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Outcomes of Agricultural Extension Contact in Bangladesh

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Abstract

Extension services make significant contributions to farmers by helping raise agricultural income. For successful introduction of agricultural extension contacts in the country, socio-economic factors such as farmers' education, age, number of adult family members, and ratio of agricultural income to total income should be taken into consideration.

In order to raise farmers' income in the developing countries, governments and international organizations have been aggressively promoting agricultural extension services. According to a review by Birkhaeuser and Evenson (1991), on the whole, extension services have contributed to improving the amount of information and technology and thus farmers' productivity levels.

However, research studies on extension services pertaining to Bangladesh are few. In the late 1970's, an extension system involving 12,000 workers was initiated under the denomination of "Training and Visit System", hereinafter referred to as T&V system (Hasanullah, 1994; Ilah et al., 1996). Yet, whether or not that program actually contributed to raising farmer's income, and, if so, whether the benefits of the system were evenly distributed among the farmers have not been ascertained. It may be noted that agricultural extension services in Bangladesh do not work satisfactorily and a great many farmers hardly ever receive such services (Rayners and Bruening, 1996; Porimol *et al*., 2008; Daily Star, 2008; Rafiq, 2009; Haq, 2011). This means that agricultural extension service in Bangladesh fails to reach its ultimate goal, which is to achieve farmers' socio-economic betterment. Investigating these issues toward development of further extension services is, thus, of prime importance.

The current research on rice farming in the central region of Bangladesh, has two major objectives: (1) to assess the actual benefits of agricultural extension services on productivity through an agricultural production function, and (2) if there are benefits for farmers, to determine the type of farmers who benefitted from the services.

The paper is structured as follows: the next section clarifies the method of analysis adopted, building on previous research, and explains the data collection process. The following sections examine the results of the agricultural function and the contact frequency function, as well as the conclusion of this research.

Method of Analysis and Data Collection

Many previous studies used the productivity index, representing the amount of production per unit of farmland, that is, the value-added production, found by deducting production costs from gross income. By using that index, it is possible to convert specific quantities of products into given amounts of money to be added up; this approach provides considerable analytical benefits. In this study, the same index has been used. As to the survey area, because livestock farming and fisheries represent a remarkably small portion of the total amount of production, the focus is on the index of crop production, namely grains, fruits and vegetables. Concerning home consumption, the amount was determined by applying the farm price to the actual quantities consumed.

As is commonly used in analyzing production functions, chemical fertilizers, farm buildings, irrigation facilities and family and hired labour should be considered as important investment functions (Evenson and Mwabu 2001, Moock 1976, Owens et al.2003). In this research, the analysis was based on the converted amounts of each type of investment. As regards family labor costs, the estimation was based on the costs applied to hired labor.

The accumulated experience of the farmer, which is an important variable, is commonly determined either from the years of farming or the age of the farmer. According to several studies, such as Evenson and Mwabu (2001) and Jollifee (1998), there is a positive relationship between productivity, income, and the amount of technical information possessed by the farmer.

Furthermore, considering the relationship between farm size and productivity, another variable—farm

size—was added. According to Evenson and Mwabu (2001), large farms have higher productivity, but other studies (Moock, 1976; Owens, 2003) did not find a clear positive relationship between the two, or, even, presumed a negative relationship. Considering the above perspective, it can be said that there is no common agreement on the relation between farm size and productivity.

Finally, an important variable is that of the activities of the agricultural extension services. In the Bangladesh T&V system, farmlands are divided into blocks and the T&V workers target the representative farmers of different blocks who are referred to as "contact farmers." Although the T&V workers can directly get in touch with ordinary farmers, they mainly train the contact farmers, who are expected to transmit their training to the others farmers in a progressive system. Considering this situation in Bangladesh, the current research used the frequency of contacts between ordinary farmers and T&V workers or contacts farmers (the combination of T&V workers and contact farmers is hereinafter referred to as "extension agents").

As in previous studies (Owens et al., 2003), the survey population was first divided into three categories, those who had no contacts (0 contact), those who had one or two contacts (1-2 times) and those who have three or more contacts (3+). Then a dummy variable was used for the estimation.

Except for the variable contact frequency, all the variables were evaluated with a logarithmic converter to avoid disparities in the figures.

Following the above reasoning, productivity was expressed in terms of the amount of money as follows:

LnCRIN=f(lnCHEM,lnIRRI,lnLABR,lnEXPE,lnAREA,EXT1,EXT2)…(1)

CRIN: Monetary value of the production per hectare (taka/ha).

CHEM: Costs of chemical fertilizers used per ha (taka/ha).

IRRI: Irrigation expenditures per ha (taka/ha).

LABR: Labour cost per ha (taka/ha).

EXPE: Experience of the head of the farm household (years).

AREA: Farm area (ha).

EXT1: Contact dummy (for 1-2 contacts per year=1; for others =0).

EXT2: Contact dummy (for 3+ contacts per year=1; for others =0).

The estimations were obtained using standard OLS methods. The method of analyzing the contact frequency between the farm households and extension agents is as follows: In this paper, the number of contacts was considered as a subordinate variable; the formula below was used to identify the contact frequency function.

NOEX=f(AGE,EDUC,RATE,NJOB)…..(2)

NOEX: Number of contacts per year.

AGE: Age of the head of the farm household.

EDUC: Years of schooling of the head of the farm household.

RATE: Share of agricultural income in total farm household income.

NJOB: Number of adult family members.

Farming income was determined by using the total monetary value of crop production from which the investment costs, labor cost, irrigation costs, land rent and the like have been deducted. As for the total farm income, it was calculated by adding non-farm income, such as income from office work, teaching, and other part-time work, to farm income. The share of agricultural income (RATE) represented 66.2 percent of the total.

Regarding farmer's education, it is presumed that the lower the level of education, the higher is the tendency to avoid risks involved in adopting new technologies; inversely, with a higher level of education, the interest or acceptance of new technology is also higher. According to a study conducted in India by Feder and Slade (1986), however, it was found that farmers with higher levels of education use more extension services.

In large farms, the costs of acquiring technical information, estimated per unit of area, decreases, according to Feder and Slade (1984). Based on these results, it is possible to presume that the higher the share of farm income of total income, the more willingness there is for the farmers to use the extension services to increase their agricultural income. Furthermore, the larger the number of adult family members, the easier it is to establish contact with the extension agents, since the family would more easily adjust to the necessary contacts with extension agents. Finally, the older the head of the household, the higher is the tendency to avoid the risk involved in acquiring new technologies.

Considering the above reasoning, it may be inferred that the education level of the head of the household, the share of agricultural income in total income, and the number of adult family members have positive correlation, while the head of the household's age has a negative general effect.

Furthermore, considering the nature of the data instead of using ordinary Least Squares (OLS), the QML-Poisson Count (Quadratic hill climbing) procedure was adopted.

Data Collection

In order to apply the above mentioned formula, a field survey was conducted, between August and September 2001, in the Gazipur district, located 30 kilometers North-East of Dhaka, the capital city of Bangladesh. This area is an average farming village in the central and northern area of the country regarding productivity, farm size and production conditions. Two areas of Gazipur (Sadar and Sreepur subdistricts) out of five sub districts were surveyed. A total of fifty farms were investigated through pre-structured questionnaires.

Following is a brief explanation of the survey families. The average age is 43.1 years, the number of years of schooling 5.5 years, the farm area owned is 1.4 ha, the family size is 7.2 and the adult family members 2.2. As for the contact frequency with extension agents, the average is 0.8 times per year and only 18 families were contacted out of the surveyed families (36 percent). The contacts were particularly few with families whose heads have low education levels; families that had no contact at all formed the majority, as can be seen in Table 1. It can be inferred therefore that extension agents had less contact with families with lower education levels.

Results and Discussions

Gross Agricultural Income

Table 2 shows the results where the findings match the result of previous studies: five out of the seven variables had a significant effect at 10 percent probability ($P \leq .1$). In addition, there are no apparent errors or irregularities in the results.

An examination of the estimation results suggests the following:

First, the coefficient for chemical fertilizer (CHEM) and irrigation expenditures (IRRI) per unit of farmland is positive at $P < .05$. The coefficient for labor costs is positive, although it does not show a significant statistical effect. Thus, it can be inferred that it is possible to realize high agricultural income per unit of land using a labor-capital-intensive management system.

Second, the coefficient for the experience of the head of the household is significant at the 5 percent degree of probability (0.259). Therefore, the accumulation of farm experience make a significant contribution to improving land productivity.

Third, the coefficient for cultivated area (AREA) is 0.337, which is positive but not significant. Therefore, it can be inferred that there is no relationship between farm size and productivity per unit of farmland. Finally, the coefficient for the dummy variable for contacts between the extension agents and the surveyed farms EXT1 (1-2 contacts per year) and EXT2 (3 contacts or more per year) is significant at both 10 and 5 percent degrees of probability. The coefficient for EXT2 is has lower probability of a Type I error (0.353), compared to EXT1 (0.234). Accordingly, it is infered that the contacts with extension agents contributed to improving agricultural production per unit of farmland.

According to Owens et al. (2003), whose research was based on Zimbabwe, a frequency of 1 and 2 operations per year between extension agents and farmers significantly increases productivity. However, a frequency of more than 3 times per year showed no clear effects on productivity. Compared with the results of Owens et al. (2003) in Zimbabwe, the results of the current study suggest that in Bangladesh the contacts between extension agents

Table 1: Education Level and Extension Contacts (persons)

Education Levels	Extension Contacts	No Contacts	Total
High school and over	3	4	7
Junior High School	7	9	16
Primary	7	11	18
Illiterate	1	8	9
Total	18	32	50

Source: Field survey 2001; Haq 2004.

Table 2: Model Explaining Gross Agricultural Income

Variables	Coefficients	T-values	
LnCHEM	0.329	2.591	**
LnIRRI	0.164	2.329	**
Ln LABR	0.339	1.406	
Ln EXPE	0.259	2.343	**
Ln AREA	0.337	1.136	
EXT1	0.234	1.796	*
EXT2	0.353	2.069	**
Intercept	0.034	0.019	
Adj.R-square	0.413		
Sample	50		

*&** indicate 10% and 5% level of significance

and survey farmers appear to be effective. This is apparent because farmers who have more than three contacts could obtain case-by-case, suitable guidance concerning the application of fertilizers or prevention of insects and diseases.

Frequency of the Contacts with Extension Agents

What kind of factors determines the frequency of contact between farmers and the extension agents? Clarifying this point is extremely important to promote more effective agricultural extension activity. The estimation results of the contact frequency function, based on formula (2), are presented in Table 3. The coefficient of the linear recurrence model being 0.632, the results can be considered as highly significant and important. Table 3 indicates that the survey farms that fulfilled the following conditions have had frequent contacts with the extension agents.

(1) The negative coefficient for the age of the head of the farm household's variable is significant at the 5 percent degree of probability (-0.083). This suggests that the younger the farmers are, the keener they are in acquiring new technologies and thus in contacting extension agents.

(2) The coefficient for schooling (EDUC) is 0.140, which shows positive effects at the 10 percent level of significance and suggests that the heads of households with higher education levels are more likely to contact extension agents with high frequency. The reason is that, apparently, they have more interest in agricultural technologies and effectively adjust to changes in their environment. According to Huffman (1974), extension activities help farmers who did not acquire enough school education to improve their ability to adjust. However, the results of the current research clearly show that farmers with low education levels do not benefit quite as much from extension services. Therefore, the difference in the educational backgrounds of the farmers influences the effects of extension services, thus magnifying the economic gap between farmers in a vicious circle.

(3) The coefficient for the share of agricultural income in comparison to total farm income (RATE) is 4.682 and is significant at the 5 percent level of significance. In other words, it can be said that farm households with dependency on agricultural income have increased their dependency on contacts with extension agents. The reason is that households, hoping to increase their gross income, are likely to

Table 3: Model Explaining Frequency of Contacts

Variables	Coefficients	T-values	
AGE	-0.083	-2.055	**
EDUC	0.140	1.939	*
RATE	4.582	2.463	**
NJOB	0.403	2.403	**
Intercept	-1.841	-1.435	
Pseudo R-square	0.632		
Sample	50		

*&** indicate 10% and 5% level of significance.

multiply their contacts with agricultural extension agents.

(4) The coefficient for the number of adult members in the farm household (NJOB) is significant at the 5 percent level of probability (0.403), suggesting frequent contacts with agricultural extension agents. Judging by the estimations of such a contact frequency function, it can be inferred that the education level of the farmers and their age are important to the degree of dependency on agricultural income and the number of adult members in the farm household.

Conclusions

This research was aimed at clarifying the effects of agricultural extension services on improving farmers' productivity. With an example from one village of Bangladesh, the relevance of contact frequency between farmers and extension agents and farm income was established. The results of the study can be summarized as follows:

First, from the estimated results of the production function, it was clarified that the greater the frequency of contacts between extension agents and farmers, the higher the level of productivity. Thus, extension services have positive effects in improving farm income.

Second, by examining the factors determining the contacts between extension agents and farmers, a positive correlation was found with education level, the share of the agricultural income from the total farm income, and the number of adults in the farm household. On the other hand, the head of the farm household's age is inversely proportional to the frequency of contacts with the extension agents. Thus, agricultural extension services do not work well enough for elder farmers, especially those with low education levels.

Considering the overall estimation, it has been ascertained that agricultural extension services positively contribute to increasing farmers' income to some extent, but there is a need to develop the system further and strengthen links to elder farmers with low education levels. This is an issue that requires further examination in future studies.

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