Participation and output effect of a Block Farm Credit Programme in selected districts of Northern Ghana

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Abstract

Purpose – The purpose of this paper is to examine the effect of the Ministry of Food and Agriculture (MoFA) Block Farm Credit Programme (BFCP) participation on crop output in four districts in the Northern region of Ghana.

Design/methodology/approach – Structured questionnaires were used to collect data from 240 beneficiary and non-beneficiary farmers of BFCP. The treatment effect model that accounts for selectivity bias was employed to examine the socioeconomic determinants of farmers' decision to participate in the BFCP and the effect of BFCP participation on crop output.

Findings – Even though the BFCP participation increases output, inadequacy and late delivery of BFCP inputs, low publicity about the programme and difficulty in accessing the inputs from the districts agricultural officers are factors that prevent the full realization of the benefits of the programme. Improving extension services to create more awareness and a re-introduction of the BFCP to make inputs available and affordable to farmers can help boost farm productivity.

Practical implications – The positive effect of the BFCP means that the provision of low-cost production credit has the potential to increase productivity and improve incomes. Hence, MoFA should endeavour up scaling and properly managing the scheme.

Originality/value – This study is the first to evaluate the BFCP in Northern region of Ghana, particularly in relation to its contribution to crop value. The findings are very useful to advise policy by taking account of the programme deficiencies and enhance effectiveness.

Keywords Participation, Block Farm Credit Programme, Northern Ghana, Treatment effect model

Paper type Research paper

Introduction

The Government of Ghana, through the Ministry of Food and Agriculture (MoFA) implemented the Block Farm Credit Programme (BFCP) as a measure to reduce the impacts of credit constraints on agricultural productivity. The objective of this programme was to exploit economies of scale and ensure that farmers benefited from subsidized credit in the form of mechanization services via the Agricultural Mechanization Service Centres, certified improved seed, subsidized fertilizer (through the Fertilizer Subsidy Programme), herbicide and pesticides as well as extension services. By bundling the delivery of credit inputs and services, it was envisaged that they are delivered timely and at a lower unit cost. Designed to focus on the youth, it was expected to help generate employment among the rural poor, especially the youth, increase farm productivity, improve incomes among farmers and ensure food security. The credit was expected to be paid back in-kind or cash at the time of harvest (Benin *et al.*, 2013).

It needs no argument to state that agricultural credit is needed by farmers for improved technology adoption (Hartarska *et al.*, 2015). Xin and Li (2011) puts the issue of agricultural credit in a broader perspective when they stressed that "finance is the center of the agriculture economy". Other empirical works indicates that providing credit to farmers in the form of inputs (e.g. fertilizer and improved seed) may increase adoption of hybrid crops by relaxing two market constraints, namely, access to financing and access to inputs. Credit markets may be underdeveloped or non-existent in certain farming locations due to the high transaction and overhead costs, low returns of providing small loans or the limitations on available collateral. These conditions may prevent farmers from attaining the finance they would need to purchase inputs at the beginning of the growing season. Further, input supplies in these markets may be scarce due to the high costs of transporting goods to rural areas. Thus, credit in the form of inputs would simultaneously address both of these market imperfections, and could thereby facilitate technology adoption and improve farm productivity.

According to MoFA (2012), farmers who are participating in the BFCP have attested to the benefits they received, including access to low-cost credit in the form of inputs and mechanization services which have led to greater farm productivity and high incomes. However, some of the participating farmers have complained about the late delivery of the credit package, which according to them, is affecting their time of cultivation and hence output. Also, the youth who were supposed to be the main target of this credit programme are not actually participating in the programme. More so, there are indications that some of the participating farmers are diverting the credit inputs for other purposes MoFA (2012). Evidence of low recovery rates has also been reported in the evaluation, which raises questions of the programme sustainability in the long run. The relevant question to ask is "whether the BFCP is actually improving farm level productivity?" This is because diverting the credit package for other uses means that the objective of increasing farm-level output of the crop in question may not be achieved (Girabi and Mwakaje, 2013; Nosiru, 2010). To be able to establish the true effect of the BFCP on crop output, an independent evaluation is needed. However, to the best of our knowledge, not much has been done in terms of investigating the determinants and effects of the BFCP, hence the need for this present study. The main objective of the study was to examine the effect of BFCP on farm-level output in the Northern region. The specific objectives were to: identify the socioeconomic factors that influence farmers' decision to participate in the BFCP, determine the effects of the BFCP participation on crop output and examine the constraints associated with the BFCP participation from the viewpoint of farmers.

BFCP

The BFCP, which was launched in 2009 as a pilot study in some locations in six regions, was intended to bring in large tracts of arable land (in blocks) for the production of selected commodities in which the locations (regions and districts) have comparative advantage. Farms developed in these "blocks" are referred to as "block farms". The notion was to exploit economies of scale and ensure that the block farms benefited from subsidized mechanization services and inputs (fertilizers, improved seed and pesticides) in the form of credit, as well as extension services that were delivered to the farmers by MoFA. By bundling the delivery of inputs and services, it was envisaged that they would be delivered timely and at lower unit costs. Agricultural extension agents (AEAs) were supposed to work closely with the farmers so that the latter followed recommended practices to meet yield expectations. Following

harvesting, the AEAs would then recover in-kind the cost of the services and inputs provided by the government to the block farmers (Benin *et al.*, 2013; MoFA, 2012).

The BFCP was based on the crop cluster concept by Porter (2000, p. 17). Porter defined cluster as "a geographical proximate group or geographic concentration of interconnected companies, or firms in related industries in particular fields that compete but also cooperate and are linked by commonalities and complementarities". The initial idea behind the National BFCP, as indicated earlier, was to have several farmers on a large tract of a single piece of land (in blocks) for the production of selected crops. However, due to the existing land tenure system in Ghana, it was impossible for government to procure large tracts of farmland in all the regions for the block farms. Therefore, most farmers were allowed to use their own lands for the programme. Under the block farm, state lands or land acquired by the government from private individuals is ploughed and shared among young farmers in blocks. Inputs such as fertilizer, improved seeds, herbicides and insecticides are supplied at subsidized prices on credit as well as extension services. Other individual farmers who farm on individual plots where large tracts of land could not be obtained would also receive the same assistance as block farmers (general crops). The main crops cultivated include maize, rice, sorghum, soybean and vegetables.

The BFCP inputs are supplied to interested farmers. Prior to the supply, interested farmers are identified and registered by the staff of MoFA. During the registration, farmers are asked to indicate the type of crop they would cultivate for the season. In addition, the total area that farmers intend to use for each of the crops enumerated is specified during the registration. Based on this information, MoFA then estimates the required quantity of inputs (seed, herbicide and fertilizer) and their cost at the prevailing market price. When all these are concluded, supply of the inputs is made to the farmers. At the end of the farming season, the AEAs recover in-kind (commodity) the cost of the inputs provided by the government (via MoFA) to the block farmers at the pre-determined price. Since the block farm is a government intervention, no interest rate is charged on the cost of inputs supplied to the beneficiaries of the BFCP.

The objectives of the BFCP were to generate employment among the rural poor for not less than 60,000 farmers, especially the youth; improve incomes among farmers by at least 50 per cent; increase food security through the use of science and technology leading to increased productivity and higher yields; and improve farming as a business.

For the pilot phase in 2009, potential beneficiaries of the programme were initially identified, following a campaign on awareness of the programme and registration of interested participants. On the block farm, participants were supported with mechanization services for land clearing, ploughing and harvesting. Inputs including certified seeds, fertilizers and pesticides were also supplied as well as training and extension services were offered. AEAs then monitored the implementation of their farming activities. The strategy for the devolution of the programme to the regions and districts involved communications with regional directors of MoFA to organize and implement the programme by the formation of regional block farm management committees; formation of district block farm management teams; identification of block farm locations and selection of crops; identification and registration of beneficiaries; sensitization and organization of youth into groups; development of implementation plans and schedules of operations, and determination of inputs and services requirements (crop budgets).

The two main conditions that were considered under the programme for crops to be cultivated in any of the four agro ecological zones of Ghana are the suitability of the

crop and comparative advantage that the district/region has on the chosen crop. For the pilot phase in 2009, six regions, including the Ashanti, Brong Ahafo, Central, Northern, Upper East and Upper West regions were selected to participate in the programme, focusing on the following crops: maize seed and grain, rice seed and grain, and soybean. By 2010, all the ten regions of Ghana were participating in the BFCP, and more crops had been added, including sorghum, tomato and onions (MoFA, 2012).

Theoretical framework and econometric analysis

Given the objective of study, which is to examine the determinants and effect of BFCP participation on farm-level output, we assume that farmers have two choices; that is to participate in BFCP or not to participate. An individual farmer may decide whether or not to participate on the basis of his/her perceived utility of participating relative to that of not participating. Assuming that farmers are risk neutral, following Faltermeier and Abdulai (2009), farmers compare the expected utility of wealth from participation, denoted as $U(\pi_p)$ to that of non-participation, represented by $U(\pi_{np})$ with net returns (π) representing wealth. Participation then occurs if $U(\pi_p) > U(\pi_{np})$. Farmers' expected utility of participation can be related to a set of explanatory variables (Z) as:

$$\pi = \alpha Z_i + u_{1i} \tag{1}$$

where α is a vector of parameters to estimated and u_{1i} is the error term distributed as $N(0, \sigma^2)$. Z_i is a vector of exogenous variables including the determinants of participation decisions. The utility derived from participation in BFCP is not observable but actions of the farmers can be observed through the choice they make (either by participating in BFCP or not). This can be represented by a latent variable P^* that equals 1 if a farmer chooses to participate in BFCP ($P^* = 1$ if $U(\pi_p) > U(\pi_{np})$), and 0 otherwise ($P^* = 0$ if $U(\pi_p) \leqslant U(\pi_{np})$).

The probability of programme participation may then be expressed as:

$$\Pr(P^* = 1) = \Pr(U(\pi_p) > U(\pi_{np})) \tag{2}$$

Assuming that the threshold utility for non-participation is censored at 0, then we have:

$$\begin{aligned}
\Pr(P^* = 1) &= \Pr(U(\pi_p) > 0) \\
&= \Pr(\alpha Z_i + u_i > 0) \\
&= \Pr(u_i > -\alpha Z_i) \\
&= 1 - F(-\alpha Z_i) \tag{3}
\end{aligned}$$

where F is the cumulative distribution function for u_{1i}. Obviously, participation in BFCP often influences output levels. The relationship between BFCP participation and the crop output variable can be specified as:

$$Y_i = \beta' X_i + \delta' P_i + u_{2i} \tag{4}$$

where Y_i is the outcome variable (farm-level total output or the total crop value), X_i is a vector of inputs, P_i is a dummy variable which takes the value 1 if the ith farmer participates and 0 otherwise. β and δ are parameters to be estimated, and u_{2i} is the error term, assumed to be distributed as $N(0, \sigma^2)$.

One problem associated with Equation (4) is selectivity bias. According to Barnow et al. (1980), selectivity bias arises in programme evaluation when the treatment

(or control) status of the subject is related to unmeasured characteristics which themselves are related to the programme outcome under study. This situation could potentially lead to wrong estimation of the treatment effect. In other words, if the unobservable factors which affect the likelihood of the programme participation equally affect the performance of the participating individuals it may lead to selectivity bias (Greene, 2003; Warning and Key, 2002). In this present study, participants may have unobservable characteristics that are correlated with their decision to participate in BFCP and if these characteristics also correlate with their farm-level output, it may be difficult to isolate the effect of BFCP participation on farm-level output. Therefore, estimates of the BFCP effect computed from the estimated coefficients on participation status will be biased. When selectivity bias is inevitable, the parameter estimates from simple OLS regression model will be inconsistent and biased (Heckman, 1976).

Heckman suggested two stages by which selectivity bias may be addressed. First a selection equation (in this case participation in BFCP) is estimated. Then using the predicted values of participation, a selectivity bias correcting factor λ, equivalent to an inverse Mills ratio (IMR) is constructed which appears in the substantive equation (in this crop output) as an additional regressand. Where the participation variable also enters the substantive equation, the model is a treatment effect model. Maddala (1983) discusses at length the issue of selectivity bias.

Formally, the model to determine the factors that influence participating in BFCP is as follows:

$$P_i^* = \alpha_i Z_i + u_{1i} \tag{5}$$

P_i^* is the latent endogenous variable but its observed and measured counterpart, P_i takes a value 1 if the ith farmer participates in BFCP and 0 otherwise (non-participant), as in the following expression:

$$P_i = \left\{ \begin{array}{l} 1 \ \text{iff} \ P_i^* > 0 \\ 0 \ \text{iff} \ P_i^* \leqslant 0 \end{array} \right\} \tag{6}$$

The error term u_{1i} is distributed as $N(0, \sigma^2)$ and captures the measurement errors as well as other factors unobserved by the researcher but known to the farmer, while Z_i is a vector of exogenous variables explaining the factors influencing farmers decision to participate in BFCP or not and α_i is a vector of parameters to be estimated. The participation Equation (5) is used to generate the selection correction variable using a probit model as:

$$\Pr(P_i = 1 | Z_i) = \int_{-\infty}^{\alpha_i Z_i} \phi(t) dt = \Phi(\alpha_i Z_i) \tag{7}$$

The selection correction variable is obtained from the estimates of each observation i as:

$$\lambda_i = \sigma_{u_{1i}} \frac{\phi(\alpha_i Z_i)}{\Phi(\alpha_i Z_i)} \tag{8}$$

where ϕ and Φ are normal probability distribution function and normal cumulative distribution function, respectively. The ratio ϕ/Φ evaluated at $\alpha_i Z_i$ for each P_i is known as the IMR.

The second step involves estimating the substantive equation with the participation variable as well as the IMR as additional regressand as follows:

$$Y_i = \beta' X_i + \delta' P_i + \sigma_{u_{1i}} \frac{\phi(\alpha_i Z_i)}{\Phi(\alpha_i Z_i)} + u_{2i} \tag{9}$$

where σ_{ui} is the covariance of u_{1i} and u_{2i}. According to Maddala (1983), if all observations for both participants and no-participants are used then Equation (9) translates into the following equation:

$$Y_i = \beta'(\Phi_i X_i) + \delta(\Phi_i A_i) + \sigma \phi_i + u_{2i} \tag{10}$$

where:

$$\Phi_i \equiv \Phi(z_i' \alpha).$$

Empirical specification of the model
Following the theoretical model the empirical model that measures the factors influencing the probability of participation is given in Equation (11), while the empirical model measuring effect of BFCP participation on crop value is given Equation (12):

$$P_i = \alpha_0 + \alpha_1 Age_i + \alpha_2 Education_i + \alpha_3 HHsize_i + \alpha_4 Experience_i + \alpha_5 Ownership_i$$
$$+ \alpha_6 FBO_i + \alpha_7 Livestock_i + \alpha_8 Extension_i + \alpha_9 Off-farm_i + u_{1i} \tag{11}$$

$$Y_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \delta P_i + u_{2i} \tag{12}$$

where Y_i is the total crop value of maize, rice and soybean measured in Ghana Cedis, $X_1 =$ farm size, $X_2 =$ tractor service, $X_3 =$ fertilizer, $X_4 =$ seed, $X_5 =$ labour, $X_6 =$ weedicides, $P =$ participation in BFCP. Table I describes these variables and well as their a priori expectations.

Results and discussion
Socioeconomic characteristics of respondents
The gender distribution of the respondents shows that most of the sampled farmers were male. Out of the 120 participants, 91.7 per cent of them were male while 8.3 per cent were female. Also for non-participants, 87.5 per cent were male while 12.5 per cent of them were female. Similarly, of the 240 total respondents, 93.3 per cent of them were married while 2.8 and 0.9 per cent were single and divorced, respectively. The age distribution of the respondents shows that 44.6 per cent of them were between the ages 30 and 39 years, followed by those within the age range of 20-29 years (19.6 per cent) and 50-59 (12.5 per cent). The lowest percentage was recorded by those within the 60-69 age brackets. In terms of household size, the highest percentage of respondents had a household size range of 6-10 (38.8 per cent), followed by 11-15 (26.3 per cent) and 1-5 (17.9 per cent). The rest are 16-20 (9.6 per cent) and under 20 (7.4 per cent). The educational levels of the respondents were generally low; while majority had no formal education (70.8 per cent), 21.3 per cent had completed basic school (primary and JHS or middle). Only 2.9 and 1.7 per cent had completed secondary and tertiary, respectively, while 3.3 per cent had undergone non-formal education. With regards to membership of farmer-based organizations (FBOs), the results show

Variables	Definition	Expected sign
Participation	A dummy variable measuring farmers' participation in the BFCP: 1 if farmer participated; 0 otherwise	na
Demographic, socioeconomic and institutional variables		
Age	The total number of years from birth of a farmer	±
Education	Dummy; 1 if farmer has had a formal education, 0 otherwise	+
Household size	The total number of members in a farmer's house that cook from the same pot	+
Off-farm	Engagement of at least one off-farm activity	−
Experience	The total number of years a farmer had cultivated vegetable	+
Land ownership	Dummy variable; 1 if farmer owns his/her farm plot, 0 if otherwise	+
Farmer-based organization	Membership of FBO; Dummy; 1 if farmer belongs to an FBO, 0 otherwise	+
Extension	Total number of visits by an extension agent within the 2013 production season	+
Livestock	Dummy; 1 if farmer owned livestock; 0 otherwise	+
Production variables		
Output value	The sum total of income from the sale of maize, rice and soybeans measured in Ghana Cedis	na
Farm size	The total number of acres of maize, rice and soybeans cultivated by a farmer	+
Tractor service	Ploughing cost in Ghana Cedis	+
Fertilizer	Total amounts of solid inorganic fertilizer used in kilograms	+
Seed	Total amount of seeds used in kilograms	+
Labour	Total labour cost in Ghana Cedis	+
Herbicides	Quantity of weedicide used in litres	+
Insecticides	The total litres of insecticides used by a farmer	+

Table I.
Description of
variables and their a
priori expectation

that 74.2 per cent of the participants belonged to FBOs as compared to 12.5 per cent of non-participants. This therefore implies most of the participants were members of FBOs and so could easily have access to information about the BFCP. In terms of access to extension services, the study revealed that 95 per cent of the participants had access to extension services as against 30 per cent of non-participants. Thus most of the non-participants did not have access to extension services. As a determinant in the participation equation, this may be the reason why they did not participate in the BCFP.

Factors influencing farmers' participation in the BFCP
The factors that influenced farmers' decision to participate in the BFCP are discussed in this section. The estimated probit regression model gave a pseudo R^2 value of 0.43, which implies that all the explanatory variables included in the model were able to explain about 43 per cent of the variation in farmers' decision to participate in BFCP. The Log likelihood ratio is significant at 1 per cent, showing that the explanatory variables included in the model jointly explained the probability of farmers' decision to participate in the BFCP. The model's results also gave a 55 per cent predicted probability of participation. This means that in a population of farmers, about 55 per cent of them are more likely to participate in the BFCP. Given the above goodness of fit measures, it was concluded that the probit model used was reliable and appropriate.

The results show that factors such as farming experience, FBO membership, extension visits, livestock ownership and off-farm income were the significant variables that influenced farmers' decision to participate in the BFCP. While faming experience, extension visits and membership of an FBO were found to be positively related to BFCP participation, livestock ownership and engagement in off-farm activities were found to be negatively related to BFCP participation. However, age, household size, land ownership and education were not significant.

As presented in Table II, farming experience is significant at 5 per cent with a marginal probability of 1 per cent. This implies that an increase in farming experience by one year will result in an increase in the likelihood of BFCP participation by 1 per cent, *ceteris paribus*. This is plausible, considering the fact that long years of farming experience imply that the farmer has gathered some experience regarding the use of agricultural inputs. Also the farmer may have established some relations and rapport with some opinion leaders as well as fellow farmers (e.g. nucleus farmers), who can facilitate his/her access to the inputs. This finding is consistent with that of Sebopetji and Belete (2009) who observed that experience in farming had significant effect on farmers' decision to take credit. On the contrary, Ilembo *et al.* (2014) observed that farming experience does not significantly influence household demand for credit.

FBO membership was also found to be significant at 1 per cent with a marginal effect of 0.50, implying that farmers who belonged to FBOs had a 50 per cent greater chance of participating in the BFCP than those who did not belong to any FBOs. In the study area, many FBOs have sprung up, where farmers organize themselves into groups and set a number of objectives to achieve as a cooperative. Some important objectives relate to how farmers can improve upon their production, marketing and farm financing activities. This has become necessary, and it is one of the policy goals of Ghana Government, because operating individually, farmers are often vulnerable in many respects. In recent times, due to farmers' high loan default rates and lack of collateral security, credit institutions have found it necessary to advance credit on a group basis so that the group acts as a guarantee. The guarantee system is designed such that credit (cash or in-kind) is advanced to a group of people with mutual trust for each other and who have set for themselves minimum rules and regulations, and each member is bound by these regulations. Each member agrees to contribute towards the repayment of a loan or credit should any other member default. In this case when a

Variables	Marginal effects	SE
Block farm credit participation		
Age	−0.0040529	0.00687
Education	0.1377646	0.09572
Household size	−0.0015027	0.00754
Farm experience	0.0120792**	0.00589
Land ownership	0.1335529	0.36688
Membership of FBO	0.4979676***	0.07358
Livestock ownership	−0.1905637*	0.10577
Extension visits/month	0.1004561***	0.02204
Off-farm income	−0.1470875*	0.08802

Notes: $n = 240$. Predicted probability is: 0.55, LR $\chi^2(9) = 142.86$***; pseudo $R^2 = 0.43$. ***,**,*Significant at 10, 5 and 1 per cent, respectively

Table II.
Maximum likelihood estimation results of the probit model

member defaults, the entire group is made to pay back the loan to the government (MoFA). Thus, the positive and significant coefficient of the FBO variable is also plausible in the sense that farmers who belong to FBOs had the opportunity to participate in the BCFP. This finding is also in sync with that of Yehuala (2008), Balogun and Yusuf (2011), Akpan *et al.* (2013) and Amao (2013).

Furthermore, with a marginal effect of 0.10 at 1 per cent significance level, it can be deduced that a unit increase in the number of extension services will result in an increase in farmers' probability of participating in BFCP by 10 per cent. The role of agricultural extension service in the adoption of agricultural technology cannot be over-emphasized. This is especially so in Ghana where a majority of the farming population have no formal education to be able to read and understand the application of some technologies. Extension staff acts as intermediary between farmers and researchers, thereby explaining and encouraging agricultural technologies to the farmer and also giving feedback to the latter for improvement. Therefore in this study, the positive and significant effect of extension contacts on participating in the BFCP is understandable. Farmers who had contacts with extension staff would have had the opportunity to learn about the importance of participating in the programme and also the use of the technologies extended to the farmers. Akpan *et al.* (2013) and Muhongayirea *et al.* (2013) also found that the number of extension visits increases the chance of farmers' participation in agricultural credit programmes.

The results, however, show that livestock ownership was significant at 10 per cent with a marginal effect of −0.19, implying that a farmer who owned livestock was 19 per cent less likely to participate in BFCP than a farmer who had no livestock. Two reasons may account for this finding. First, farmers who are into serious livestock rearing may not be serious crop farmers and consequently may not see the need to participate in a programme that is crop biased. Second, livestock farmers are likely to be better-off financially than non-livestock owners. In this case the former may not find it necessary to go in for credit to support their crop farming work. The result is in line with the finding of Yehuala (2008) that the number of livestock owned by a farmer significantly decreases his/her probability of participating in a credit programme.

Similarly, participation in off-farm livelihood activities was found to have a significant influence at 10 per cent level of significance, with a marginal effect of –0.15. This implies that a farmer who engaged in off-farm activities was 15 per cent less likely to participate in the BFCP compared with a farmer who did not. The two reasons that may account for low participation of livestock farmers in BFCP are also relevant for the effect of off-farm involvement on BFCP participation. Other things being equal, a part-time crop farmer may not have the commitment and interest in his/her crop farm compared with a full-time crop farmer. Second, the part-time farmer may borrow from his/her other sources of income for crop farm financing and may not find it necessary to borrow from an external source such as the BCFP of MoFA. Sebopetji and Belete (2009), Tang *et al.* (2010) and Kofarmata *et al.* (2014) also made similar observations. However, in Muhongayirea *et al.* (2013) study, off-farm income had positive influence on credit participation in Rwanda because it served as an important collateral security in the acquisition of credit.

Effect of BFCP participation on crop value
This section discusses the results of the substantive estimation as presented in Table III. The coefficient of the IMR (λ) is insignificant indicating that there is no evidence of selection bias at the conventional 10 per cent significance level. This finding

Variables	Coefficient	SE
Total crop value (GH¢)		
Farm size(acres)	1.088479***	0.2888803
Quantity of seed used (kg)	0.2698891***	0.0698645
Plough cost (GH¢)	−0.3652796	0.27751
Labour cost (GH¢)	−0.0385636**	0.0172216
Herbicides (litres)	−0.1849645***	0.0557813
Quantity of fertilize used (Kg)	0.056508*	0.0336293
BFCP participation (1 = yes, no = 0)	0.103652***	0.035671
Constant	2.984964***	0.4562519

Notes: $n = 240$. Hazard $\lambda = -0.0050375$, $\sigma = -0.02059$, $F = 52.24$***. ***,**,*Significant at 10, 5 and 1 per cent, respectively

Table III.
Effect of Block Farm Credit Programme on crop value; OLS results

implies that there are no unobservable farmer characteristics which determine the likelihood of BFCP participation and crop value at the same time. The result of the study shows that variables such as total farm size, quantity of seeds used, quantity of herbicides used and BFCP participation were significant at 1 per cent. While labour cost was significant at 5 per cent, fertilizer application was significant at 10 per cent. The cost of ploughing, however, was not significant. Also, while quantity of seed used, farm size, fertilizer applied and BFCP participation have positive effect on total crop value, quantity of herbicides used had negative effect on total crop value.

Total farm size cultivated was found to be positive and statistically significant at 1 per cent to the total crop value with a coefficient of 1.09. This indicates that holding all other explanatory variables constant, an increase in total farm size by one acre will lead to an increase in total crop value by GH¢1.09. This result confirms that of Ajah and Nmadu (2012) as well as Obasi *et al.* (2013) who observed that an increase in area of land cultivated resulted in an increase in crop output. As noted from the introduction, one of the limiting factors to the effective implementation of the BFCP is inadequate land. The initial plan of the programme was to use government lands for the purpose. However, the complex land tenure arrangements meant that MoFA could not secure the needed hectares for the programme and so had to depend on private lands. These were not adequate. From the findings, any opportunity for farmers to increase their plot would mean that output could be increased.

With regards to the quantity of seeds used by the farmers, the results reveal that an increase in the quantity of seeds by 1 kg will result in an increase in total crop value by GH¢0.27. This finding also confirms the fact that maximum crop yield is dependent on the right seed density. As part of the BFCP package, farmers are taught to plant in rows and also to ensure the right seed density. Even though farmers may be though the right agronomic practices and may know how to do it, the actual implementation or practice of such knowledge may be constrained by credit or finance.

The quantity of fertilizer applied was found to be significant with a coefficient of 0.057 implying that an increase of fertilizer applied by 1 kg will lead to an increase in total crop value by GH¢0.057. Matsumoto and Yamano (2011) had a similar finding and stressed that fertilizer credit helps increase inputs applied by farmers and consequently contributes significantly to crop yield. Like seed density, two reasons may account for low application of fertilizers by farmers. These are ignorance and financial constraints. In a situation where the farmer has no knowledge and also does not have access to extension or research staff, it may be difficult for him/her to apply the right quantities

of fertilizers on his/her plot, even if he/she has the means. Similarly, if he/she has the knowledge but the means is not there it would be difficult for him/her to apply the right quantities.

While seed density and fertilizer had a positive effect on output, the quantity of herbicides was found to be negatively related to total crop value with a coefficient of −0.18. This means that, a litre increase in the amount of herbicide used reduces total crop value by GH¢0.18. The probable explanation is that herbicides may have been overused. There is this general notion that increase in quantity of weedicide used by farmers would lead to an increase in crop output due possibly to efficacy. However, if the optimal efficacy threshold is exceeded, any additional quantity may only increase the production cost, affect crop growth negatively and eventually reduce yield, and consequently reduce crop value. Likewise, the quantity of labour was found to have negative effect on total crop value with the coefficient of −0.039. Thus, additional labour would decrease crop value by GH¢0.039. At this stage, the general explanation may be that farmers participating in the BFCP are overusing labour on the limited land allocated; hence diminishing or negative returns have set in. As outlined in earlier discussions, the government through MoFA could not acquire adequate tracts of land to implement the programme; hence farm sizes were generally limited. Most farmers tend to use the entire household members for cultivating the limited land. Donkoh (2011) also found the labour variable to be negative in explaining variation in output.

The main objective of the study was to determine the effect of BFCP participation on crop output. From the findings, BFCP participation had a positive and significant effect on output, the coefficient being 0.10. This means that a farmer who participated in the BFCP obtained 10 per cent higher crop value than the one who did not participate in the BFCP. This is a very important finding for policy formulation. Benin *et al.* (2013) made a similar observation and reiterated the fact that farmers who participated in the BFCP had access to low-cost credit in the form of inputs resulting in greater farm productivity and higher incomes. The result is also in line with that of other empirical studies including Iqbal *et al.* (2003), Bashir *et al.* (2010) and Das *et al.* (2009).

Constraints associated with BFCP participation
The main constraints associated with effective implementation of the BFCP participation mentioned by the participants were: inadequacy of the BFCP inputs (48.2 per cent); difficulty in paying back the credit due to low yields (20.9 per cent); late delivery of BFCP inputs (13.70 per cent); high cost of transporting inputs to homes and farms (12.2 per cent); and unfavourable credit terms. Among the non-participants, some of the problems they had with the programme were low publicity (54.7 per cent), difficulty in assessing BFCP inputs (41.5 per cent) and not belonging to any group (3.8 per cent). This result is consistent with findings by Ugwumba and Omojola (2013), who observed that higher interest rate, cumbersome processing procedures, delays in disbursement, lack of collateral, lack of awareness of loans packages and the attitude of some government officials are the constraints which impeded farmers from accessing credit packages. However, 20 per cent of the respondents indicated that they did not face any constraint in accessing the BFCP.

Conclusion and recommendations
The study sought to examine the socioeconomic factors influencing farmers' decision to participate in the BCFP of MoFA, and the effect of participation on crop output. Besides

these, the study also examined the constraints associated with the effective implementation of BFCP. Based on the findings, it is concluded that farmers who are more experienced, farmers belonging to FBOs and those that receive greater number of extension visits have positive probabilities of participation in the BFCP. More importantly, farmers' participation in the BFCP leads to increased crop value. Apart from the BFCP participation, other variables that led to increase crop output were farm size, quantities of seeds and fertilizer used. Finally, farmers who could not participate in the BFCP did so because the BFCP inputs were inadequate. Participants also complained of late input delivery and poor access of BFCP inputs from district agricultural offices.

In the light of the findings, it is recommended that government, through MoFA should employ more extension agents so that more farmers in the country can have access to extension services. The formation of FBOs should also be taken serious by farmers in order to benefit from government interventions as well as other organizations since many NGOs and financial institutions prefer working with groups instead of individual farmers. Government should consider a re-introduction of the BCFP in a form that overcomes the constraints enumerated by farmers so that the programme becomes effective and more efficient at achieving its intended goals.

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