



Agricultural Extension Contact and Farmer's Income in Bangladesh

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ABSTRACT

The impacts of extension contact on income of farmers have been examined with a view to evaluate the agricultural extension services in Bangladesh. The scope of the study was ten villages of Gazipur of Bangladesh. The objective of the study is to identify the effect of extension contact on crop income, livestock income, fisheries income, miscellaneous income, total agricultural income, nonagricultural income and total income of farmers. The sample of the study consists of 1000 farmers. Data came from field survey and multistage random sampling technique was used for the collection of data. The results indicated that the impacts of extension contact coefficients on crop income, nonagricultural income are positive and significant. However, the impacts of extension contact coefficients are not significant in the cases of livestock, fisheries, miscellaneous and agricultural incomes. But it does not mean that agricultural extension has no reward in Bangladesh. The sample data indicates that the impact of extension contact on total income of farmers is positive and significant. The study concludes that agricultural extension is necessary to raise the income of farmers.

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Introduction

Realizing the importance of agricultural extension services, agricultural extension services have been increasing over time throughout the world (Owens et al., 2003). It is noted that agricultural extension intends not only to raise productivity and income but also to improve multifaceted aspects of rural life (Waddington et al., 2010). Understanding this importance, agriculture extension in Bangladesh is gaining momentum since long decades. However, sometimes this is not adequately appreciated by most policymakers and planners in the less developed countries like Bangladesh. It is noted that agricultural extension services do not work satisfactorily and many farmers hardly ever received agricultural extension services in Bangladesh (Rayner and Bruening, 1996; Haq, 2004; Rafiqul, 2009; Haq, 2011). This means that agricultural extension services in Bangladesh still fail to reach its ultimate goal, which is to increase the farmers' socio economic betterment. In the broadest sense, extension impacts have been associated with improvements in productivity (Haq, 2012) and household income (Xuan et al., 2014). While there is a large literature dealing with agriculture extension issues in developing countries, rigorous impact evaluations of agriculture extension interventions are less common (Waddington et al., 2010). With this regard, importance of agriculture extension for the improvements of agriculture yield, household income and poverty status need to be evaluated (ibid). These evaluations can assist policy makers and practioners in designing effective extension program (ibid).

A number of materials are available concerning agriculture extension. Many of them deal with training and visit system, participatory demonstration and training extension system, challenging facing extension agents and role of extension service in commercialization (Hasanullah, 1994; Rayner and Bruening, 1996). Fewer numbers of impacts studies are available (Haq, 2011, 2012; Owens et al., 2003; Birkhaeuser and Evenson, 1991; Evenson and Mwabu, 2001) but the focuses of those studies concentrated on the role of extension in raising crop productivity in terms of physical quantity and monetary value. Hardly any evidence exists about the impact of extension services on the overall income of farmers with minor exceptions (IAPP 2013; FFSA 2011; Xuan et al., 2014). Above those, IAPP and FFSA are based on projects which identified the differences of incomes between the target farmers and non-target farmers. It was also observed in Xuan et al. (2014) about the differences of income of target and non-target tea farmers. It is assumed that the information of previous studies in the context of relationship between extension service and the dynamics of income of farmers considering the types of agricultural incomes, non-agricultural incomes and total income are scanty in order to evaluate agricultural extension in the countries. This is too inadequate in Bangladesh. For example, whether or not the agricultural extension actually contributed among the farmers' productivity in terms of income and if yes, whether the benefits of the system are homogeneously distributed among the farmers have not been clarified enough. Investigating those issues toward developing

further extension services that are more efficient is of prime importance. Therefore, the current study is to determine the influence of extension contact on incomes of farmers. Finally, the study draws a conclusion about the agricultural extension in Bangladesh.

Anyhow, it is assumed that studies are done by many researchers and funded projects considering several topics of agricultural extension which are not easy to pinpoint the source of the difference among those experiments because their data, location, objectives and model specifications were quite different. Despite it, the current study can differentiate itself with others since the study identify the impact of agricultural extension services on various agricultural incomes, non-agricultural income and total income of the farmers of Bangladesh by covering the whole Gazipur district which is also an average agricultural productivity area.

This study keeps importance in the farmers of Bangladesh. It is because the farmers are the major dominant of the rural areas of the country. Unless their income improvement, rural developments are quite possible and migration from rural to urban and rural to rural and agricultural work to non-agriculture work will not possible to minimize. The Government of Bangladesh is determined to reach at the medium income country from low income country by the year 2021 (Ahmed, 2015). For this instance, incomes of rural peoples must be raised because sixty percent peoples live in the rural areas and their main occupation is agriculture. Therefore, the impacts of agricultural extension service on the overall income of farmers are noted to be important in order to attain the medium income country as well high income country either in Bangladesh or elsewhere.

Materials and Methods

Sampling Design

The selection of the Gazipur district, upazilas (sub districts), villages and sample respondents were done purposively. There were some salient features in the selection procedure. First one, the selected district includes some important infrastructures, such as Bangladesh Agricultural Research Institute and Bangladesh Rice Research Institute, etc. Secondly, total number of selected villages was ten by selecting two villages from five upazilas. Of the two villages in each upazila, one village is selected comparatively near to the upazila headquarters and the other one is selected comparatively away from the upazila headquarters. The selected nearer villages were Samantapur (Sadar), Bagnahati (Sreepur), Dushya Narayanpur (Kapasias), Katalia (Kaliakoir), and Poinlanpur (Kaliganj). The selected villages which were comparatively away from the upazila headquarters, namely, Bara Bhabanipur (Sadar), Saitalia (Sreepur), Noyanagar (Kapasias), Poshim Chandpur (Kaliakoir), and Bhatgati (Kaliganj). Thirdly, the total households were more than one hundred in the selected villages (BBS, 1993). It was then decided to collect one hundred samples from each village. The total numbers of investigated farmers were one thousand (2

villages x 5 upazilas x 100 farmers) and multistage random sampling technique was followed. Primary data was collected using survey method and personal interviews were conducted through pre-tested questionnaires with a view to collecting data. The survey was administered with the help of staff of BARI in 2002. Lastly, each upazila has some characteristics: Sadar upazila is completely urban type; Sreepur, Kapasia and Kaliganj upazilas are rural type and headquarters of these upazilas are the only urban areas, while Kaliakoir upazila headquarter is the only urban area and Safipur is the other urban area of this upazila (BBS 1993).

Conceptual Framework

Many of the previous researches used the productivity index representing the amount of production per unit of farm land, the value added of production, which is found by deducting production costs from gross income. By using that index, it is possible to convert the specific quantities of products into given amounts of money to add up; therefore it represents a considerable analytical benefit. The method of settling the type of variables from which the index is determined, expected to be discussed (Haq, 2012).

As is commonly used in analyzing production, chemical fertilizer, farm buildings, irrigation facilities, family and hired labours should be considered as important investment functions (Evenson and Mawabu, 2001). Haq (2012) considered crop income per unit of land as dependent variable and chemical fertilizer cost per unit of land, irrigation cost per unit of land, experience of farmers, farm area, number of times extension contact as independent variables. Therefore, it summarized the model;

$$\ln \text{crop income} = f(\ln \text{chemical fertilizer}, \ln \text{irrigation}, \ln \text{experience}, \ln \text{farm area}, \ln \text{labour}, \text{extension contact dummy}_1, \text{extension contact dummy}_2).$$

Haq (2011) interpreted rice yield as dependent variable, while age of the farm household head, number of family earners in the household, number of times extension contact, proportionate effect of flood to crop land, distance from farm land to market, actual size of cultivated land, per unit cost of chemical fertilizer, per unit land cost, per unit irrigation cost, village dummy were taken as independent variables. The production function was solving by applying the ordinary least squares. The above concepts provide to run an empirical model which is found in the ensuing section.

Empirical Model

The model applied here is the input-output model. The heart of the input-output model is the concept of the production function [$Y=f(\text{Capital}, \text{Labour})$] which helps us in understanding the role of important variables like capital and labour in determining the crop productivity. But only two factors have no reflection on the productivity of any crop. Therefore, based on related past studies (Evenson and Mwabu, 2001; Owens et al., 2003; Haq, 2011) and logical analysis, some important

explanatory variables are considered in this study namely age of the farm household head (Ag), years of schooling of the head of the household (Ed), number of family members (Fm), number of family earners in the household (Fea), number of educated family members except household head (Fem), number of times extension contact received by the farmer for the sample crop season (Et), institutional link (MSdummy); it takes 1 if the farm involves in any village cooperatives /NGO; otherwise it is 0, proportionate effect (%) of flood to crop land (Fec), homestead area in acre (Ha), distance from farm land to market in miles (Mr), actual size of cultivated land in acre (Fs), total money spent for irrigation (Irr), village dummy (Vdummy) = 1 if near village; otherwise = 0. Dependent variables are total income (Tin), total agricultural income (Tagin), crop income (Cin), livestock income (Livin), fisheries income (Fishin), miscellaneous agriculture income (Misc.ag.in) and non agriculture income (Ngin). Table 1 indicates the summary statistics of selected variables. Data have been analyzed through frequency, percentage, mean, standard deviation and regression analyses. The productivity expressed in terms of income is as follows,

Cin	= f (Ag, Ed, Fm, Fem, Fea, Et, MSdummy, Fec, Ha, Mr, Fs, Irr, Vdummy)	(1)
Livin	= f (Ag, Ed, Fm, Fem, Fea, Et, MSdummy, Fec, Ha, Mr, Fs, Irr, Vdummy)	(2)
Fishin	= f (Ag, Ed, Fm, Fem, Fea, Et, MSdummy, Fec, Ha, Mr, Fs, Irr, Vdummy)	(3)
Misc.ag.in	= f (Ag, Ed, Fm, Fem, Fea, Et, MSdummy, Fec, Ha, Mr, Fs, Irr, Vdummy)	(4)
Tagin	= f (Ag, Ed, Fm, Fem, Fea, Et, MSdummy, Fec, Ha, Mr, Fs, Irr, Vdummy)	(5)
Ngin	= f (Ag, Ed, Fm, Fem, Fea, Et, MSdummy, Fec, Ha, Mr, Fs, Irr, Vdummy)	(6)
Tin	= f (Ag, Ed, Fm, Fem, Fea, Et, MSdummy, Fec, Ha, Mr, Fs, Irr, Vdummy)	(7)

Income Computations

Agriculture income is the sum of crop income + livestock income + fisheries income + miscellaneous income. Incomes from crops (rice and vegetables) are calculated by deducting the total production costs from the gross return. Gross return is the value of total production plus value of by-products. Total costs are seed, manures, fertilizer pesticide, irrigation, tractor, animal power (family and hired) human labor (family and hired), interest on capital and land rent as describe in national census (Haq, 2004). The value of subsistence and crops gift to others is also included in net income, which is valued at prevailing local price (Murphy et al., 1997). Miscellaneous incomes derive from traditionally produced fruit spices, pulses, oilseeds, bamboo and timber in the homestead areas followed by occasionally grown jute in the fields. Incomes such as rent out land, tractor rent out, irrigation equipment rent out, wage for self-employed works of farm operator are also included in miscellaneous income. Income from fisheries is computed for one year by deducting the total production costs from

the gross return, which also include value of home consumed fish. Costs mainly included feeding, excavation, labor and pond rent (Haq, 2004).

Income from livestock resources are derived from milk, egg production, poultry bird sale, plough rent out, cattle and goat sale. Various information of livestock were collected on a weekly, daily, monthly and yearly basis and later all data were converted into a yearly basis. Total livestock income = net return of milk + net return of poultry egg + net sale of cattie, goat, plough rent out and poultry birds. Net incomes are derived by deducting the total expenditures from the gross return. Value of unsold and subsistence products such as milk and eggs were also included in net income which were valued at prevailing local prices. Non-agriculture incomes are collected monthly, daily basis and converted them into a yearly basis. Non-agriculture income sources are trade, salary, wage labor, wage for self-employed works, internal and international remittances, shop rent and house rent. Relevant expenses such as marketing expenses were deducted from the gross value (Haq, 2004).

In the objective of this research, the most important independent variable is that of the activities of the agricultural extension services. In Bangladesh Training & Visit (T&V) system, farmlands are divided into blocks and the T&V workers target the representative farmers of the different blocks, who are referred to as "contact farmers" (Haq, 2012). Although the T&V workers can directly get in touch with ordinary farmers, they mainly train the contact farmers, who afterwards transmit the training results to the other farmers, in a progressive system (ibid). Considering this situation in Bangladesh, the current paper used the frequency of contacts on the basis of actual number of times contacted between ordinary farmers and T&V workers or contact farmers. Note that the combination of T&V workers and contact farmers is hereinafter referred to as "extension agents" (ibid). Most of the farmers of Bangladesh are either illiterate or unskilled. Thus with the knowledge derived from extension services through extension contact, farm operators may increase their income (Haq, 2012; Owens et al., 2003). Explanations of the selection background of other explanatory variables can be found in relevant literatures (Haq, 2004, 2012).

Results and Discussion

The regression results are presented in Table 2. The values of AR^2 agree with similar studies which are understandable because of the numerous factors affecting crop income, agricultural income, non-agricultural income and total income. Moreover, F-values are significant at 1% level of significance which implies that the specification of the models is reasonably accurate (Haq, 2004). The fit for livestock income, income from fisheries, miscellaneous income and non-agricultural income models cannot be determined as they are tobit models (Haq, 2004).

Table 1 Summary statistics of variables*

Variables	Mean	Standard Deviation
Total income (Taka)	90690.12	165,676.35
Total agriculture income(Taka)	49388.46	71293.96
Total nonagricultural income(Taka)	41301.66	149,171.18
Income from livestock(Taka)	24805.95	67076.42
Income from fisheries(Taka)	2016.32	13578.35
Miscellaneous agriculture income(Taka)	9228.53	9979.51
Crop income (Taka)	13338.04	11387.51
Ag (Age of the farm household head)	42.52	11.83
Ed (Schooling year of farm household head)	5.77	2.11
Fm (Number of family members in the farm household)	5.34	2.11
Fem (Number of educated family members excluding farm household head)	2.65	1.70
Fea (Number of family earners in the household)	1.49	0.85
Et(Number of times extension contact)	0.24	0.61
MSDummy (Institutional link; yes 1, otherwise 0)	0.25	0.43
Fs (Actual size of cultivated land in acre)	0.74	0.61
HA(Homestead area)	0.26	1.60
Fec (Proportionate effect of flood to crop land)	10.08	19.79
Mr (Distance from farm land to nearest market in miles)	1.03	1.39
Irr (Total cost of irrigation)	887.13	704.12
Vdummy (1 near village, otherwise 0)	0.50	0.50

*Source: Author's calculation from survey data. 1 US\$= BDT80 (approximately)

Table 2 Regression results

Variables	C in	Livin	Fish in	Misc.ag.in	Tagin	Ngin	Tin
Ag	-138.700*** 29.697	508.74* 302.956	-19.139 68.662	41.411* 28.058	391.537** 207.114	393.143 686.535	784.680 483.007
ED	-476.968*** 87.000	2118.273*** 887.525	309.241* 201.151	228.250*** 82.197	2177.844*** 606.750	969.581 2011.234	3147.425** 1414.992
FM	-45.050 210.800	-1276.295 2150.460	316.026 487.386	466.403*** 199.162	-539.766 1470.147	682.262 4873.19	142.496 3428.505
FEM	1488.390*** 240.651	649.184 2454.985	143.665 556.404	147.984 227.366	2424.337* 1678.333	-4214.102 5563.278	-1789.766 3914.013
FEA	587.724 460.164	3653.892 4694.331	-771.487 1063.936	1109.399*** 434.761	4580.472* 3209.245	7957.054 10637.89	12537.53* 7484.230
ET	743.589* 558.830	-4948.460 5700.864	-81.417 1292.06	119.400 527.980	-4156.324 3897.355	21459.51* 12918.81	17303.18** 9088.959
MSDUMMY	1157.378* 762.018	15701.48** 7773.662	2400.508* 1761.844	-1405.371** 719.950	17871.83*** 5314.408	37546.41** 17616.01	55418.23*** 12393.65
FEC	-76.155*** 16.996	169.650 173.391	8.911 39.297	-67.189*** 16.058	35.549 118.537	-120.031 392.925	-84.481 276.44
HA	-84.350 200.408	1173.728 2044.447	-20.463 463.359	-120.656 189.344	948.110 1397.672	-81.306 4632.953	866.803 3259.488
MR	-436.262* 234.902	428.526 2396.340	-12.708 543.116	785.959*** 221.934	764.432 1638.241	-2031.873 5430.383	-1267.44 3820.515
FS	3195.913*** 560.560	1035.718 5718.505	-0.661 1296.058	-1346.818*** 529.614	2859.763 3909.415	-3460.075 12958.79	-600.312 9117.084
IRR	3.916*** 0.480	-3.052 4.902	-0.309 1.111	-0.819** 0.454	-0.264 3.351	-11.233 11.110	-11.497* 7.816
VDUMMY	-3197.628*** 656.063	-16076.96*** 6692.77	1455.806 1516.868	2151.994*** 1487.519	-15692.83*** 4575.464	-16960.30 15166.59	-32653.13*** 10670.37
CONSTANT	14002.58*** 1574.437	-4755.145 16061.480	-1877.623 3640.218	2446.408* 1487.519	9851.786 10980.31	16046.62 36397.16	25898.41 26607.01
AR ²	0.220				0.03		0.02
F values	22.916***				3.79***		3.23***
Loglikelihood		-12647.99	-11128.28	-10566.56		-13462.34	

***, ** & * indicate 1%, 5% and 10% level of significance. Italics are standard error, Source: Author's calculation from survey data.

The effects of regression coefficients of extension contact on crop income, non agriculture income and total income are positive and significant. The effect of extension contact on crop income is comparable with others (Owen et al., 2003; Haq, 2012). Owen et al. (2003) observed that effects of extension contact of 1-2 times is more effective while Haq (2012) observed 3 times or more times extension contacts are effective in case of Bangladesh. The present study indicates that many times extension contacts with farmers seem to be more effective on crop, non-agriculture and total incomes. It is observed in IAPP (2013) that farmers in the top income quartile were provided three times more visit by the government extension worker. The study of Xuan et al. (2014) clears that the income of farmers accessed to agricultural extension services is highly influenced than in the farmers who had no access to agriculture extension services. Results of FFSA (2011) indicate that incomes from crops and total income of target farmers are significantly higher compared to those incomes of non-target farmers. Nonagricultural income of target farmers is not significantly different from non-target farmers of the study of FFSA (2011). The effects of extension contact on livestock, fisheries and total agricultural incomes are positive but insignificant in the present study. However, it is found in FFSA (2011) study that incomes from livestock, fisheries and agricultural incomes are significantly higher in the case of target farmers than in the non-target farmers. It is seen in Table 2 that the effect of extension contact on miscellaneous income is positive though the magnitude is weak since the regression coefficient of extension contact is not significant.

It is evident from the study that extension agents are very conscious to provide knowledge to farmers about crop agriculture compared to non-crop agriculture. The one reason is, perhaps, that the country gives priorities to increase the food grain production for the sake of overcome the food deficit. Therefore, farmers are able to raise crop productivity either in terms of physical value or monetary value by acquiring knowledge from the extension agents. Moreover, extension agents are very often provided training which is relevant to crop agriculture rather than non-crop agriculture. So it is assumed that the knowledge of crop agriculture of extension agents is comparatively better than in the case of knowledge of non-crop agriculture. Non agriculture income is an important source of finance in order to keep the sustainability of agricultural activities of farmers of Bangladesh like many other countries. Therefore, extension agents also disseminate their knowledge to the farmers in order to raise non agricultural income. Policymakers should take note of this.

Conclusion

The effects of extension contacts on crop income is positive and significant but the effects of extension contacts on livestock income, fisheries income, miscellaneous income as well total agriculture income is positive and insignificant. It does not mean that extension

contact is weak. The impact of extension contact on non-agriculture income is positive and significant. The overall impacts of extension contacts on total income are positive and significant. It indicates that extension contacts of Bangladesh are rewarded.

The government of Bangladesh determines to raise the income of the people with a view to reach the Millennium Development Goal (MDG) by 2021 (Ahmed, 2015). In this context, following proposals can be made useful for the policy implications:

In practice, one extension worker in Bangladesh covers 1000 to 1200 households approximately while it covers 235 households in Japan (Hoque and Usami, 2004). In the current study, it is also found that 82.9% sample respondents were excluded from the extension contacts. Thus it is proven, that extension workers in Bangladesh cannot transfer relevant ideas about farm management to all farmers appropriately. Sub assistant agricultural extension officers (SAAO) of the extension services should be increased in order to spread extension contact among all farmers.

It is noted that a 10% increase in farm income generates a 6% rise in non farm income in Bangladesh (Anonymous, 2016). It is found in the present study that the impact of extension contact is not significant on the agricultural income but the impact of extension contact on the non agricultural income is positive and significant. It is thus expected that extension workers should be trained up properly so extension workers can assist farmers to raise agricultural income.

It is also observed that the effect of agriculture extension service is not stronger than in the impact of other rural institutions such as NGOs on income of farmers. The government should take initiative for the development of agriculture extension service in order to accelerate the productive works in the rural areas by consolidating with other rural development organizations with a view to fulfill the MDG either in Bangladesh or elsewhere.

Finally, these are not last but least. Things which are excluded from the present study, should be done by the researcher in the future.

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