Impact of Rural Finance on Agricultural Development in Bangladesh

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Abstract: An increase in agricultural production is an effective weapon for sustainable economic growth, increases food sufficiency, and reduces poverty in Bangladesh. However, agriculture's contribution to GDP was insufficient and unsatisfactory due to a lack of adequate financing and contemporary technology in the industry. In this perspective, the study's main objective is to determine the impact of rural finance on the agricultural production in Bangladesh. The data related to assessment Bank Credit is collected from Bangladesh Bureau of Statistics Reports and Reports of Microcredit Regulatory Authority of Bangladesh. Overall growth and performance of rural people have been analyzed based on multiple variables of rural finance. The study uses Multiple Regression model and the study found that Bank loan to the agricultural sector have a significant positive impact on the country's overall Agricultural output/production. More financing in the agricultural concerns will increase the aggregated agricultural output of the country.

Keywords: Rural Financing, Bank Credit, Agricultural Output, Agricultural Development.

Introduction

Bangladesh's economy is agriculture dominated, with 67% of the population directly or indirectly depending on agricultural activities, although the country is moving towards industrialization. Thus, the agricultural segment plays a very important role in Bangladesh's total economic growth, and it is the blood and crucial weapon of Bangladesh's economy. It is also an essential social sector related to food and nutritional security, poverty reduction, and income generation. The most challenging banking field is rural and agricultural finance, which has notoriously lagged in financial systems' overall development (Hollinger, 2011).

Rural finance, on the other hand, refers to the collection and pooling of funds, as well as the lending of cash to rural people, especially farmers, to continue their socioeconomic along with other commercial activities in rural areas. Rural finance is significant in combining production variables to raise production and improve the incomes and living standards of beneficiaries in rural areas. Preferential loans are fundamental in the fight against poverty in developing countries, (Nguyen, et al. (2018). Rural finance provides rural residents with long-term financial programs that benefit people of all economic levels in the rural areas, (Richter, 2011). The rural financial services providers can be formal, semi-formal, or informal (Oluyombo, 2013b) as practice in Nigeria, especially in the rural areas. However, rural finance services should accommodate rural people's income. They are not technically excluded from patronizing formal financial service systems in these areas because rural dwellers have low education and financial as well as technical illiteracy.

Access to financing in rural areas allows rural people to increase their productivity and income by acquiring goods and services, potentially reducing poverty, and improving their standard of living (Henry and Schimmel, 2011). Formal financial systems did not better serve the rural dwellers in the rural community. There is a service gap because financial organizations either avoid or fail to provide key financial functions to rural populations (Richter, 2011; Aina and Oluyombo, 2014).

Agricultural finance, Micro finance and SME finance are the subparts of rural finance. Agricultural finance refers to a range of financial products for agricultural output, processing, and commercialization, including short-term, mid-term, and long-term loans, financing, and agricultural crops and livestock insurance

Agricultural microfinance as defined by Christen and Pearce (2005) is the lending of money for crop production, selling, distributing, and handling to local farmers and poor rural families, (TAŞÇI, 2015). Rural finance is how financial facilities are given to rural people in developing nations. Three methods used are individual, group, and combination of the group. This group delivery method is the most common among rural financial services providers. For example, the method is used by the Grameen Bank of Bangladesh (Haque and Yamao, 2008; Mawa, 2008). Access to financial resources in rural areas allows rural residents to raise their productivity and profitability by acquiring products and services, potentially reducing poverty, reducing inequality and improve the lifestyle of the people in the rural society, (Henry and Schimmel, 2011). Before the nationalization of major commercial banks, no institutional credit was provided to agriculture except by cooperatives and the government. The common goal for agricultural credit or finance is to increase production and contribute to crate investment, i.e., capital stock Jugale, V. B. (1991). Agricultural finance plays a vital contribution in advancement of agriculture. Due to a lack of financial solvency and a lack of clarity about the product level and the time interval between inputs and outputs, agricultural household models suggest that agricultural financing is necessary, Sadoulet, et al., (1998). This took the form of proposing collectivization, centrally planned, and available switching from the overseas markets in radical dependency theory (Frank 1967). In response, rural policy mandated land collectivization and the forced extraction of agricultural surpluses for massive industrial funding. Critical theoretical advancements in applying new institutional economics (NIE) to challenges pertinent to rural development design have been accomplished in recent years. This theoretical breakthrough has accompanied in a new era of modeling and empirical research into home engagement, agricultural institutions, social behavioral patterns, and national growth drivers (De Janvry, et al,. (2002). Professor Yunus has propagated the concept of microfinance amid famine throughout nation began to make small loans to low-income families in nearby cities to break the vicious circle of poverty (Sultan, et al., 2017). Banks' inability to participate in services in rural finance leads to a lack of entrée to financial facilities by rural people in developing nations (Lohlein and Wehrheim, 2003; Aina and Oluyombo, 2014). For that reason, which may impede the economic improvement and development of rural people and the possibility of reducing the poverty level among the rural people? Tackling poverty in rural areas is very important in developing and under-developing countries where most people cannot access the services from formal financial instructions (Aina and Oluyombo, 2014). Furthermore, in the case of Bangladesh, more than 50% of people reside in rural areas. Majority of the rural people are poor, and some live in extreme poverty. For overall development and balanced economic growth, rural development is significant nowadays.

The objectives of this study are-

- To evaluate the “impact” of rural Finance (Bank’s Loan) on agricultural sector development.
- To recommend ways in which rural finance can successfully contribute to boosting Bangladesh's agricultural production.

For the objective, the research question is - What is the impact of rural finance, and how can rural finance contribute to agricultural production development?

According to the World Development Report, financial constraints are more prevalent in agriculture than in other sectors (World Bank, 2007). At the heart of his talk is a look at how recent implementation efforts have fared, a discussion of current challenges, and a vision for the future of rural finance under the World Bank's rural development strategy. With this document, the World Bank explains the current best practices in rural financing and how it attempts to implement them into its operations as a standard reference point for policymakers in client countries, bank employees and other donor organizations. The technique provides some practical information on the types of instruments that are acceptable in certain scenarios, but it is not meant to be a toolbox for project design, (Steel and Charitonenko, 2003). An agricultural innovation foundation in Basel, Switzerland, works with people in semi-arid regions to improve their livelihoods (Seibel, 2012). In a study by Yishay, et al., (2017), it was shown that households in the microcredit arm were more willing to pay full price for upgraded latrines than those in the non-financing arm with 60 percent of the financing arm's households willing to do so. Alauddin and Biswas (2014) explored the present trend of agricultural credit flow over the recent years in Bangladesh. They discovered that, although the informal sector historically dominated the rural credit market for agriculture, the formal sector has grown in recent years in disbursing agricultural credit. Many local private commercial banks and foreign banks are using these channels to give agricultural finance because NGOs have a stronger network throughout the country. In times of economic and financial crises, agriculture can be a more effective hedge than other sectors. According to these studies, agriculture has shown amazing resilience in the face of a global economic crisis, (FAO, 2013).

There was formerly a great deal of attention paid to extending rural and agricultural financing in developing nations because of the rural economy's critical role in supporting overall economic growth, employment, and poverty reduction. In the early 1990s, the rural sector was vital since the most of China's population and much of the country's private sector resided in rural areas, Qian & Huang, (2016).

Farmers' investment and production decisions are heavily influenced by their access to financial instruments, according to Karlan et al. (2011). Farmers may be discouraged from implementing more efficient technology, acquiring agricultural supplies, or making other decisions to increase their enterprises' efficiency if adequate risk mitigation products or available financing instruments do not fit their needs. Increasing farmers' investment options and providing them with more effective management tools can be achieved through better access to financing.

Bangladesh and Ethiopia were studied by Tenaw and Islam (2009), who analyzed the structure of rural banking services from the perspective of their ability to improve farmers' lives. They discovered that improving agricultural productivity, food security, and poverty alleviation can all be aided by easy access to rural financial services. Furthermore, it found that the lack of an effective, sustainable, and widely accessible rural finance system remained a serious concern in most developing nations.

Increased farmer investment in agriculture could be made commercially feasible, according to Beaman et al. (2014). For decades, it has been accepted as common knowledge that sustained agricultural growth is essential to reducing poverty and promoting economic progress.

Ethiopia's government has devoted more than 10% of its budget to agriculture, investing heavily in speeding up its agricultural extension and rural financing programs and emphasizing initiatives that encourage the increased production of cereal crops, (Rashid and

Negassa, 2013). Another study indicated that families with many dependents need loans to keep their productivity and consumption on track (Duong and Izumida, 2002).

With the relaxation of access policy, many new rural financial institutions such as banks, lending subsidiaries, and the Union of rural funds will emerge. It will break the previous monopolistic position of rural credit cooperatives in rural finance. The new finance pattern will bring new competition and vitality for financial services in rural areas; on the other hand, it also brings a new topic for China's rural financial supervision, (ZHAO Tianrong- Issues in Agricultural Economy, 2007) en.cnki.com.cn. Rural Chinese businesses, which are typical SMEs, are important to the economies of rural China and the country, have a hard time getting funding. The most important findings include Anhui's 1990s-era rural SMEs have a major lack of working and investment capital in rural areas of the province, (Zhixiong, D., Quinsin, M., & Yoichi, I. (2005).

Strengthening agricultural production and efficiency in developing countries is one of the most important components of contemporary technology. Governments set up legally established lending institutions to provide subsidies for the use of agricultural technology (Manig, 1990). According to a study, credit subsidy policies can cut interest rates in the informal sector and boost agricultural output and farmer welfare if they are implemented via the first path (Chaudhuri, 2001).

Formal loans subsidized for informal lenders help small farmers get better conditions on their loans, boosting agricultural productivity, (Chaudhuri and Dwibedi, 2002). Agricultural credit cooperatives provide financial incentives for farmers to conserve and recycle their money (Kawai, 1999).

Traditional rural communities are the key to any successful emerging global development movement (Galor, 2005). Microfinance is now widely regarded as an institutional framework for providing financial services to the poor. The rapid expansion of microfinance in India, which has the world's greatest concentration of poor people, was only to be expected (Satish, 2001). Many microfinance institutions around the world are having difficulty meeting the needs of the impoverished. Grameen Bank Replicators run by the Nepalese government are a good example of the substantial difficulties encountered in this undertaking, Wehnert and Shakya Jan, (2001). Microfinance institutions (MFI) that receive government funding are common. Because of this, governments and donor organization want MFIs to be financially sustainable and assist the lowest of the poor (Zeller and Sharma, 2000).

Most African efforts to build financial markets and rural credit institutions have failed to meet the needs of rural residents for savings and credit services (Turtiainen, 1999). The research demonstrates that informal savings and credit associations reflect more of our social and economic capacity than official ones. Gaining a better knowledge of this issue could aid in the creation of a rural finance system that is both more effective and more practical, (Owoeye and Adenuga, 2005).

Providing rural financing to the poor is a way for banks to improve their financial situation while ensuring that the rural poor are better able to save for the future. It is estimated that as many as 80% of people in developing countries are dependent on agriculture and rural activities. To fulfill agricultural development goals, credit can be used as an input, but it cannot be the primary driving force (Khan, 1992).

Agriculture plays an important role in establishing food security and self-dependency, maintaining health security, eliminating rural poverty, and enhancing long-term economic development in the country (Bangladesh Bank, 2011-12). As a result, to assist the country in

overcoming this difficulty, the government has made agriculture a key priority. Agricultural loans seemed to be an important fragment of contributions required to improve and improve agricultural output from the past period. There are huge lacking financing opportunities in the rural areas, in that case rural financing plays significant role and introducing the helping hand for the rural people.

From the above discussion of review of literature, it is relevant to examine the impact of rural finance on agriculture production in Bangladesh through the study.

Materials and Methods

Research Hypothesis: Positive relation between rural financing and agricultural production development (Output)

The structural advancement of rural financial services and the function of financial institutions can all contribute to improvements in agriculture, food security, and the reduction of poverty (Tenaw and Islam, 2009). In addition, it was concluded that most developing countries face a significant problem in building an effective, long-term, and widely available rural banking system.

For Determining the context of this matter and making its way to a meaningful proposal about it are thus crucial.

Data Collection:

The study focuses on commercial banks' credits to an agricultural sector like rural farmers in Bangladesh. The study considers secondary data, be concerned about the macroeconomic nature of the country. The data collected from the Statistical Yearbook of Bangladesh of Bangladesh Bureau of Statistics for the period of 2003-2019. The data is more years for all variables are not available in the secondary source.

Variable Measurement:

Agricultural production output is assumed to be correlated with changes in agricultural input variables across time.

Basic Model for Measuring the Impact of Bank Credit on the Agricultural Output

$$AO = \beta_0 + \beta_1 BC + \beta_2 CA + \beta_3 RP + \beta_4 AE + \beta_5 RE + \beta_6 Sub + \varepsilon$$

Here,

AO = Agricultural Output

BC = Bank Credit to Agricultural Sector

CA = Cropped Area

RP = Rural Population

AE = Agricultural Expenditure by Government

RE = Expenditure by Government for Development of Rural Institutions

SUB = Subsidy Provided by Government

Agricultural Production Output:

Historically, credit has been acknowledged as a critical tool for the development of small and medium-sized firms as well as agricultural production. An appreciable percentage of the population is engaged in agricultural production, Iderawumi, (2016). So, Agricultural Production Output is considered as dependent variable. It measured as metric ton.

Commercial Bank's Credit to the Agricultural Sector (Rural Financing):

The role of inclusive rural finance in rural transformation is critical in a changing global economy, amidst financial crises, volatile food and agricultural commodity prices, and the dangers of climate change (IFAD). The International Fund for Agricultural Development (IFAD) is the world leader in the field of agricultural risk management (ARM). A holistic strategy to protecting and strengthening rural economies and food production systems is advocated by the Fund, which also seeks to leverage rural financing and investment in small - scale farmers at the same time. That is why the agricultural output is a dependent variable with independent variable of rural finance. https://www.ifad.org/en/rural-finance. Finance plays a significant role in growing the firms including farms which is argued by many researchers and experts (Malhotra et al., 2007; Deakins at al., 2008; Teima et al., 2010; Shkodra, 2010; Shkodra, 2014; Fowowe, 2017). It is calculated as a million.

Intuitional expenditure by Government Support and Allocation to Agricultural sector

Financial allocation or support, including financial subsidies, credit, and tax benefits, are the most frequently evaluated. A same number of studies indicating greater production as those claiming no effect was produced because of this form of government help (Raphael Lencucha et al., 2020). A document or evidence exists to imply that the influence of financial assistance on a farmer's income or revenues is different and based on characteristics such as farm size and production capability, among other things. According to Judzinska (2013), direct payment supports, and government policy have a variety of effects on farmers in a variety of ways, including economically. Direct payment supports and government policy provide farmers with greater opportunities to increase their production capacity, but they can also discourage farmers from improving farm efficiency at the same time. The result explains that careful use of government spending has significant potential to accelerate agricultural development and improve its efficiency, De (2018). The Johansen co-integration tests revealed a long-run relationship between agricultural output and government agricultural expenditure, Uremadu, et al., (2018). For that reason, the government allocation is control variable with respect to agricultural output. It measured as a million.

Cropped Area:

Agribusiness production is dependent on the availability of cropland, and it is influenced by a variety of factors, including yields, macroeconomic uncertainties, and consumption patterns. It also has a significant impact on the prices of agricultural commodities. That is why the study considers this variable to be control variable of the dependent variable for agricultural production output, according to the OECD (2021).

Subsidy provided by Government:

A government subsidy granted to farmers and agribusinesses to increase their income regulate the agricultural output or products and impact the cost and supply of those commodities is known as an agricultural subsidy. Agricultural subsidies have long been a staple of agricultural policies in both developing and industrialized nations. Credit grants to farmers, interest-free loans, fertilizer subsidy (reduction in the cost of fertilizer), seed subsidy, machinery subsidy (reduction in the cost of hiring farm implements such as tractor, plough, etc.) and pesticides, herbicides, and insecticide subsidy are all examples of agricultural subsidies. In other words, agricultural subsidies are aimed at lowering the cost of obtaining agricultural inputs, NWAFOR (2018). The impact of agricultural subsidies on agricultural

output was investigated in this study. The data was gathered over a seventeen-year period (2003–2019) and analyzed using a two-staged least squares regression approach. However, the findings demonstrated that agricultural subsidies have a statistically significant impact on agricultural output. It was suggested that the government implement policies to encourage agriculture commercialization through a cooperative structure, NWAFOR (2018). Due to findings of the above research, this paper considers this variable as control variable for agricultural output. It measured as a million of taka.

Rural Population:

Expenditure in land renovation in areas where agriculture is still in its infancy, with little or no usage of heavy machinery, is mostly comprised of direct agricultural labor expenditures. Cultivators can increase the productive ability of the local agricultural system by investing more labor (both household and appointed labor) in planting crops, leveling, and terracing land, supplying water to the fields, and so on, Boserup, E (1975). Rural labor indicates rural population in this model. More rural population means there is more availability of labor in the rural areas. In this study, rural population had taken as control variable for the agricultural output/production.

From the above models, we can now draw the following priori inferences:

I. If the dependent variable AO responds positively to the set of independent variables BC and control variables CA, RP, AE, RE and SUB as may be shown by the parameter estimates β_0, β_1, β_2, β_3, β_4, β_5, and β_6, the study can conclude that agricultural output can be positively influenced by these variables as mentioned above.

II. Although the research concludes that the variables do not have a major impact on agricultural output in Bangladesh if their estimations show negative signs and values, this is not the case for all the variables.

Results and Discussion

Hypothesis: Positive relation between rural financing and agricultural production development.

H_0 = There is no positive relation between rural financing and agricultural production development.

H_1 = There is positive relation between rural financing and agricultural production development.

Impact of Bank credit on Agricultural production

Table 1: Descriptive Statistics of the Variables

Variable	Obs	Mean	Std. Dev.	Min	Max
AO	17	1454464.412	584832.240	786604	2405416
BC	17	109582.244	61522.019	29550	213930
CA	17	36439.471	1727.528	33922	39357
RP	17	1.021e+08	867138.091	99681804	1.027e+08
AE	17	22258.647	20050.949	5520	66412
RE	17	52870	45546.473	6787	161886
Sub	17	70942.765	67505.986	17918	224401

Source: BBS Report from 2003 to 2019

From the descriptive table stated above we can see that the total number of observations is 17 for each variable. Data is taken from the year 2003 to 2019. Here,

Average amount Agricultural Output (AO) 1.45 million metric tons and standard deviation is 0.58 million metric tons. Maximum agricultural output was 2.40 million metric tons in the

year 2019 and minimum agricultural output was in the year 2003 and the amount was 0.78 million metric tons. The maximum amount of Credits provided by banks in the agricultural sector was 0.21 million taka and it was in the year 2019. The minimum number of Credits provided by the banks in the agricultural sector was 0.03 million taka in the year 2003. On an average bank provided 0.11 million taka credit to the agricultural sector from the year 2003 to 2019. Average cropped area from 2003 to 2019 was 36439.471 acres and maximum cropped area was 39357 acres in 2019 and minimum was 33922 acres in 2006.

Subsidy provided by the government is a very vital factor that has an impact on agriculture. The average amount of subsidy provided by the Government of Bangladesh from 2003 to 2019 was 0.70 million taka. Government provided the maximum subsidy in the year 2019 and the amount was 0.24 million taka.

Table 2. Pair wise correlations among the variables

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) AO	1.000						
(2) BC	0.983***	1.000					
(3) CA	0.952***	0.948***	1.000				
(4) RP	0.553**	0.631***	0.485**	1.000			
(5) AE	0.833***	0.842***	0.799***	0.389	1.000		
(6) RE	0.815***	0.854***	0.762***	0.418*	0.772***	1.000	
(7) Sub	0.926***	0.921***	0.869***	0.357	0.853***	0.883***	1.000

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Source: Stata Data Analysis

From the table stated above, it can be concluded most of the variables have positive significant correlations with other variables except for the Rural Population. Rural population has no significant correlation with Agricultural Expenditure by the Government and the subsidy provided by the government. Rural Institutionalization Expenditure has significant correlation with the Rural Population at 10% level. Except for these situations stated above all other variable pairs have significant correlation between themselves.

Table 3. Regression Table for Measuring the Impacts Rural Financing and Other Controlling Factors on Agricultural Output

	(1) OLS	(2) OLS	(3) OLS	(4) OLS	(5) OLS	(6) OLS	(7) OLS	(8) 2SLS
	AO	AO	AO	AO	AO	AO	BC	AO
BC	9.344***	7.569***	9.058***	9.478***	12.538***	11.522**		9.771***
	(.452)	(1.377)	(1.679)	(2.093)	(2.642)	(4.271)		(.967)
CA		66.691	31.742	28.167	-21.572	-10.256	14.85***	
		(49.033)	(53.062)	(55.814)	(59.435)	(71.889)	(2.389)	
RP			-.063	-.069	-.111*	-.091	.018***	
			(.043)	(.049)	(.051)	(.084)	(.003)	
AE				-.972	-.932	-1.015	.111	1.148
				(2.691)	(2.499)	(2.621)	(.182)	(2.38)
RE					-2.181	-2.237	.105	-1.201
					(1.277)	(1.344)	(.089)	(1.089)
Sub						.587	.337***	
						(1.884)	(.086)	
_cons	430556.38***	-1805138.8	5721063.6	6504234.7	12314132*	9913237.2	-2276154.9***	421678.56***
	(56357.359)	(1644646.8)	(5443318.8)	(6037602.2)	(6556029.2)	(10306575)	(241650.67)	(56646.447)
R-squared	.966	.97	.974	.975	.98	.98	.99	.969
Adj R^2	.964	.966	.968	.966	.97	.968	.986	.962
F	428.00	227.05	163.83	114.69	107.02	81.88	220.42	
Prob>F	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Wald chi2(3)								519.00
Prob > chi2								0.000

Standard errors are in parentheses
*** p<.01, ** p<.05, * p<.1*

Source: Constructed by Researcher using Stata

The model one is a simple linear regression, built with only Agricultural Output and Bank Credit to the Agricultural Sector where predictor Bank Credit in the model is statistically significant at 1% level where R^2 value (96.6%) and adjusted R^2(96.4%) value of this model indicates high level of predictability of this model.

$$AO = \beta_0 + \beta_1 BC + \varepsilon \quad \text{---------- (1)}$$

$$E[AO|X] = \beta_0 + 9.344.BC + 0$$

The equation one confirms that if the banks provide credit to the agricultural sector, the output will increase by 9.34 metric ton for each millions of taka extra provided by banks. In simple words, 1 million taka extra bank credit will increase agricultural output by 9.344 metric tons.

In the model 2, another variable is included as a control variable with bank credit which is the cropped area.

$$AO = \beta_0 + \beta_1 BC + \beta_2 CA + \varepsilon \text{---------- (2)}$$

$$E[AO|X] = \beta_0 + 7.569.BC + 66.691.CA + 0$$

From the second model it can be noticed that the relationship of bank credit with the Agricultural output is still significant, $\beta_1 = 7.569$, $p<0.05$. But the relationship between the cropped area and Agricultural Output is not significant. So, it can be said that there is not enough evidence for measuring the impact of the cropped area on agricultural output although from the correlation matrix (Table 2) there exists a perfect positive relationship between Agricultural Output and the Cropped Area.

In the model 3, two other variables are included as control variables with bank credit which are cropped area and Rural Population.

$$AO = \beta_0 + \beta_1 BC + \beta_2 CA + \beta_3 RP + \varepsilon \text{---------- (3)}$$

$$E[AO|X] = \beta_0 + 9.058BC + 31.742CA + -0.063RP + 0$$

From the third model it can be noticed that the relationship of bank credit with the Agricultural output is still significant, $\beta_1 = 9.058$, $p<0.05$. One noticeable thing is that the coefficient of bank credit created the agricultural sector significantly improved. But the relationship between the cropped area and Rural Population with Agricultural Output is not significant. So, it can be said that there is not enough evidence for measuring the impact of the cropped area and Rural Population on agricultural output although the regression model is significant with high R^2 (0.974) and adjusted R^2 (0.968) value.

The fourth model is significant and can predict dependent variable's variability 97% according to R squared value and 96% according to adjusted R squared value. Three control variables are added with our main independent variable bank credit to the Agricultural sector. Three control variables are: cropped area, rural population, and agricultural expenditure by the government.

$$AO = \beta_0 + \beta_1 BC + \beta_2 CA + \beta_3 RP + \beta_4 AE + \varepsilon \quad \text{---------- (4)}$$

$$E[AO|X] = \beta_0 + 9.478BC + 28.167CA - .069RP - .972AE + 0$$

From the multiple regressions depicted above only bank credit has statistically significant Coefficient value and other three variables do not have any statistical significance Coefficient value. So, in this situation we do not have enough evidence to measure the impact of the other three variables on agricultural output.

In the 5th model, one more variable is added as a control variable and that is the subsidy provided by the government. This model is statistically significant with high R^2 value and adjusted R^2 Value.

$$AO = \beta_0 + \beta_1 BC + \beta_2 CA + \beta_3 RP + \beta_4 AE + \beta_5 RE + \varepsilon \text{---------- (5)}$$

$$E[AO|X] = \beta_0 + 12.538BC - 21.572CA - 0.111RP - 0.932AE - 2.181RE + 0$$

In this 5th model only bank credit has positive statistically significant Coefficient. All other coefficients of this model are statistically insignificant and negative. One noticeable thing is that the coefficient of bank credit improved significantly.

In this sixth model one more variable is added. Subsidy provided by the government is added in this model as a control variable with bank credit. This model is statistically significant with high R squared value and adjusted R squared value. But without bank credit all other variables' coefficients are statistically insignificant.

$$AO = \beta_0 + \beta_1 BC + \beta_2 CA + \beta_3 RP + \beta_4 AE + \beta_5 RE + \beta_6 Sub + \varepsilon \text{---------- (6)}$$

$$E[AO|X] = \beta_0 + 11.522BC - 10.256CA - .091RP - 1.015AE - 2.237RE + .587Sub + 0$$

The seventh model is calculated for finding the instrumental variable for endogeneity test. In this model, the dependent variable is bank credit and independent variables are cropped area, rural population, agricultural expenditure by government, rural institutionalization expenditure by government, and subsidy provided by government.

$$BC = \beta_0 + \beta_1 CA + \beta_2 RP + \beta_3 AE + \beta_4 RE + \beta_5 Sub + \varepsilon \text{ ----------(7)}$$

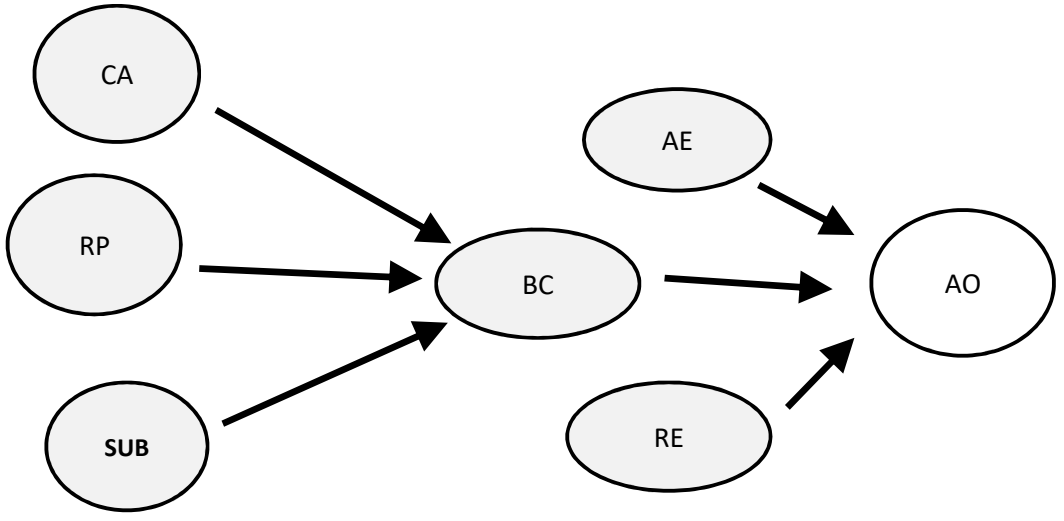
$$E[BC|X] = \beta_0 + 14.85CA + .018RP + .111AE + .105RE + .337Sub + 0$$

From table 3 it can be said that the bank credit is significantly affected by cropped area, rural population and subsidies provided by the government. But from the model 6 it can be realized that these three variables which have a significant relationship with bank credit, do not have any impact on agricultural output.

Finding Endogenous Variables

From the model 7, found instrumental variables which have a significant impact on our main independent variable but do not have any impact on our dependent variable. The graph depicted below shows the situation clearly.

Figure 1. Process of finding endogenous Variable



Source: Constructed by Researcher

In model 8, two variables with main independent variable bank credit are included i.e. One is Agricultural expenditure by the government and rural institutionalization expenditure by the government.

$$AO = \beta_0 + \beta_1 BC + \beta_2 AE + \beta_3 RE + \varepsilon \text{ ---------- (8)}$$

$$E[AO|X] = \beta_0 + 9.771.BC + 1.148.AE - 1.201.RE + 0$$

Two stages least square regression is run to assess the impact of rural financing on agricultural output. Here, cropped area, rural population and subsidy provided by the government are taken as instrumental variables. From this model, it can be realized that the coefficient of bank credit is positive and significant, but the coefficients of Agricultural expenditure and rural institutionalization expenditure is still insignificant. Also, the coefficient of rural institutionalization expenditure is negative. So here we do not have enough evidence to calculate the impact of rural institution expenditure and agricultural expenditure by the government from this model although this is significant in predicting variability of dependent variables by independent variables (Wald Chi-Square = 519.00, df = 3 p = 0.000) and value of both R^2 and adjusted R^2 is 96% which is very high. From this model it can be concluded that for every million of bank credit invested in the agriculture sector will bring 9.7 metric ton additional agricultural output.

Tests of endogeneity

H_o: variables are Exogenous

H_1: Variables are Endogenous

Durbin (score) chi2(1) = 0.172818 **(p = 0.6776)**

Wu-Hausman F (1,12) = 0.123242 **(p = 0.7316)**

From the Endogeneity test it can be easily concluded that there is no endogenous variable in this present model. That means all variables included in this model are exogenous.

Conclusions and Recommendations

It is found that rural financing (Bank's Credit) has a significant impact on the agricultural production of Bangladesh. In the analysis, the model shows that every million of bank loan invested in agriculture yields 9.7 metric tons more. Cropped area, rural population and rural institutional expenditure have no any significant on agricultural development. The findings can be regarded as valuable resources concerning literature and can be used by academicians in their further studies and research. Besides, Bangladesh is now becoming affluent with the number of universities district wise, focusing on each undertaking with area-based/ demographic importance. So, the academic members of these newly formed institutions can imply the findings of this study following their requirements

i. From the analysis the study has seen that people are mostly engaged with banks. So, banks should regulate their policies so that people can help financial assistance easily and utilize them in proper income generating activity.
ii. Policymakers and bankers should think about the following lessons when it comes to rural finance: Inclusionary finance and its interrelationships with the larger rural development process must be recognized in forward-looking research and academic agenda.
iii. Every financial institution including banks should establish monitoring system that will regularly monitor the progress of borrowers and how they are utilizing their funds.

iv. As rural finance has a big impact on the financial circumstances of rural Bangladesh's people, efforts to engage them with financial institutions should be intensified.
v. Financial Institutions should strive to gain a deeper understanding of business strategy and to tailor their programs accordingly. To guarantee quality, program should be changed and evaluated on a regular basis with response from specialists.

This paper is based on secondary data only and number of observations is low because data of the previous years of all variables are not available. The study's aim is to examine the influence of rural financing on agricultural output. The study's findings are that rural financing has a significant positive relation with agricultural development. It also has impact on increasing the income of the rural people. This study makes a valuable contribution by providing a foundation for rural financial institutions to improve and enlarge their assistance and financing for poor people in the rural society. Tenaw and Islam (2009) found that rural banking services improved agricultural productivity. This study also supports and proves their findings.

Conflict of Interests

The authors declare that there is no conflict of interests concerning the publication of this paper.

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