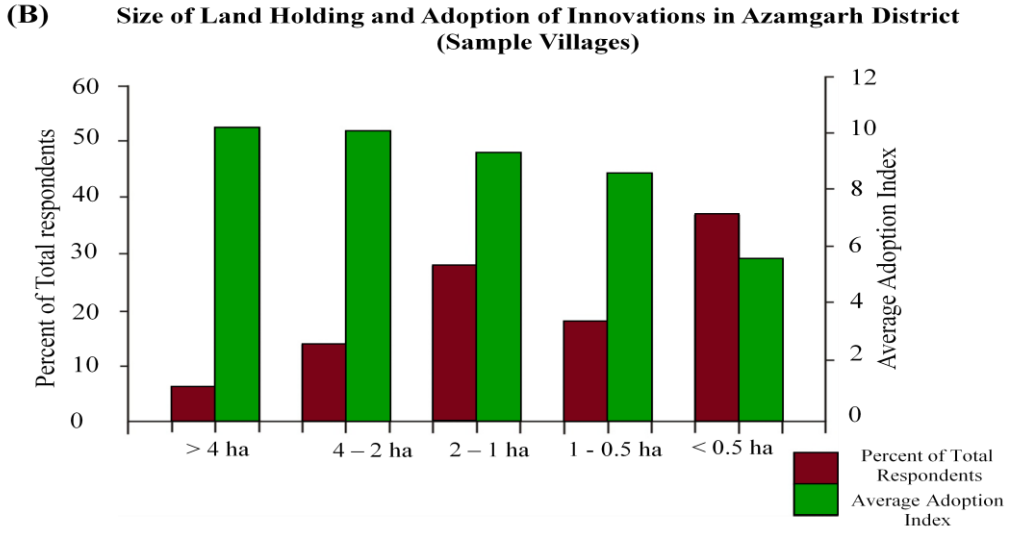
Table 1.14: Occupational Structure and Average Adoption Index

Sl. No.	Occupational Group	No. of Respon-dents	Average Adoption Index	Groups Compared	Difference in average adoption index	Mean Difference	Std. Error	Sig.
1	A. Exclusively Farming	162	7.5802	A-B	-1.4550	-1.45493*	0.330	0.00
2	B. Farming and Service	199	9.0352	A-C	-1.3819	-1.38187*	0.366	0.00
3	C. Farming and Business	132	8.9621	A-D	2.0745	2.07450*	0.415	0.00
4	D. Farming and Other Occupation	87	5.5057	B-C	0.0731	0.07305	0.350	0.997
				B-D	3.5294	3.52943*	0.401	0.00
				C-D	3.4564	3.45637*	0.431	0.00
* The mean difference is significant at the 1% level.								





Size of Land Holdings and Adoption of Agricultural Innovations

The importance of size of land holdings in agrarian economy hardly needs any explanation. Many studies have been done in this regard. There are two different opinions about the impact of size of landholdings on adoption of innovations. The scholars like Mohammad (1978), Desai (1966), Freeman (1961), and Ahmad and Rahman (2007) in their respective studies found high positive correlation between the size of holdings and the level of adoption of agricultural innovations. They have argued that the bigger size of landholdings support the farmers to adopt modern implements which often need big size of holdings to operate easily. On the other hand,

these implements require big amount of capital, which the small farmers can't afford.

The scholars like Singh (1965), Basu (1978) etc. have found negative correlation between these two variables. Their findings suggest that small farmers have adopted innovations earlier than bigger one, because being low earner and small producer, they have been strongly motivated to increase their level of living by adopting new farm technology where as another group does not need so intensified farming as to raise their overall output.

On the basis of the observed facts during field survey and results obtained from data collected for respondents it has been found that there is high positive correlation between size of land holdings and adoption of innovations in the study area. Small farmers were found highly motivated to adopt HYV seeds and fertilizers only to raise their crop yields and they were not interested in adoption of costly and big implements. They are still using these implementsmostly on rent basis from big farmers. On the basis of the above discussion it has been tried to find out relationship between these two.

Operational holdings have been taken into consideration to determine the size of land holdings, which were collected through the field work. In the study area size of landholdings varies from 0.2 hectare to more than 15 hectares. On the basis of size of land holdings the respondents were classified into following five groups (table 1.15):

Table 1.15: Size of Land Holdings of Different Groups of Respondents

Group	Category	Size of Land Holdings
Group A	Large-size farmers	More than 4 hectare
Group B	Medium-size farmers	4-2 hectares
Group C	Semi-size farmers	2-1 hectares
Group D	Small-size farmers	1- .5 hectare
Group E	Marginal farmers	Less than .5 hectare

Average adoption index for each group was worked out on the basis of individual adoption score of respondents. Analysis of variance (ANOVA with post-hoc) is used to test the general statement. The obtained results are given in table 1.16.

Table 1.16: Analysis of Variance for Size of Land Holdings vs Adoption of Innovations

Sources	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2291.206	4	572.802	77.701	0.00
Within Groups	4238.821	576	7.372		
Total	6530.028	580			

* The mean difference is significant at the 1% level.

The calculated 'F' value is 77.701 which is higher than the corresponding value in 'F' test table. Hence, the above statement seems to be significant. Average adoption in different groups varies significantly.

After getting total individual scores of the respondent, the average adoption index for each group of farmers is obtained. Table 1.17 shows that there are only 37 farmers (6.37 %of the total respondents) whose operational holding is more than 4 hectare but their average adoption index is highest 10.486 which is slightly greater than 10.291,the adoption index for group B (4-2 hectare). The marginal farmers 206 in number accounting for 35.51 percent of sample farmers have the lowest average adoption index (5.50).

Table 1.17: Size of Land Holdings and Average Adoption Index

Sl. No.	Groups/ Land Holdings	No. of Respond -ents	Average Adoption Index	Groups Compared	Difference in average adoption index	Mean Difference	Std. Error	Sig.
1	A > 4 Hectare	37	10.486	A-B	0.19535	0.19535	0.54088	0.99
2	B 4-2 Hectare	79	10.291	A-C	1.05611	1.05611	0.49588	0.20
3	C 2-1 Hectare	158	9.430	A-D	1.84649	1.84649*	0.52245	0.00
4	D .5-1 Hectare	100	8.640	A-E	4.98649	4.98649*	0.48479	0.00
5	E < .5 Hectare	206	5.500	B-C	0.86076	0.86076	0.37413	0.14
				B-D	1.65114	1.65114*	0.40870	0.00
				B-E	4.79114	4.79114*	0.35931	0.00
				C-D	0.79038	0.79038	0.34695	0.15
				C-E	3.93038	3.93038*	0.28713	0.00
				D-E	3.14000	3.14000*	0.33091	0.00

* The mean difference is significant at the 5% level.

The semi-size and small-size farmers who account for 44.48 percent of sample farmers have an average adoption index of 9.430 and 8.640 respectively. Fig. 1.4.B and table 6.20 clearly shows that there is positive correlation between the size of landholdings and average adoption index, supports our above statement.

Conclusion

Leaving exceptions apart, the overall picture which emerges from the present study is that the improved farm technology acts as unfailing engine to accelerate the pace of socio-economic development. Above analysis clearly reflects that the socio-economic and demographic features like age, social groups, education, family size, occupation and monthly income, size of land holdings, tenurial status

etc. are the major influencing factors in adoption of innovations. It is evident that modern farm technology and socio-economic development are entwined in the form of mutually supportive relationship.

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