

PRELIMINARY REPORT

NOT TO BE QUOTED

**AN EMPIRICAL ANALYSIS OF THE IMPACT OF AGRICULTURAL
CREDIT FROM BANKS AND MICRO FINANCE INSTITUTIONS
(MFIs) IN GDP GROWTH: BANGLADESH PERSPECTIVE¹**

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EXECUTIVE SUMMARY

1. Introduction

At the moment, roughly one-fifth of Bangladesh's GDP originates from agricultural sector, and the sector absorbs about half of the total labor force of the country. Agricultural credit is being construed as an integral part of the modernization of agriculture and commercialization of rural economy. Agriculture as a sector depends more on credit than any other sector because of seasonal variations in farmers' returns and a changing trend from subsistence to commercial farming. The lack of access to credit not only deprives a person to put him in poverty; it also means that GDP is reduced in the absence of the contribution of the person concerned.

Historically, the public sector stepped into the rural credit market –mainly through Krishi Bank – to help farmers come out of the clutches of money lenders/land-owners who, allegedly, charge usurious rate of interest. Over time, other financial institutions entered to cater to agricultural credit needs. But since the credit from the Krishi Bank or other institutions requires collateral, (especially land), the loans so disbursed seemingly went mostly to large and medium land owners at the peril of the poor farmers. On the other hand, the credit from NGOs has two problems: it requires that the borrower must have at least 50 decimals of owned land, and the loan is disbursed largely for non-farm activities. Thus, in one way or the other, the sharecroppers were denied of the access to credit by formal sources. Obviously, the inaccessibility disdained their contribution to GDP growth rate.

It is in this backdrop, and in an epoch-making move, Bangladesh Bank (BB) has stipulated a special fund of Tk.5000 million to provide agricultural loans to the sharecroppers only – to those engaged in cultivation (at least for last three year), not being member of any NGO , and only for crop production. Brac, the largest NGO in the world, was given the responsibility of distributing the credit under its group-based lending polices. The programme started in December 2009, and so far could reach a vast number of sharecroppers (Number?) throughout Bangladesh.

2. Research Methodology

The present impact study is based on sample surveys done on target households – receiving this credit – and the control households without such loan. The total effective sample size is

400 distributed across 7 Divisions. The survey involved structured questionnaires to generate quantitative information relating to socio-economic and demographic parameters. Further, discussions with stakeholder in sample villages were held to gain qualitative insights to the impact assessment. A Multivariate Logistic Regression was run to ascertain the impact of the special credit for sharecroppers where the perceived change of economic condition of the household was treated as a dependent variable (Dichotomous), and related to some explanatory variables, including the access to the credit line.

3. Major Findings

3.1 Aggregate Scenario

To start with, we can look at few of the aggregate statistics before taking up issues of impacts at household level. The programme seemingly progressed well. Information gathered from Brac shows that, out of the stipulated amount of Tk.5000 million, Tk.4440 million has already been disbursed as of May 2012 - across 204 Upazilas of 41 districts. A total of 175 thousand sharecroppers have accessed loan so far averaging Tk.12, 000 credits per applicant. Meantime, about 284 thousand sharecroppers joined as members in village organizations (VOs). Assuming that a member has to deposit Tk.50/month as saving, the amount of saving generated amounts to Tk.170 million/year. Nearly half of the borrowers seemed to have scaled up (taking successive loans by large amount), and the recovery rate from the loan is 98%.

3.2 Impacts at Household Level

3.2.1 Economic Impacts

- The average amount of loan received amounts to Tk.14,000 with a range of 8,000-30,000. About 95% of the participants have repaid the loan timely. Again, accessing loan from Brac involved no ‘extra money’ whereas a survey shows that, even to access loans from NGOs, 1% of the loan money had to be paid by borrowers as ‘extra’.
- Four-fifths (80%) of the borrowers now cultivate modern paddy (MV) as the available credit, to a great extent, eased the working capital constraint. In consequence, and for example, gains from increased yield almost doubled – from 8-10 maunds/bigha for TV to 15-20 maunds/bigha for MV.

- Ninety per cent (90%) of the respondents reigned on the importance of loan for their economic uplift; three-fourths (around 75%) of the participants revealed that, in the absence of this particular loan, they would have to borrow from village money-lenders at an interest rate of 10% per month. In some areas, 10 maunds of paddy worth of Tk.8000 had to be surrendered to get a loan of Tk.10, 000 (for three months). This kind of dependency has also forced distress sales of agricultural output. The availability of credit from present source, reportedly, relieved them of the rough days of those hardships as they now have to part with Tk.1000 as service charge.
- The ‘beauty’ of the current programme appears to be that it takes maximum 21 days – from joining the group to approval of loan. This compares with more than half of the borrowers from NGO making three visits to get the loan.
- It seems that, in the improvement of economic condition, membership of NGOs does matter. For example, among those who reported improved economic condition over the year, three-fourths (75%) of them are NGO members. This contrasts with 38% of non-members reporting positive change. Specially, roughly four-fifths (80%) target respondents reported a positive change, while in the case of control respondents, the share was just one-fourth (25%);
- Econometric exercises (Multivariate Logistic Regression) carried out to relate change in economic condition with relevant explanatory variables show that: (a) responses about economic change aren’t correlated in same Division (insignificant), but correlated at union level (significant); (b) all variables explain the economic change (improvement, same or deterioration after the loan) significantly excepting land ownership variable; (c) most importantly, for target farmers, the chance of having improved condition is about 2.2 times higher than the control ones.
- In reply to a question as to how much interest rate would they accept before the programme is called off owing to financial constraint, one-third (66%) of the respondents agreed to accept 13% and almost all agreed to accept 12%.

3.2.1 Non-Economic Benefits

- Knowledge on agricultural technology, banking through pass books leads to modernization and commercialization;

- Group cohesion from regular monthly meetings: sharing experiences, savings mobilization, voices against vulnerability,
- Women empowerment: decisions on choice of crops, crop management, children's education, travels and recreation etc.
- Spill-over effects on non-borrowers
- Children's education: promise to be kept- private tutors, better schools.
- Housing condition: improved
- Access to Food: More and better quality food – fish and occasionally meat unheard before.

4. Identified Problems

- The survey data show that 10% of the borrowers shouldn't have got this loan either due to bigger land size or already accessing loans from other sources.
- As sharecroppers left earlier lenders (especially village owners and mohajons) in search of a 'soft' option like this credit, some of the inter-linkages were cut-off due to apathy from lenders.
- In some areas, and in the face of weak monitoring, over enthusiasm in getting loans at subsidized 10% led to misuse of the credit money.
- Only 30% of borrowers could scale up indicating that there is mismatch between structure of opportunities and the structure of endowments.
- Farmers complained about lower price of paddy.

5 Policy Suggestion

Bangladesh bank should continue this special credit programme as the poorest of the villages get the opportunity of improving economic condition by utilizing the money. However, the problem of targeting should duly be addressed immediately. Second, time has possibly come to think whether a part of the loan could earmark for non-crop activities such as livestock.

AN EMPIRICAL ANALYSIS OF THE IMPACT OF AGRICULTURAL CREDIT FROM BANKS AND MICRO FIANANCE INSTITUTIONS (MFIs) IN GDP GROWTH: BANGLADESH PERSPECTIVE

*“When you have got a little,
it is often easy to get more.
The great difficulty is to get that little”
Adam Smith (The Wealth of Nations).*

1.0 INTRODUCTION

1.1 Why Credit?

In different countries of the world including Bangladesh, the ardent goal of the government is the reduction of poverty through, inter alia, sustaining high growth rate of GDP. In reaching this goal-post, experiments with various strategies and instruments are continuously at work. To that effect, the importance of financial intermediation in augmenting growth rate and attacking poverty is not only recognized, but also rigorously researched. Examples are in avalanche where financial constraints have been considered as the main hurdle on way to escaping poverty.

The reasons for emphasizing the role of finance aren't far to seek. Arguably, the fragile financial environment tends to constrict economic returns from pro-poor public investments, such as irrigation and education. In the absence of necessary working capital for buying water, fertilizer and pesticides, coupled with it the lack of the knowledge for their balanced application, farmers often fail to reap a better harvest from modern technology-led crops. Likewise, the government's efforts at enhancing school participation rates through raising buildings may recoil in the face of a shortage of savings to meet children's school expenses. Therefore, inadequate financial support in improving health, welfare and earning capacity of the people often results in punishing consequences.

There is also another important aspect that should not take a back-seat in our mind-set. The most important requirements towards the creation of employment in non-farm activities are investments in working capital and development of basic skills in reading, writing and arithmetic. So, the shortage of both financial and human capital could stand as a stumbling block for the in taking up productive pursuits. May be the requirement of financial capital is 'small' at the lower income strata, but the accumulation of that "small" becomes a big and

hard task. The situation reminds us of the quotation - *a la* Adam Smith: “when you get a little, it becomes easy to get more. But the problem is to get that little”. There is little shade of doubt that development of human capital is a long-term process. But the shortage of working capital is a short-run phenomenon which can be addressed quickly if the access to credit is ensured at doorsteps.

Let us turn to basic relationship between credit and capital. Baker and Hopkin (1969) have shown that the relationship between the growth in equity capital and credit is governed by the following equation:

$$\Delta E/E = [(D/E) (r - i) + r] (1 - c),$$

Where, D is the amount of loan; E is the amount of equity capital (own capital engaged in business); r is the income or profit from business; i is the rate of interest on the loan; and c is consumption expenditure out of the earned income. The authors reckon that, as long as the rate of interest charged on loan would remain lower than the return on assets, credit will increase family income. The higher the share of total capital (D+E), the higher will be the growth of income of the household. If the marginal propensity to consume is unity, the amount of equity capital will be unchanged. But if it is less than one, the received loan will increase the net worth of the household. Under normal circumstances, the poor may find it very difficult to save but if the credit program is such that the loan and the interest rate are covered in small installments over a period of time, the loan may force compulsory regular savings of small amounts that would otherwise be consumed under the pressure of poverty.

1.2 Rural Credit Market in Bangladesh

Bangladesh has made commendable progress in addressing two basic problems of the rural credit market: dualism and fragmentation. It is true that the share of rural households seeking credit has remained at same level over the last two decades (about 45% of all rural households), but the sources of credit have remarkably changed over time. Preponderance of the informal sources of credit was quite evident in the initial periods. For example, two decades back about one-third of rural households used to access credit from non-institutional sources (money lenders: 15%, Friends and relatives: 17%). In recent years, the share has dropped to only about 10%. On the other hand, the share of households borrowing from institutional sources went up from 13% to 39% during the same period of time (commercial banks 5% and NGOs 34%). More importantly, the share of poor borrower-households (owning up to 0.2 ha) went up almost ten-fold from about 4% to about 40% during the same period of time. Specifically speaking, the share of this poor group in accessing credit from

institutional source has gone up from 21% to 43% over time (Hossain and Bayes 2009, 2010). However, the aggregate statistics appear to conceal the fact that the small and marginal sharecroppers remained outside the orbit of opportunities opened up by formal credit channels, especially by Banks and NGOs. Such a state of unequal access to financial services continues to adversely affect household income as well as GDP.²

Another development in agrarian transformation in rural Bangladesh, and its links with credit market, needs to be noted. It is the growing tenancy market. The Preliminary Report on Agricultural Census of 2008 shows that roughly one-thirds of rural households are tenant households (BBS 2010). Field level evidences reveal that nearly 40% of the cultivated land is now operated under tenancy arrangement as compared with 23% of two decades back, and thus depicting growing thickness in the tenancy market. Again, 26% of farms are reported to be pure tenants (living in own house but living on others' land), 15% constitutes tenant-owner (large portion comes from others), 8% appear to be owner-tenant (large portion owned land) and 52% are reported to be pure owner-cultivators (Hossain and Bayes 2009, 2010).

1.3 Agricultural Credit and Sharecroppers

At the moment, roughly one-fifth of Bangladesh's GDP originates from agricultural sector, and the sector absorbs about half of the total labor force of the country (Planning Commission 2011). Agricultural credit is being construed as an integral part of the modernization of agriculture and commercialization of rural economy. Agriculture as a sector depends more on credit than any other sector because of seasonal variations in farmers' returns and a changing trend from subsistence to commercial farming (Abedullah et.al).

Historically, the public sector stepped into the rural credit market –mainly through Krishi Bank – to help farmers come out of the clutches of money lenders/land-owners who, allegedly, charge usurious rate of interest. Over time, other financial institutions also entered to cater to agricultural credit needs.³ But since the credit from the Krishi Bank or other institutions requires collateral, (especially land), connections and confidence, allegedly, the loans so disbursed went mostly to large and medium land owners at the peril of the poor

² The nexus between credit and growth is well-known. Equal access to credit is necessary not only for poverty reduction, but also for growth itself. A person deprived of the access to credit might miss the opportunity to participate in economic activities and, thus, fall in poverty. But the other side of this problem is that, at the same time, the national output is lost in the absence of the contribution of the deprived person (Osmani 1997).

³ According to Agricultural Credit Department of Bangladesh Bank, eight Government Banks along with Foreign Commercial Banks (FCBs) and Private Commercial Banks (PCBs) disbursed a total of Tk.11,2100 million from July 1 2010 to 31 May 2011 against Tk.9,8890 million in previous period.

farmers.⁴ On the other hand, the credit from NGOs has two problems: it requires that the borrower must have at least 50 decimals of owned land, and the loan is disbursed largely for non-farm activities. Thus, in one way or the other, the sharecroppers of rural Bangladesh were denied of the access to credit by formal sources. Obviously, the inaccessibility disdained their contribution to GDP growth rate.

It is in this backdrop that, in an epoch-making move, Bangladesh Bank (BB) has decided to support sharecroppers and stipulated a special fund of TK.5000 million to provide agricultural loans (called crop loans) to the sharecroppers only. Brac, the largest NGO in the world, has been assigned with the task of distributing the credit under its group-based lending polices. The programme started in December 2009, and so far could reach a vast number of sharecroppers throughout Bangladesh (Table 1.1).

Table 1.1: Information on Loans for Sharecroppers.

| Indicators | Status as of March 2012 |
|-------------------------------------|-------------------------|
| Total Amount Stipulated (Tk) | 5000 Million |
| Disbursed Amount | 4440 Million |
| Number of Districts covered | 41 |
| Number of Upazilas covered | 204 |
| Loan Range (Tk) | 7000-30,000 |
| Average Loan (Tk) | 12,000 |
| Total Members (No) | 2,84000 |
| Total Borrowers (No) | 1,75,000 |
| Total loans to Borrowers (Tk.) | 3,69,000 |
| Average number of loans | 2 |
| Scaled up (% of borrowers) | 50-55% |
| Loan recovery rate (%) | 98 |
| Non-Eligible cases (% of borrowers) | 4-5 |

Source: Brac

⁴ A working paper prepared by MM Shawkat Ali shows that in the mid-eighties, farmers had to pay up to 25% of loan money to access agricultural credit from various agencies – a constraint that only large and medium land owners could possibly bear with.

This credit scheme, however, stands in sharp contrast with traditional agricultural credit provided by public and private banks mainly on two counts. First, a lion share of the general agricultural credit is long-term in nature (for purchase of irrigation equipment or livestock), whereas the credit to sharecroppers is of short-term nature for pursuing seasonal agricultural activities, such as growing paddy. Second, the former attaches no pre-conditions, excepting collateral, but the latter demands some socio-demographic and health related attitudinal change on way to accessing the loan.⁵

1.4 Rationale for Research

It is almost three years that sharecroppers have been receiving credit through Brac. BB needs to ascertain the impact of the loans on socio-economic uplift of sharecroppers with a view to taking up future policy actions. The issues that have been looked at are the following:

- The impact of access to BB credit by sharecroppers on income, expenditure, investment and food security of households segmented into target and control households and
- Provide policy prescriptions.

⁵ For example, it is a group-based lending following the foot prints of micro-credit programmes of Brac. The client has to commit to 18 ‘promises’ pronounced during pre-loan period - such as sending children to school, use safe water and sanitation, cleanliness, raise voice against corruption, maintain group discipline etc. Otherwise, the application for loan is never processed.

2.0 METHODOLOGY AND DATA SOURCE

The impact assessment is based on three approaches. First, sample survey was conducted with structured questionnaires to generate quantitative information for households. The data so generated mostly relate to socio-economic parameters. Second, field visits were made in several villages to record the perception of stakeholders about the impacts of the credit. This has been done through dialogue with village organizations (VOs). And finally, secondary information from Brac and BB sources were accessed in the preparation of the report.

The methodological niches need some elaboration. The sample farmers come from 7 Divisions in Bangladesh. The sampling scheme of the survey was a combination of several sampling techniques mainly, multistage sampling. The different levels of the hierarchy defined by the sampling scheme are farmers, unions and districts. Stratification was performed at the union levels with fixed sample size and at the district level. Within a district, sampling was taken proportional to population size in each union.

Within each stratum, sample of individual farmers was obtained in three stages. At the first stage, Thanas (primary sampling units) were drawn by a systematic sampling procedure with probability proportional to their size. The next stage of random selection took at union level (secondary sampling units) according to a clustered systematic sampling procedure after ranking the union hierarchically by size and duration of the loan activities of different NGOs. Finally, individual farmers (ultimate sampling units) were selected within unions in such a way that a maximum of 20 farmers were interviewed in each union.⁶

2.1 Data Set

The data set used for this study was drawn from the Surveys in line with sampling procedure described above, and conducted during the months of 2011. From the survey a total of 450 farmers, 400 were considered for final analysis with complete information (Table 2.1).

⁶ This way of sample selection is amply demonstrated by Renard *et al.* (1998) and Van Oyen *et al.* (1997).

Table 2. 1: Sample Size and Distribution across Divisions

| Division | Sample Size | % of total |
|------------|-------------|------------|
| Dhaka | 55 | 14 |
| Rajshahi | 68 | 17 |
| Chittagong | 55 | 14 |
| Sylhet | 60 | 15 |
| Barishal | 60 | 15 |
| Khulna | 65 | 16 |
| Rangpur | 37 | 9 |
| Total | 400 | 100 |

To identify variables related to the target response, perceptions of the respondents about change of economic condition was taken as a proxy for welfare. For example, the respondents were asked whether their economic condition has improved, remained same or deteriorated following the receipt of the loan from Brac. The perception has been linked to a set of covariates which generally fall under one of the three following categories namely: Socio-Demographic variables (age, sex, household size etc.), Loan related variables (e.g. duration of membership of any NGO, whether received any loan from NGO by any member of the family, membership in this project etc.), and income related variables (Land ownership, annual agricultural income, annual non-agricultural income, non-land fixed assets etc.). Further, a new variable named Living Environment Index (LEI) was derived from households' space, access to electricity, sources of drinking water etc. to study the relationship with change of economic condition in a more scientific manner rather than using individual variables separately. Out of the total sample, 5 cases for Living Environment Index (LEI) were missing and those values were excluded from that particular variable.

3.0 QUALITATIVE ASSESSMENT

Improvement in economic status is a long-term process. But in the short-run, and as already pointed out earlier, access to credit may remove some of the constraints to improved economic condition, such as smoothening consumption, meeting working capital needs in growing modern technology-led crops etc. While quantitative impact assessment, especially of pro-poor projects, has long dominated the discourse on impact assessment, critics point out that such objective impressions bypass the perception of the population about their own economic condition. In other words, the “facts and figures” of the researchers may not fit the “feelings” of the respondents about their own condition. Whereas, “...at the start of the 21st century, any policy document on poverty should be based on the experiences, reflections, aspirations and priorities of the poor people themselves” (Narayan et.al 2000). Thus, participatory and qualitative poverty assessment has emerged as important tools in the recent literature on poverty (Sen and Hulme 2004).

However, the perception of people regarding their economic status should be taken with some reservations. For example, and in general, poor have the tendency to be satisfied easily with very little improvement. This tendency is common in developed countries as well. Thus, in order to identify variables which are related to economic change of the household, data on several covariates were extracted and considered that are discussed in the next section. Given the caveats, we shall submit below some of the observations based mostly on qualitative data.

3.1 Non-institutional source to institutional source

During the discussions the sharecroppers revealed that, in the absence of this particular loan, they would have to borrow from village money-lenders at an interest rate of 10% per month. In some areas, 10 maunds of paddy worth of Tk.8000 had to be surrendered to get a loan of Tk.10, 000 for three months. This kind of dependency has also prompted distress sales of agricultural output in the past. The availability of credit from present source, reportedly, relieved them of the rough days of those hardships as they now have to part with Tk.1000 as service charge.

3.2 Amount, Time and Repayment

The average amount of loan received amounts to Tk.14, 000 with a range of 8,000- 30,000. The amount is decided upon by the land size, crop variety etc. The ‘beauty’ of the current programme appears to be that it takes maximum 21 days – from joining the group to approval

of loan (Box 3.1). This compares with more than half of the borrowers from NGO making three visits to get the loan. Again, it involves no ‘extra money’ whereas a survey shows that, even to access loans from NGOs, 1% of the loan money had to be paid by borrowers as ‘extra’ (Hossain and Bayes 2009, 2010). About 95% of the participants in discussions disclosed that they have repaid the loan.

3.4 Eligibility and Access

It appears that roughly 90% of borrowers conformed to the conditions set by Brac for eligibility to the access. That means, as survey data show, 10% of the borrowers were apparently ineligible (mis-targeted) to get this loan either due to bigger land size or already accessing loans from other sources.

Second, another important aspect of the programme seems to be that, about 40% of the borrowers are reported to be pure-tenants - owning homestead plus 10-15 decimals of cultivable land. In rural areas, these households are considered as the poorest households drawing most of their income from manual labor either in agriculture or in non-agricultural activities. Further, most of these pure tenants always remained outside the orbit of institutional sources of credit channeled through Banks or NGOs. This possibly provides a strong justification for continuation of the programme.

3.5 Adoption of New Technology

As against the local/traditional varieties of paddy (TV) adopted in the past, 80% of the borrowers were reported that they now adopt modern varieties of paddy (MV) as the available credit, to a great extent, eased the working capital constraint. In consequence, and for example, gains from increased yield almost doubled – from 8-10 maunds/bigha for TV to 15-20 maunds/bigha for MV (Box 3.1). Reportedly, this has served two purposes: (a) improving food security at household level, and (b) allowing diversion of land to non-rice crops in lieu of a rise in land productivity. Another dimension is that one-fifth of the borrowers reported to have put more land under cultivation from the tenancy market.

3.6 Accumulation of Non-Land Assets

Survey data show that over half of the borrower households spent income on repairing/maintenance of house; about 40% bought livestock, and 10% purchased agricultural equipments.

3.7 Willingness to Pay

In reply to a question as to how much interest rate would they accept before the programme is called off owing to financial constraint, one-third of the respondents agreed to accept 13% and almost all agreed to accept 12%.

3.8 Non-Income Benefits

- Knowledge on agricultural technology, banking through pass books leads to modernization and commercialization;
- Group cohesion from regular monthly meetings: sharing experiences, savings mobilization, voices against vulnerability,
- Women empowerment: decisions on choice of crops, crop management, children's education, travels and recreation etc.
- Spill-over effects on non-borrowers
- Children's education: promise to be kept- private tutors, better schools.
- Housing condition: improved
- Access to Food: More and better quality food – fish and occasionally meat unheard before.

Table 3.1 : Some perceptions of farmers regarding loan

| Indicators | | % |
|------------------------------|--------------------------|----------|
| Importance of loan | Very important | 46.7 |
| | Important | 43.2 |
| | Not so Important | 5.7 |
| | No comment | 4.4 |
| Availability of loan | Available when I need it | 40.8 |
| | Not so available | 27.9 |
| | Not in Timely | 14.4 |
| | Rarely | 6.0 |
| | Not available | 3.0 |
| | No need | 8.0 |
| Safer sources of loan | Bank | 44.9 |
| | NGO | 51.2 |
| | Relatives/Friends | 1.4 |
| | Neighbour | 1.0 |
| | Others | 1.4 |

BOX 3.1: Loan and Lessons

Sultana Begum (23) of Gobordhanpur village under Bogra Sadar, has applied for a loan for the first time. She is a sharecropper and has been cultivating 98 decimals of land (Own:40, rented: 50) for the last three years. Excepting two houses made of tin, and housed in 8 decimals of homestead land, Sultana has no other assets worth the mention. To her comfort, the family size is relatively low comprised of 4 members, but there is only one earning member, her husband, engaged in farm and non-farm activities. With an initial saving of Tk.150, she applied for a loan of Tk.10, 000 for a year on 17 February 2011. The loan was approved within two days on 19 February 2012 by the Branch and Regional managers. The loan has to be paid in 11 equal installments of Tk.1000 each. In fact, she will have to repay Tk.11, 000 including the service charges. If we take into account the day of her membership in the group (30 January 2011), the total time spent to access the loan money is roughly one month, and possibly much lower than the time required in getting loans from NGOs. However, her prayer for loan had to be recommended by small group leader Masuma and President of the group Anjuara. The system requires that Sultana submits a proposal for the loan that runs as follows:

She intends to grow boro paddy in 90 decimals with estimated total costs of Tk.15,700 including service charges on loaned capital (Tk.1000). She expects 1800 kg of output, and at the going market price of Tk.17/kg, the outlay would amount to Tk.30, 600. This would provide her with a net profit of about Tk.16, 000. Even if we impute the value of her family labor – roughly one-fifth of total cost - the net profit would still be rewarding.

It is not profit per se that economists would always like to count in relation to assess the impact of credit. Before becoming eligible to apply for a loan, she had to make as many as 18 promises in her group meetings held regularly. The promises include sending children to school, keeping family size small, ensuring cleanliness, maintaining group cohesion, deposit of regular savings, and stand against corruption and injustices etc. Meantime, Sultana got a pass book to record her payment and receipt of loan money from Brac.

This way of organizing groups and offering lessons provided to hitherto ignorant go a long way in expanding the frontier of knowledge, accumulating social capital, enhancing empowerment of women etc. In fact, from now on, Sultana could possibly survive even without such subsidized credit unless external shocks (man or nature made) shroud her shrub.

Source: Field visit and papers from Brac Branches.

4.0 QUANTITATIVE ASSESSMENT: TECHNIQUES AND RESULTS

4.1 Exploratory Data Analysis (EDA)

This fundamental step has been carried out in order to gain better insight into the data set. To this effect, various data exploration techniques were employed to study possible potential predictor variables related to change in economical strength of a farmer's family. Simple descriptive statistics (means and standard deviations), graphical and cross tabulations were mainly used to study the association between the response variable with the set of explanatory variables.

4.2 Model Building and Variable Reduction

Examination of each predictor with the response variable can provide a preliminary idea how important the variable is. Consequently, a uni-variate logistic regression model was fitted and variables with p-value < 0.25 were considered as candidates for the multivariate model (Hosmer and Lameshow, 2000). Then to examine the relative importance of all the variables simultaneously, multiple logistic regression technique was adopted. Multiple logistic regression is used when the dependent variable is dichotomous and the explanatory variables are of any type, qualitative, quantitative or both. It can be used not only to identify risk factors but also to predict the probability of success.

The general multiple logistic regression model is given as:

$$\text{Logit} (P (Y_i=1/X)) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_p X_p$$

Where: Y_i denote the dependent variable for i-th observation.

$$Y_i = \begin{cases} 1 & \text{if } i\text{th respondent is in positive change} \\ 0 & \text{if } i\text{th respondent is in negative change} \end{cases}$$

X_i : p explanatory variables.

β_i : respective parameter estimates.

The parameter β_i refers to the effect of X_i on the log odds that $Y_i = 1$, controlling the other X_j . For instance, $\exp(\beta_i)$, is the multiplicative effect on the odds of a unit increase in X_i , at fixed levels of other X_j .

Eventually, manual backward selection procedure was adopted and variables with p-value < 0.05 were retained for further statistical analysis.

There were two levels of clustering in the dataset (district and union). First, Alternating Logistic Regression (ALR) models were fitted only on the union level and then it was adopted again that take into consideration the two clustering levels simultaneously.

4.3 Alternating Logistic Regression (ALR)

The odds ratio is a particularly straightforward measure to capture association between binary or categorical outcome (Molenberghs and Verbeke, 2005). The Alternating Logistic Regression (ALR) models the association between pairs of responses with log odds ratios. Thus, inferences can be made not only about marginal parameters but also on pair-wise association between measurements within the union. The odds ratio (OR_{ijk}) between k^{th} and j^{th} measurements for the i^{th} union can be expressed as:

$$OR_{ijk} = \frac{P(Y_{ij} = 1, Y_{ik} = 1) \cdot P(Y_{ij} = 0, Y_{ik} = 0)}{P(Y_{ij} = 1, Y_{ik} = 0) \cdot P(Y_{ij} = 0, Y_{ik} = 1)}$$

Odds ratio between k^{th} and j^{th} farmers greater than one indicates positive association, less than one indicates negative association and equal to one indicates independence. Upon convergence, the ALR algorithm provides estimates of the marginal parameters (β) in terms of log odds ratio, and α the measure of pair-wise association.

4.4 Alternating Logistic Regression (ALR)

In order to have a valid model, variables to be included in the model for statistical analysis have to be appropriate and moderate in number. Thus, variable reduction process was performed by fitting uni-variate logistic regression for each covariate and variables with p-value > 0.25 were dropped. Only the variable *Sex* (p -value= 0.935) was dropped by this procedure. Results from the exploratory data analysis also support the fact that sex of the respondent has no association with economic change. The rest of the variables were fitted in multiple logistic regression. Using manual backward selection approach the variables household size, land ownership, non-land fixed assets, Member of NGO, Loan from Tenant-Farmer Development Project (TFDP), and average education of household were found to be significant.

Alternating Logistic Regression model using exchangeable working assumption was fitted to capture the true pair wise association within a household using odds ratio. Formal inferences about marginal parameters based on their odd ratios can also be made from ALR estimates. The log odds ratio for any pair of two measurements within a union was 0.67 with standard error of 0.32 and it was found to be significant (p -value=0.0385). Its corresponding

odds ratio was 1.95 (Table 4.2). It can be inferred that measurements from same union are slightly correlated.

Another alternating logistic regression was fitted by taking the two clustering levels (district and union) into account, where unions are nested in districts. Therefore, any pair of measurements from the same unions have constant log odds ratio (α_1) and any pair of measurements within a district but from different union have a constant log odds ratio (α_2). The parameter estimates and standard errors when considering both levels of clustering are displayed.

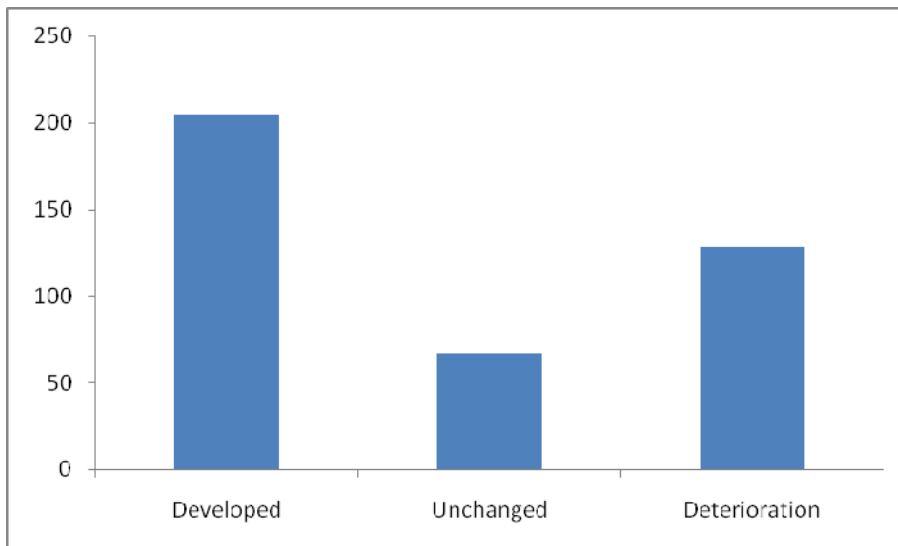
The log odds ratio between any pair of measurements of the same union was 0.67 with standard error 0.27 and was significant ($p\text{-value} = 0.0130$). The corresponding odds ratio was 1.95. However, the log odds ratio between any two pairs of measurements from different unions but from the same district was 0.02 with standard error 0.02 and it was not significant ($p\text{-value} = 0.4803$). The corresponding odds ratio was 1.02. Thus, measurements from the same unions were slightly associated while measurements from the same district were not associated.

Since the dataset contains two levels of clustering, models that consider such types of data were used like ALR. Analysis of ALR at union level was performed to measure the association in terms of odds ratio. A constant odds ratio 1.95 resulted from ALR implies weak association between individuals within a union. Formal interpretation for marginal parameters from ALR using odds ratio at union level can be done. For instance, the odds of having positive economic change for an allergic person is 2.2034 ($\exp(0.79)$) times higher than farmer who is not a member of VO (Table 4.2). Similar interpretations can be done for the rest of the variables. There was no district clustering effect when the two clustering levels were considered simultaneously.

4.5 Results from Exploratory Data Analysis (EDA)

Out of 400 sample respondents, only one-third were found non-recipient of this special loan (*Control households*) under the project while a little over two-thirds reported to have received this loan in varying amount (*Target households*). To reiterate, respondent were asked whether the economic condition of the household has experienced an improvement, unchanged condition or worse condition since the receipt of the first loan. It is observed that about 17% of total sample household reported that their economic condition remained unchanged. For further statistical analysis and to making way to logistic regression, a dichotomous variable was introduced. Since this answer was totally based on the perception of the respondent, we have decided to quantify their savings in the last year and then convert it to “improvement” if

the savings was positive; otherwise it was bracketed as “deterioration”. Eventually, 220 households or 55% could be found to have perceived “improved” economic status and 180 households or 45% perceived “deterioration”. Apparently, the difference between the ratios of improvement and deterioration is not much. But it should be noted that most of the households reporting improvement took sharecroppers’ loan from Brac while most of the households reporting deterioration come from control households. And this particular variable pertaining to perception regarding change was the main response variable to verify the hypothesis regarding impact of the loan on economic improvement.



Second, structured questionnaire of the survey has both categorical and quantitative responses which had to be considered as predictors for the response. For the continuous predictor variables and the mean difference between positive and negative change was found to be significant excepting the average male-female (Table 4.1).

Table 4.1: Mean values for some selective indicators

| Indicators | Positive change | Negative Change | p-value for difference test |
|---------------------------|------------------------|------------------------|------------------------------------|
| Household size | 5.1 | 4.2 | 0.034 |
| Land ownership | 69 dec. | 65 dec. | 0.015 |
| Non-land fixed assets | Tk. 68678 | Tk. 42596 | 0.003 |
| Average education Of HH | 7.48 yrs. | 8.21 yrs. | 0.001 |
| Housing Environment Index | 15.32 | 22.67 | 0.052 |
| Non-agricultural Income | Tk. 72967 | Tk. 70590 | 0.042 |
| Male-Female Ratio | 0.96 | 0.95 | 0.059 |

Third, in terms of categorical predictors in the improvement of economic condition, membership of NGOs matters most. For example, three-fourths of NGO members reported positive change in economic condition while 38% of non-members reported positive change. Second, those taking loan from Brac (stipulated for sharecroppers), roughly four-fifths reported a positive change in economic condition while one-fourth of non-recipients of such loan reported positive change (Table 4.2).

Table 4.2: Cross Tabulation of economic change with selected loan related variables

| Change in Economic Condition | NGO | | Brac Loan | |
|------------------------------|------------|-----------|------------|-----------|
| | Yes | No | Yes | No |
| Positive (percentage) | 134 (76.1) | 86 (38.4) | 154 (81.0) | 58 (27.3) |

Fourth, we could identify, through a process of elimination, pertinent variables that are likely to affect a household's change in economic condition by applying *bivariate logistic regression* already described in methodological discussions. From the bivariate regression, significant predictors were selected to run a multivariate logistic regression. The main observations are: (a) responses are not correlated in same district (insignificant) but correlated at union level (significant); (b) all variables explain the change significantly excepting land ownership; (c) most importantly, farmers who accessed loan from Brac the chance of having improved condition is about 2.2 times ($e^{0.79}$) higher than those who didn't (Table 4.3).

Table 4.3: ALR parameter estimates and standard errors for both clustering levels

| Parameter | Union Level | | Union and District Level | |
|--|-----------------|--------|--------------------------|--------|
| | Exchangeable | P- | Exchangeable | P- |
| | Estimate | value | Estimate | value |
| Intercept | -1.95 (0.27) | <.0001 | -1.96 (0.25) | <.0001 |
| Household size | 1.72 (0.09) | <.0001 | 1.71 (0.10) | <.0001 |
| Land ownership | 0.15 (0.12) | 0.1820 | 0.15 (0.12) | 0.2251 |
| Non-land fixed assets | 0.29 (0.11) | 0.0048 | 0.29 (0.09) | 0.0011 |
| Member of NGO | 0.43 (0.20) | 0.0313 | 0.43 (0.18) | 0.0163 |
| Loan from Brac (Loans to sharecroppers) | 0.79 (0.29) | 0.0062 | 0.79 (0.27) | 0.0035 |
| Average education Of HH | -1.18 (0.26) | <.0001 | -1.16 (0.22) | <.0001 |
| Housing condition | -2.10 (0.26) | 0.1001 | -2.08 (0.24) | <.0001 |
| <i>Alpha1</i> | 0.67 (0.32) | 0.0385 | 0.67 (0.27) | 0.0130 |
| <i>Alpha2</i> | - | - | 0.02 (0.02) | 0.4803 |

Note: Figures in parentheses show standard error.

Most importantly, it appears that loans to sharecroppers contributed to improvement in economic condition, and the result is statistically significant. In fact, farmers receiving the loan have two times more chance of being better-off than non-recipients of such loan. In other words, farmers who are engaged in income generating activities by using the loan money are less likely to be poor (negative change of economic status) than a farmer without such loan (Box 4.1).

Box: 4.1: A Relief for Rafiq

For Rafiqul Islam (33) of Shambaria under Bogra Sdar, the news was worth celebrating. It is that he can access credit from local Brac branch to grow crops. Rafiq owns 6 decimals of homestead land and 66 decimals of cultivable land. To eking out a living for a family of four, he also rented in 70 decimals. For reasons unknown, he could never be associated with any NGO. However, Rafiq took Tk. 10, 000 as the first loan at a service charge of Tk.1000. Before that, he used cultivate land by borrowing from village moneylenders surrendering 10 maunds of paddy (worth Tk.8000) for a loan of Tk. 10,000. It is quite understandable how one could survive by paying such an exorbitant interest rate. He grew BR 28 and 29 to get 24 maunds of paddy per bigha when the prevailing price was Tk. 700-800/maund.

The availability of sharecroppers' credit served him three important purposes: first, the pressure from mohajons to repay debt no more forces him to distress sales; second, interest rate is now eight times lower than alternative sources, and finally, the surplus generated through growing modern variety provides food security, enables children's schooling and improve housing condition. Meantime, he has saved Tk.600 for which Brac will pay 6% as interest.

So, the credit for sharecroppers is some kind of a relief for Rafiq. Possibly, as he pointed out, his 'comrades' who couldn't avail this opportunity are still groaning under the usurious yoke of the village money lenders and mohajons.

Source: Field Visits.

5. CONCLUDING REMARKS AND POLICY SUGGESTIONS

5.1 Benefits

5.1.1 Economic

- The credit programme is epoch-making in the sense it addressed the needs of a group of farmers bypassed by Banks and NGOs. The availability of credit enabled them to grow HYV crops. The yield gain from modern variety is twice the traditional ones. This helps food security as well crop diversification;
- Ninety per cent of the respondents harped on the importance of loan for their uplift. In group discussions, three-fourths of the participants revealed that, in the absence of this particular loan, they used to borrow from village money-lenders at an interest rate of 10% per month. In some areas, 10 maunds of paddy worth of Tk.8000 had to be surrendered to get a loan of Tk.10, 000 (for three months). This kind of dependency has also forced distress sales of agricultural output. The availability of credit from present source, reportedly, relieved them of the rough days of those hardships as they now have to part with Tk.1000 as service charge.
- The repayment rate is astoundingly high at 95%. The ‘beauty’ of the current programme appears to be that it takes maximum 21 days – from joining the group to approval of loan. This compares with more than half of the borrowers from NGO making three visits to get the loan.
- It seems that, in the improvement of economic condition, membership of NGOs does matter. For example, among those who reported improved economic condition, three-fourths of them are NGO members. This contrasts with 38% of non-members reporting positive change. Second, those taking loan from Brac (stipulated for sharecroppers), roughly four-fifths reported a positive change, while in the case of non-recipients the share was just one-fourth;

- Econometric exercises (Multivariate Logistic Regression) carried out to relate change in economic condition with explanatory variables show that: (a) responses are not correlated in same Division (insignificant) but correlated at union level (significant); (b) all variables explain the economic change (improvement, same or deterioration after the loan) significantly excepting land ownership variable; (c) most importantly, farmers who accessed loan from Brac as sharecroppers, the chance of having improved condition is about 2.2 times ($e^{0.79}$) higher than those who didn't access such loans;
- The average amount of loan received amounts to Tk.14, 000 with a range of 8,000- 30,000. About 95% of the participants in discussions disclosed that they have repaid the loan. Again, it involves no 'extra money' whereas a survey shows that, even to access loans from NGOs, 1% of the loan money had to be paid by borrowers as 'extra'.
- 80% of the borrowers were reported to have moved to modern paddy (MV) as the available credit, to a great extent, eased the working capital constraint. In consequence, and for example, gains from increased yield almost doubled – from 8-10 maunds/bigha for TV to 15-20 maunds/bigha for MV.
- In reply to a question as to how much interest rate would they accept before the programme is called off owing to financial constraint, one-third of the respondents agreed to accept 13% and almost all agreed to accept 12%.

5.1.2 Non-Income Benefits

- Knowledge on agricultural technology, banking through pass books leads to modernization and commercialization;
- Group cohesion from regular monthly meetings: sharing experiences, savings mobilization, voices against vulnerability,
- Women empowerment: decisions on choice of crops, crop management, children's education, travels and recreation etc.
- Spill-over effects on non-borrowers
- Children's education: promise to be kept- private tutors, better schools.
- Housing condition: improved

- Access to Food: More and better quality food – fish and occasionally meat unheard before.

5.2 Identified Problems

- The survey data show that 10% of the borrowers are apparently ineligible to get this loan either due to bigger land size or already accessing loans from other sources.
- As sharecroppers left earlier lenders, especially village owners and mohajons, in search of a ‘soft’ option like this credit, some of the inter-linkages were cut-off due to apathy from lenders.
- In some areas, and in the face of weak monitoring, over enthusiasm in getting loans at subsidized 10% led to misuse of the credit money.
- Only 30% of borrowers could scale up indicating that there is mismatch between structure of opportunities and the structure of endowments.

5.3 Policy Suggestion

1. Bangladesh bank should continue this special credit program since the poorest of the villages get the opportunity of improving economic condition by utilizing the money.
2. The problem of targeting should duly be addressed through appropriate selection;
3. The loans may be extended to non-crop sector like livestock.

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Appendix: Financial Services and Rural Living

