ENHANCEMENT OF FARM INCOME AMONG THE MARGINAL FARMERS IN WEST BENGAL, INDIA: IMPORTANCE OF MICRO-CREDIT AND CO-OPERATIVE FARMING

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ABSTRACT

This paper, based on a field investigation in rural West Bengal, aims to identify possible ways which can enhance the farm income of marginal farmers. It is observed that the micro-credit system under a joint liability credit contract can play a dominant role during the time of disbursement of institutional farm credit, but the availability and size of this credit mainly depend on the operational holdings of the farm households. It is also observed that institutional credit, which is mainly provided through a micro-credit system, helps the beneficiary farmers to utilize their operational holdings optimally by enhancing their cropping intensity and or crop diversification. This creates a positive impact on their net farm income. It is also proved that the size of operational holdings creates a positive impact on the net farm income of the marginal farmer households at an increasing rate, which establishes the importance of cooperative farming through forming farmer's groups at the ground level.

Contribution/ Originality: The government of India has set a target of doubling farmers' incomes by 2022-23. West Bengal is a state of India where the dominance of marginal farm households is observed. This paper, has shown that micro-credit under a joint liability credit system operated through government organization and implementation of Cooperative farming can help marginal farmer households to enhance their net farm income.

1. INTRODUCTION

Agriculture always plays an important role in the Indian economy. In 2011-12, nearly 70% of the Indian population was either directly or indirectly dependent on agriculture for their livelihood. However, over time, the per-capita landholding of the Indian farm households is gradually declining and the dominance of small and marginal farmers is observed in major parts of India (Kundu & Das, 2019). National Sample Survey Organization (NSSO) Data (2011-12) on the consumption expenditure survey showed that more than 20% of the agricultural households' income was below the government declared poverty line. Niti Aayog of India has decided to enhance the income of the farmers and wants double it in 2022. Few policies relating to the doubling of farm income of the Indian farmer have been proposed. Chand (2017) pointed out that Indian agriculture is presently dominated by small and marginal farmers who are in disadvantageous positions in terms of the scale of operation during the time of production and it becomes

difficult for them to move towards multiple cropping. He suggested the importance of farmer production organization, which can organize the farmers under a certain institutional mechanism and also help them to remove the hindrance related to scale of operation. It was also pointed out that, due to the existence of poverty and the absence of acceptable collateral, it is also difficult for them to get access to credit from the organized credit sector. He did not, however, mention the possible way out of the disbursement of credit to those small and marginal farmers with the least transaction cost and at a comparatively low rate of interest. The justification behind the importance of farmer production organization to improve farm income among the majority of the small and marginal Indian farmers was also not established. Singh (2018) ignored this fact and placed greater emphasis on non-farm occupations and agro-industrialization to enhance the income of the farmers. No one has yet suggested how the farmers' income can be enhanced through intensification of the cropping system among all sections of the marginal farmers, which is an important way to enhance the farm income of marginal farmers purely from agricultural activity. In India, the dominance of small and marginal farmers is now observed to identify possible ways of enhancing farm income of those farmers. West Bengal, a state of India, is suitable for investigation. After the successful implementation of land reforms, and due to the law of inheritance, marginal and small farmers are observed in almost every part of West Bengal. Marginal farmers are generally identified as subsistence farmers as they mainly cultivate their operational holding for self-consumption and it is difficult for them to move towards multiple cropping.to improve their livelihood due to a lack of working capital. So when the government of India is giving importance to making the farm income double, it is required to identify the ways which can enhance the farm income of the marginal farmers of West Bengal as well that of India. This paper, based on a micro-level field investigation in West Bengal, will try to find a few policy prescriptions that can help Indian farmers enhance their farm income over time.

Kundu and Pubali (2022) have shown that marginal farmers of West Bengal can cultivate a maximum of three times in a reference year only under certain favorable situations like the availability of irrigation facilities, High Yielding Variety (HYV) seeds at a subsidized rate, purchasing capacity of chemical fertilizers and pesticides etc. However, the unavailability of working capital is an important constraint that often prevents the small and marginal farmers moving towards multiple cropping in the post rainy season. In almost all parts of West Bengal, paddy, cultivated in the rainy season is mainly used for self-consumption and the marketable surplus crop is almost zero. A positive amount of marketable surplus can be observed during the time of cultivation in the post rainy season where, apart from paddy, a variety of types of horticultural products are cultivated. Those products are sold to local traders. Hence enhancement of the minimum support price of the produced paddy is not sufficient enough to enhance the farm income of the marginal farmers of West Bengal. To improve income from agriculture, it is necessary to enhance cropping intensity and crop diversification among the marginal farmers. Kundu and Pubali (2022) using district-level data from West Bengal showed that minor irrigation work, improved condition of roads (most of which have improved in West Bengal due to proper implementation of Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS) work for asset creation) and average agricultural wage rate can enhance crop diversification. All the considered variables are macro specific variables. Haque and Goyal (2021) showed that farmers in the Eastern region of India are mainly small and marginal farmers and they have little access to institutional credit and depend largely on non-institutional credit at a very high rates of interest. They mentioned the importance of institutional credit for enhancing farm income among the marginal farmers by a micro-credit system operated through the formation of self-help groups. However, they did not investigate whether this system could help the marginal farmers to enhance their farm income by moving towards multiple cropping. That issue will be investigated here. In addition, it is necessary to investigate the importance of cooperative farming in West Bengal agriculture to enhance the farm income of the marginal farmers. This investigation can only be done based on farm household-specific micro-level data, which can only be obtained by conducting field investigation.

Marginal farmers need to secure low-cost credit from the Government and or banks so that they can avoid the clutches of professional money lenders. The availability, accessibility, and time factor during the time of securing

institutional credit can ensure sustainability and profit in the farming process. Microfinance and institutional loans from other sources in India are utilized not only for agricultural purposes but also benefit trading, processing and transportation, and other income-generating activities that in turn facilitate agricultural production as a whole (Binswanger & Khandker, 1995). The National Bank for Agriculture and Rural Development (NBARD) is an initiative by the government of India that intends to provide rural financial assistance to small and marginal farmers. The financial responsibility of the Reserve Bank of India in correspondence with the State Cooperative Banks and the Regional Rural Banks was taken over by NABARD. It is still a challenge for the members of the small-scale farming sector of India to access credit. In 2011-12 in the state of West Bengal in India, around 60% of the rural population is engaged in agricultural activities for a living. Agriculture has contributed to the growth rate of the State's gross domestic product (SGDP)[1]. The productivity of land is contingent upon investment in agriculture. So, among the small and marginal farmers[2], it is a necessity to improve the availability of credit which can be utilized as working capital during the time of agricultural production. A dual economy comprises the parallel existence of formal and informal financial systems functioning in the rural finance market of any underdeveloped economy, including India. In the extensive rural financial network of India, moneylenders, traders, vendors, relatives, and friends are considered informal financial systems that can offer credit instantly and most of the time without requiring proper collateral. Recently, the government of India has taken initiatives to enhance the supply of credit among the small, as well as marginal farmers, through NABARD, Commercial Bank, Co-operative banks, Kishan Credit Cards and micro finance system. Microcredit is generally more expensive than traditional institutional credit because of the high transaction cost that is required to provide accessibility and other services during the time of disbursement of credit. Due to the existence of a joint liability credit contract, the loans are generally disbursed more quickly and the repayment rate is also very high. Due to peer monitoring among the group members, credit can be disbursed without collateral. The regularity of the repayment of a loan through instalments is a major cause behind the very low presence of defaulters. Farm loans are required to meet two types of production needs: the need for working capital, and the need for fixed capital. In addition, there are strong indirect effects of loans. Loans can indirectly affect long-term productivity through investment in education, especially skill acquisition, better nutrition and access to medical facilities. However, the present study will exclusively focus on the direct productive effects of farm loans. It intends to undertake a primary survey to explore three interrelated issues: (i) it will try to identify possible factors based on which the farm households can get formal credit (an investigation of the role of micro-credit as agricultural credit is required); (ii) whether formal agricultural credit can help the farm households to enhance their earnings through multiple cropping and optimum utilization of operational holdings; and (iii) to identify possible policies that can enhance net farm income of the marginal farmers of West Bengal.

2. EXISTING LITERATURE RELATED TO THE IMPORTANCE OF FORMAL CREDIT FOR ENHANCEMENT OF EARNINGS FROM AGRICULTURAL PRODUCTION

Several studies have estimated the benefits of formal credit for the enhancement of agricultural production in developing countries. Binswanger and Khandker (1995) found that the effect of formal rural credit on output and employment is not very large even though a major part of the credit is used to purchase fertilizer, machinery and livestock. Mishra and Pattanaik (2005) studied the importance of institutional finance on farm income and productivity in Orissa. It was also shown that the small and large farmers had to borrow about 75 to 81 per cent of the total finance as working capital for agricultural production. Further, it is evident that out of total borrowings, crop loans constituted about 68 per cent as against term loans 32per cent. Multiple factors are involved in determining

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[1]Agriculture contributed 24% to the State gross domestic product in 2019-20.

[2]Marginal farmers are those farmers who own agricultural land up to 2.5 acres, and the small farmers own agricultural land up to 3 acres. In West Bengal, the size of the land holding is generally reported in terms of bigha where 1 bigha = 0.33 acre. So, in West Bengal, a farmer will be marginal if he or she owns 7.57 bighas of land.

the accessibility of credit among the small and marginal farmers. Those are the age of the head of the household, gender, literacy, size of land holding and informal tenancy contracts (Oboh & Ekpebu, 2011). In another study, Golait (2007) analyzed the issues in agricultural credit in India. The analysis revealed that the credit delivery to the agriculture sector continues to be inadequate. It appeared that the banking system is still hesitant on various grounds to disburse credit to small and marginal farmers. Amjad and Hasnu (2007) found that tenure status, family labour, literacy status, off-farm income, the value of non-fixed assets and infrastructure quality were the most important variables in determining access to formal credit. They also found that the total operated area, family labour, literacy status and off-farm income are significantly related to the determination of credit status of smallholder farmers from informal sources. Land tenure status was found to be the single most important variable determining credit status. Abdalla and Ebaidalla (2012) noted that agricultural finance is a decisive factor input in farming operations as it helps poor farmers to maintain their consumption of necessities, adopt advanced technology and raise their incomes. Narayanana (2016) investigated the relationship between formal agricultural credit and agricultural output based on secondary data. She considered the periods of 1995-96 to 2011-12. In her state-level analysis of India, it was observed that the availability of agricultural credit helped the farmers to purchase different types of agricultural inputs, but that is not very effective for production. She also pointed out that most of the farmers who have taken agricultural credit were either small or marginal. However, she did not properly address how the credit can be supplied to them with the lowest transaction cost. No study has been done to identify the ways in the farm income of the small and marginal farm households of India can be enhanced. If the availability of institutional credit is necessary as working capital to enhance farm income to intensify cropping, then it is also required to find a suitable way of making that available to all sections of marginal farmers of West Bengal.

3. THE RESEARCH OBJECTIVES

Kundu and Pubali (2022) identified that a large section of the marginal farmer households in West Bengal are economically poor and vulnerable. Against this background, it is necessary to identify specific policies that can enhance the farm income of the marginal farm households. Farm income purely from agricultural activity can be increased if a farmer can enhance the cropping intensity and crop diversification in his or her operational holding. For a marginal farmer, that can be done if credit related to agriculture is made available during the time of need and without much delay and at a comparatively low rate of interest and where the loan can be repaid in instalments. A microcredit delivery system can fulfil those requirements. It is also necessary to investigate whether the small size of operational holding creates a hindrance to the enhancement of farm income of the marginal farmer households and, if it is true, it is also necessary to identify a policy that can minimize that hindrance.

Hence the following research problem will be addressed:

1. To identify the socio-economic factors of the farm households that determine the availability and size of institutional credit required only for agricultural production. The importance of micro-credit through self-help groups under the group lending system will also be investigated.

2. Next, it will be investigated whether the size of institutional credit plays a positive role in increasing the gross revenue of the beneficiaries from agricultural production by helping them to enhance cropping intensity and crop diversification in the post rainy season. It is also necessary to investigate the importance of Self Help Group (SHG) to supply institutional credit to the marginal farmers. Also, it is necessary to identify other possible factors that can help the marginal farmers to intensify their cropping on their operational holdings. Here per bigha earnings of a farm household in the entire reference year purely from agricultural purposes is considered as a proxy of cropping intensity of that farm household.

3. Ultimately, it is necessary to identify the possible ways in which the net farm income of the marginal farmer households of West Bengal can be enhanced.

The entire investigation is based on primary data.

4. AREA OF STUDY AND SOURCES OF DATA

West Bengal has 8% of the total population of India (Census of India, 2011). According to the report of the Government of West Bengal (Economic Review, 2017-18) here, agriculture plays an important role in the overall state economy. There are 71.23 lakh farmer households, out of which 96% are small and marginal farmers where the average size of landholding is 0.77 hectare. In West Bengal, the net cropped area is 52.85 lakh hectares and the overall cropping intensity is 184%. It ranks first in paddy and vegetable products in India, and enjoys surplus production of rice, horticultural products, potatoes etc. The productivity of crops is not uniform across all the districts of West Bengal. Hooghly, West Medinipur, Nadia, North 24 Parganas and South 24 Parganas are agriculturally developed districts in West Bengal where productivity is very high compared to other districts (Kundu & Goswamy, 2019). In this micro-level study, the South 24 district of West Bengal is considered here. Marginal farmers dominate this district. Here, the farmers either hold land which they cultivate and or leased some land for cultivation. Paddy is the principal crop in the district. Vegetables are also grown. The district has 30 blocks. In our micro-level study, we have randomly chosen the Sonarpur block. In the Sonarpur block, there are 65-gram panchayats. We have randomly chosen two-gram panchayats for our investigation[3], which are Dihi and Gangajara. From the local panchayat, we obtained information about the landholders and cultivators of those two villages. The research involved both qualitative and quantitative processes in data collection and data analysis. A structured well-designed questionnaire was prepared based on two pilot surveys in the study area to collect the primary data from the marginal farmers. Here, the information was collected directly from the respondent who was not only the head of the family (most of the times, male) but also the main farmer of the sample farm household. The sample size of the farm household is 234 farmers. They were chosen randomly[4]. Out of the total of 234 sample farm households, 61 farm households were landowners who, in our entire reference period, only cultivated land that he or she owned, and 104 farm households that were owner and tenant farmers who have taken land on lease for one year mainly under a fixed rent system for the entire reference period. The remaining 69 farm households were landless, but were involved in agricultural production purely on leased-in land. All sample farm households were marginal farm households. During the time of field investigation, it was reported that the area is suitable for multiple cropping, but the main problem the farmers faced in intensifying their cropping was financing because of high input costs. Availability of institutional credit is difficult for them as most of them do not have any acceptable collateral to have credit from formal sources. Kundu and Pubali (2022) had shown that a good percentage of marginal farmers in that area had to lease out their land. Lack of working capital and motivation among the younger household members to continue agriculture as their livelihood are the major reasons behind leaving farming as their livelihood. To arrange working capital to intensify their agricultural production in the post rainy season, they have to depend on informal sources for borrowing including from comparatively affluent relatives. A good section of the farmers can avail themselves of credit from microfinance institutions run by Regional Rural Bank in those localities in which the rate on interest is less than the informal credit market and credit can be obtained without collateral and can be repaid in instalments.

Initially, the number of farm households in the sample that have taken credit purely for agricultural production from institutional and or non-institutional sources in the entire reference period were identified. Next, it will be necessary to identify the purpose of taking credit i.e., whether it was taken only for agricultural production purposes or for non-agricultural purposes? In this investigation, the amount of credit taken purely for agricultural purposes is ONLY considered as the size of institutional farm credit.

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[3] The villages are 25 kilometers away from Kolkata, the state capital of West Bengal, India. Due to limitation of financial resources, the field survey was done in only two villages where agro-climatic conditions, local infrastructural factors and socio-economic conditions of the local residents are identical. But that study area can easily be selected as a representative of West Bengal in terms of agricultural operations.

[4] In the study area all the farmers are marginal in nature. So the area is suitable to represent the characteristic of the farmers of West Bengal.

The distribution of three types of farmers who have taken credit from different institutional and or and non-institutional sources is given in Table 1.

Table 1. Distribution of the farm households who have taken credit from institutional or (and) non-institutional sources (in numbers).

Type of Farm Households	Institutional sources including from SHG operated by RRB		Non-institutional Sources	
	Agricultural Purposes	Non-Agricultural Purposes	Agricultural Purposes	Non-Agricultural Purposes
The farm households who operate only on his/her owned land	47	13	4	9
The farm households who operate owned land and leased-in land	71	14	43	17
The farm households who are landless and operate only on leased land	28	25	10	28

Table 1shows that all three types of sample marginal farm households have taken credit for agricultural purposes from institutional sources in our entire reference period[5]. Here, microcredit disbursed through SHG is considered institutional credit because, in our study region, the micro-finance system is operated through the Regional Rural Bank. This micro-credit has played a leading role during the time of getting institutional credit for agricultural purposes. It is observed from Table 1 that the landless farm households are also getting access to institutional credit for agricultural purposes. This happens due to the presence of a micro-finance system in the study region where micro-credit can be disbursed without proper collateral. Some marginal farm households have also got institutional credit through the Kishan Credit Card (KCC). A certain number of sample households (24% of the total sample) have also taken agricultural credit from non-institutional sources. The respondents who had an association with SHGs have got credit of up to Rs 15,000. It was also observed that 15 farmers cultivate their land only and 13 farmers operated both owned land as well as leased-in land had got credit through KCC. A small section of our sample respondents have taken credit with the help of KCC, and the majority of the farmer households in the study area did not have any access to KCC[6]. The farm households could draw credit from commercial banks within the reference period. The complex documentation process during the time of claiming loans from the commercial banks worried the marginal farmers who, most of the time, required credit within a very short space of time. They also usually do not prefer to approach banks directly due to the requirement of a guarantor and a long time being taken during to disburse the credit. Against this background, no sample farm households had taken any credit from banks purely for agricultural purposes. Next, we move to Table 2, which shows the distribution of the size of agricultural credit among the sample farm households.

It is observed that most of the sample marginal farmers have taken micro-loans either from institutional or non-institutional sources. The micro-loan taken from institutional sources here is used only as working capital during the time of agricultural production and no fixed capital was formed among the sample farm households in the entire reference period by utilizing institutional credit[7]. No incidence of 'credit rationing' was reported among all sample farm borrowers during the time of borrowing from institutional sources.

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[5] The field survey was done between May – June, 2019. So here reference period is the previous one year i.e., between June 2018 to May 2019.

[6] Credit through KCC is available for a period of up to 3 years and repayment can be made once the harvest season is over.

[7] It was reported during field investigation that the drawn credit both from the formal sector and (or) informal sector was used to purchase HYV seeds, hire hand tractors, purchasing water during the time of irrigation in the post rainy season (whose cost is heavy due to high diesel price) and to purchase chemical fertilizers. As the cost of different parts of cultivation is high and all the sample farm households are marginal, there exists little chance for them to generate fixed capital after borrowing from institutional sources purely for agricultural purposes. Hence, the entire amount of drawn credit was used as working capital during the time of agricultural production.

Table 2. Distribution of the size of credit taken by our sample farm households both from institutional and non-institutional sources (In numbers).

Size of Credit	The farm households who operate owned land only		The Farm households who operate both owned land and leased-in land		The Farm households who only cultivate leased-in land	
	Agricultural Credit	Non-agricultural Credit	Agricultural Credit	Non-agricultural credit	Agricultural Credit	Non-agricultural credit
Less than Rs.1000	-	-	-	-	-	18
Rs.1001 –5000	9	8	7	18	20	12
Rs.5001– 10000	21	8	49	10	4	13
Rs. 10001-15000	21	6	58	3	14	10
Total	51	22	114	21	38	53

5. POSSIBLE FACTORS THAT CAN HELP THE FARM HOUSEHOLDS TO BORROW FROM INSTITUTIONAL SOURCES FOR AGRICULTURAL PURPOSES

It is necessary to identify the factors that can help the marginal farmers to access agricultural credit from institutional sources. The possible factors are set out below with theoretical justifications behind choosing them.

Age of the farmer (Age): This explains the age of the main farmer of the sample farm household. Winter-Nelson and Temu (2005) showed that age hurts access to formal credit. The main farmer of a sample household has to work as a 'permanent' worker in his field whose main job is to supervise the entire production process and monitor the hired labour in the field (Kundu, 2006). Sometimes he or she has to engage members of the family, including children, to work as a family labour force in the field in different stages of agricultural production. It is expected that farmers of older age have better connections with credit sources, which could help him or her get more information about different sources of institutional credit. Level of education (Education) -Education is another important factor that can influence farmers' access to institutional credit. Li, Gan, and Hu (2011) showed that a farmer with at least a secondary level of education has a greater probability of accessing credit from institutional sources than an uneducated farmer. Awareness of credit opportunities and knowledge of the process of documentation is observed more among educated farmers. An educated farmer is preferred by the institutional lenders due to low 'transaction cost' during the time of disbursement of credit. Here 'education' is measured in terms of the years of education the respondent spent in school. Operational holdings (Opholding) – It indicates the total size of cultivatable land operated by sample farm households for agricultural purposes. It is measured in local units 'bighas'. The operational holding is the total area of owned land and leased-in land and for landless tenants, it is only the area of leased-in land[8]. Instead of owned land, 'operational holding' is considered as a choice variable because it was observed during the field survey that a certain number of landless farm households who cultivate only on lease-in land had also got agricultural credit through the micro-finance system. It is used as collateral during the time of disbursement of credit from farming activities.

Other sources of Income (Othnfincome): In the present study area, members of the farm households were engaged in various non-farm activities like working in MGNREGA (Mahatma Gandhi National Rural Employment Guarantee Act), working as construction workers and or different private non-farm activities or in any shop in nearby urban areas etc. Higher earnings from non-farm activities may improve the repayment capability of the borrowers, and it is expected that their probability of default will be less. A rural community is a closely-knit community where anyone can easily identify whether a borrower is a risky borrower or a safe borrower. A household with better non-farm income can be identified as a safe borrower whose possibility of default is lower. Kundu and Das (2021) proved that livelihood among the marginal farmer households is better if we observe the presence of diversified occupations besides farming among the adult members of the household. So, it is necessary to investigate whether or not higher

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[8]In our study region, the farm households cultivate paddy in his/her entire operational holding in the rainy season. This is common for all sample farm households because the produced rice is mainly used for self-consumption and the marketable surplus of it is almost zero.

non-farm earnings can help the farmers to get access to credit from formal sources? Self Help Group Member (SHG_i): Haque and Goyal (2021) showed that farmers in the Eastern region of India are generally small and marginal and have to depend largely on non-institutional sources of credit, which keeps them in a debt trap. The predominance of marginal farmers in that region including in West Bengal is a major cause of poor access to institutional credit for the farmers. They gave the importance of the microfinance programme through a Self-Help Group that can enhance their accessibility to institutional credit. In our study area, Self Help Groups are operating under the Regional Rural Bank. It is observed that at least one household member of a major section of our sample of marginal farmer households is a member of an SHG. Here, the members can take credit through a group lending system where 'peer monitoring' among the group members is highly present, but 'positive assortative matching' is not very prominent among the group members and loans are mainly taken for agricultural purposes in the entire reference period. As the SHGs in the study area are attached through the Regional Rural Bank, the credit disbursed through an SHG is here treated as institutional credit. SHG_i indicates whether any member of the ith farm household, mainly female, is a member of local the SHG or not. It is here treated as a dummy variable in nature. It has taken value 1 if any female member of the ith farm household is a member of an SHG, otherwise it takes value 0. Whether or not membership of an SHG enhanced the possibility of the farm households getting institutional credit for agricultural purposes was investigated.[9]

The summary statistics of all the variables (both dependent and independent) are given in Appendix 1.

To identify the actual factors that determine access to formal credit among farm households in our survey area, following Tobit regression model[10] is her applied.

The proposed Tobit model can be explained as:

$$FCredit_i = \alpha_0 + \alpha_1 Opholding_i + \alpha_2 Opholding^2 + \alpha_3 Age_i + \alpha_4 Othnfincome_i + \alpha_5 Education_i + \alpha_6 SHG_i + \varepsilon_i \quad (1)$$

Here, FCredit indicates the amount of institutional credit only for agricultural purposes received by the ith farm household in the reference period[11]. It is known that dairy, poultry, and fishing are also considered agricultural activities. However, only pure farming activity is considered during the time of considering 'FCredit' here.

The result of the Tobit regression is presented in Table 3[12]. The Econometric model is presented in Equation 1.

Based on the results shown in Table 3, it is clear that the availability and amount of institutional credit for agricultural purposes among the farm households in the study area is very much dependent on the operational holding of the farm households, and the possibility of getting institutional credit for agricultural purposes will increase, but at a decreasing rate, with the size of operational holding. Other factors considered in the above model 'SHG' plays an important role in accessing institutional credit for agriculture.

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[9] Another economic factor that can play as a role of collateral during the time of disbursement of formal credit is the value of the asset except operational holding. The value of the ornaments (mainly of gold and silver) is a vital component of it. But the sample farm households were not willing to disclose that. Hence that variable is dropped in the final questionnaire and that cannot be considered in Equation 1. It is also observed that during the time of disbursement of formal credit purely for agricultural purposes, types of sample marginal farm households as narrated in Table 1 are not a decision-making factor. Hence, they are also ignored in Equation 1.

[10] In a Probit model, the variable of interest is unobserved and we just observe the Dummy variable either 1 or 0. In contract (Splett, Barry, Dixon, & Ellinger, 1994) devised the Tobit model or censored normal regression model, for situations in which the outcome variable is observed for values greater than '0' but not observed for values of 0 or less. Here the outcome variable is censored or takes the value 0 when the farm household could not get formal credit in that specific period.

[11]A good number of sample farm households did not get any formal credit. If Credit was taken then it was taken only in cash and based on their self-declaration and it was only used as working capital during the time of agricultural production.

[12] Social factors like caste, religion or gender of the household head did not play any significant role to have institutional credit for agricultural purposes. It was statistically identified before constructing Equation 1. Actually, in West Bengal, even now the above-mentioned social factors have not become determinant during the time of disbursement of farm credit from institutional or non-institutional sources.

Table 3. Here the dependent variable is F credit.

Name of the independent variables	Value of the Co-efficient	Standard Error
Operational Holding (Opholding)	33333.8***	6317.374
Opholding²	–8.102*	4.76
Age	–251.98	188.49
Other Non-farm Income (Othnfincome)	0.3362	0.2630
Education	524.377	914.0825
SHG	2695.672**	1370.351
Constant	14634.09*	8172.193

Note: LR χ^2 = 31.08 *** and Pseudo R² = 0.311, ***=> significant at 1% and **=> Significant at 5% level and * => significant at 10% level.

Generally, during the time of disbursement of formal credit for agricultural purposes, owned land is used as collateral. However, the operational holding of the farm households is treated as the main decision-making factor during the time of disbursement of credit because, among sample farm households, there exists a set of farmers who are landless but have received micro-credit through the microfinance system due to the size of their operational holdings, which is positive. The above result shows that the possibility of getting institutional credit from the agricultural sector will increase in the study area if any female member of the sample farm household is a member of an SHG. This proves that Self Help Group membership can help the marginal farmer households (based on operational holdings even with non-ownership of any cultivatable land) to obtain institutional credit for agricultural purposes.

6. DOES FARM CREDIT PLAY AN IMPORTANT ROLE IN HELPING THE MARGINAL FARMERS TO INCREASE THEIR EARNINGS FROM AGRICULTURE THROUGH ENHANCING CROPPING INTENSITY AND OR CROP DIVERSIFICATION?

To enhance the livelihood of the marginal farmer households in West Bengal, it is necessary to improve their earnings from agricultural activities, which can be done if the farmer can enhance their cropping intensity as well as crop diversification through moving towards multiple cropping. In the survey area, it was observed that after taking credit, a good number of sample farm households had moved towards multiple cropping[13]. Most of the time, this microcredit was used as working capital during the time of cultivation in the post rainy season. It was used to purchase seeds, water for irrigation, fertilizer, etc. whose costs are high from the point of view of the marginal farmers. Apart from credit (both institutional and non-institutional), it is also necessary to investigate what are the other possible factors that can encourage the farmers to move towards multiple cropping to increase their farm income.

It was observed that the cultivation of paddy is common in the rainy season and the major part of the produced crop is used for self-consumption and that the marketable surplus crop is very little. Each respondent farmer was asked about the amount of their produced paddy used for self-consumption. That amount was then converted into earnings based on the procurement price of paddy offered by the state government. The second cultivation is also paddy and depends very much on irrigation. In the study area, a micro-irrigation facility was developed with the help of an assets creation programme under MGNREGS. This encouraged the farmers to go for paddy cultivation for the second time in the post rainy season for earning purposes. However, they sometimes faced constraints during the time of purchasing water due to a lack of working capital. So credit is required for them to remove this financial constraint. The total market value of the produced crop is here considered as earnings from farming activities in that season. Here, the major portion of the produced crop has become a marketable surplus and very little was retained for self-consumption. A good number of our sample farmers also cultivated horticultural products in February and March during the survey period. Here, the major portion of the produced crop was sold in the market. Total earnings from this horticultural product were the sum of the total earnings from the produced crops at different times in the

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[13] It is observed that out of 110 farm households who took credit from institutional sources, 85 have reported that they utilized the credit for agricultural production in the post rainy season.

entire reference period. During the time of calculation of 'Perbighaearnings', initially per bigha earnings of each crop cultivated and then adding per bigha earnings of all produced crops, one can get total the per bigha earnings of a particular farmer in the entire reference period[14]. To identify the factors that can motivate the marginal farmers to move towards multiple cropping, the following model was considered.

$$\text{Perbighaearnings}_i = \alpha_0 + \alpha_1 \text{FCredit}_i + \alpha_2 \text{INFCredit}_i + \alpha_3 \text{Age}_i + \alpha_4 \text{TFlf}_i + \alpha_5 \text{Othnfincome}_i + \alpha_5 \text{Education}_i + u_i \tag{2}$$

$$\text{FCredit}_i = \beta_0 + \beta_1 \text{SHG}_i + \upsilon_i \tag{2A}$$

Among the explanatory variables, the amount of institutional credit is very much dependent on the size of operational holding. Here, the dependent variable in the above model is 'Perbighaearnings' i.e., total earnings per bigha purely from agricultural production. So that variable cannot be considered. It is also observed from Table 3 that 'FCredit$_i$' is very much influenced by membership of an SHG. So it is required to apply 2SLS here instead of simple OLS[15]. The Econometric model is presented through Equation 2 and Equation 2A. It is obvious that only membership of an SHG cannot have a direct influence on 'Perbighaearnings$_i$, but it influences FCredit.

In Equation 2, the explanatory variables like 'FCredit[16]'. 'Age', 'Othnfincome' and 'Education' have already been explained. Here, 'INFCredit' is the total amount of agricultural credit taken from non-institutional sources only for agricultural production. 'TFlf' is the total family labour force of a sample household. As the cost of hired labour in our study area is quite high (Rs.350 per day), the marginal farmer households think that agricultural production can be economically viable for them if more family members are involved in the production process. It is also observed that the opportunity cost of the family labour force is here 'zero'. The result of Equation 2 is given in Table 4.

Table 4. Dependent variable: Perbighaearnings.

Independent variables	Value of the Co-efficient	Standard Error
Fcredit	6.1471***	0.091
INFCredit	3.2025***	0.0935
Education	61.0706**	25.674
Age	47.931	82.166
TFlf	2381.652*	550.862
Othnfincome	0.1676***	0.0126
Constant	1804.62***	402.55

Note: $R^2 = 0.3821$, ***=> significant at 1% level, **=> significant at 5% level and *=> significant at 1% level.

Table 4 shows that the amount of formal credit plays a positive role in increasing the per bigha earnings of the marginal farmer households of West Bengal. It is also proved that the availability of family labour force during the time of agricultural production, the education level of the farmers, amount of non-institutional credit taken for

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[14]A farmer in the survey area had taken land on lease for the entire season. All the sample farmers are marginal and their size of owned land, as well as leased-in-land is calculated in terms of 'bigha'. So here the calculation is done after considering 'bigha' as the unit of measurement of operational holding. The total revenue earned by a farm household in the entire reference period is used as a proxy of multiple cropping or maximum utilization of operational holding for agricultural production of a farm household. If a sample farmer goes for multiple cropping and cultivates his entire operational holding thrice then it is expected that his earnings from agricultural output will be higher. Incidentally, no natural calamities happened in our survey region in our entire reference period which can affect agricultural production as well as earnings of the borrower farmers.

[15] Endogeneity occurs due to the presence of omitted variables. There are several factors which are accommodated in u$_i$ like availability of irrigation facility, seeds, fertilizers which can influence the explained variable but may be correlated with Fcredit. So here 'SHG' is considered as an instrument of 'Fcredit' because that is uncorrelated with u$_i$ and have no direct influence on 'Perbighaearnings'. Durbin-Wu-Hausman test also supports the presence of such endogeneity in this model. Hence 2SLS using Instrumental Variable' is here applied in place of OLS.

[16] Generally, all the agricultural credits are not used as working capital and some part of it is used for fixed capital formation. But here all the sample farm households are marginal and average size of operational holdings is only 3.19 bighas and the average size of agricultural credit taken from institutional sources is only around Rs.7000. The cost of cultivation in the post rainy season is also very high. Hence, the entire credit is used as working capital during the time of agricultural production.

agriculture and other sources of income of the farm households also play a positive role in increasing the per bigha earnings from agricultural production through enhancing cropping intensity.

The availability of the family labour force here plays the most influential role. It is also observed that the income of the sample farm households from the non-farm sector also plays a positive role in increasing their per bigha earnings purely from agriculture. A certain fraction of the income from different non-farm sources was used as his working capital in farm production, particularly in the post rainy season. It is also observed from Table 4 that the influence of non-institutional credit on the increase in per bigha earnings is less than the institutional credit. It is also proved that membership of the female member of an SHG helps the farm households to get access to institutional credit for agriculture.

7. WHAT WILL HAPPEN TO THE NET FARM INCOME?

Better earnings do not indicate better profitability of a farmer from agricultural occupation. It is observed that both institutional and non-institutional credit for the agricultural sector plays a positive role in increasing per bigha earnings of the marginal farmer households. However, the cost of credit and different inputs required for cultivating different crops are high. The borrowers from an SHG have to pay interest of 2% per month. Sometimes, the interest rate charged against non-institutional credit is Rs.30% per annum. This type of incidence was very small in this investigation. The farmers have to bear operational costs such as the cost of fertilizers, hired labour, pesticides, water for irrigation, etc. In the study area, it was also observed that a section of farm households did not cultivate a third time on his entire operational holding due to the high operational costs of cultivation, mainly of horticultural products.

It is also necessary to investigate the ways that can play a positive role to increase the net farm income of the marginal farm households. To do that it is initially required to calculate separately the amount of profit earned by each farm household from each cultivation, and then taking the sum total of all one can have total profit earned by a farm household only from agricultural activity in the entire reference period.

During the time of measuring farm income or profit in any particular season, it is must be remembered that a substantial part of the product (mainly paddy cultivated in the rainy season) is not marketed and some inputs used for agricultural production did not have any market value. If we look at the cost of the cultivation part, it is required to consider both paid-out costs and catch all costs. The paid-out costs are the operational cost and catch all costs including operational cost, cost of the family labour force and cost of loan repayment. The gross value of output less paid-out cost is designated as farm business income and after subtracting the catch-all cost from the gross value of output (measured in terms of rupees), one can get the actual net farm income of the farm household. It is necessary to calculate the operational cost (which includes, the cost of hired labour, seeds, pesticides, fertilizer, irrigation and other ingredients) of a farmer in an agricultural season. As a sizable number of farmers in our sample have taken land on lease for cultivation, the rent (here fixed) is also an important component of cost for those farmers. It came out from the field survey that a sizable number of farmers had taken land on lease under the fixed rent system, but the rent differs from crop to crop. The rental values varied from Rs1500/bigha for paddy, Rs.1000/bigha for wheat, to Rs.600/bigha for vegetables. The rent for kind payment for the cultivation of paddy was 0.40 kg/bigha.

The value of yield in monetary terms is measured as the product of the amount of production in kilograms and per Kg market price of that crop. To calculate the value of paddy used for self-consumption, it is necessary to multiply the amount of paddy used for self-consumption by the procurement price of rice in that season. To get the gross profit level from agricultural activity in any particular crop (GP_1), it is necessary to subtract the total cost of production including payment of rent from the total monetary value of the produced crop. If the farmer has done multiple cropping, then it is necessary to calculate $\sum_i^3 GP_i$ and then $TP_i = \sum_{i=1}^3 GP_i - L(1 + i)$. Here TP_i is the aggregate net farm income earned by an ith farmer in the entire reference period where $L(1+i)$ is the total payment of loan only taken for agricultural purposes. The opportunity cost of the family labour force is zero. However, in our sample there are farm households who took credit both from institutional sources and non-institutional sources specifically for

agricultural production. In those situations, the aggregate net farm income of the ith farm household in the entire reference period was calculated as $TP_i = \sum_{i=1}^{3} GP_i - L(1+i) - NIL$, (where NIL indicates the size of non-institutional credit taken only for agricultural purposes but was interest-free) or $TP_i = \sum_{i=1}^{3} GP_i - NIL$, respectively. Here during the time of calculation of farm income of the sample farmers, only credit taken solely for agricultural purposes was considered and there was a total absence of credit rationing. For the ith farm household who have done single or double cropping in the entire reference period, $i = 1$ or 2.

To identify possible factors that can help the farmers to earn net farm income from agricultural activities, the following 2SLS Model is considered: Before forming the model, it is necessary to explain the theoretical justifications behind choosing the explanatory variables which have not yet been explained.

AvOpholding: It represents the average size of operational holding of a farmer in the entire reference year. It has already been mentioned that a sizable number of sample farm households had taken land on lease for cultivation. So, here operational holdings should be the aggregate of owned land and leased-in the land. That is for the entire reference period. It was also observed that none those farmers cultivated their entire operational holding. Suppose the initial operational holding of a representative farm household is 3 bighas, but in the remaining two seasons he cultivated only 2 bighas and 1.5 bighas respectively. Then his average size of operational holding for that farm household was (3+2+1.5)/3 bighas or 2.16 bighas. It came out from our primary survey that few landless households had also taken land in a lease for cultivation. For those farm households, the initial operational holding was just the total size of land taken in lease. Based on the operational holding of that particular farmer in the remaining two seasons it is necessary to calculate the average size of his operational holding (in bighas). It is expected that a higher size of the average operation holding of a marginal farmer household can help him to enjoy positive economies of scale during the time of production process, which may also help him to generate better net farm income from agricultural activities[17].

AGFormal: It is treated as a dummy variable and has taken a value of 1 if the sample farmer has taken institutional credit in the entire reference period only for agricultural purposes, otherwise it will take a value of 0.

AGINFormal => It is also treated as a dummy variable and has taken a value of 1 if the sample farm household has taken non-institutional credit in the entire reference period only for agricultural purposes; otherwise, its value is 0. The last two variables are required to investigate whether institutional credit or non-institutional credit purely taken for agricultural purposes can help the farm households to increase their farm income[18]. In our sample, only 6 farm households took credit both from institutional and non-institutional sources. However, in all situations, the amount of credit from institutional sources is larger than the amount from non-institutional sources. In these situations, the situation of non-institutional borrowing is ignored and only the borrowing from institutional sources is considered.

The reasons behind considering the 'Age' of the respondent as another explanatory variable have already been discussed. So, the following two models are now considered where $NetFarmIncome_i$ indicates the net farm income of a marginal farmer household purely from agricultural cultivation in the entire reference period. It has already been proved that $AvOpholding_i$ influences and $FCredit_i$ depend on SHG_i. So Equation 3 and Equation 3A can be framed in the following way.

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[17] It is required to mention that total operational holding of a farm household can play a positive role during the time of getting institutional credit but net farm income may be very much dependent on the average size of operational holding of a sample farm household.

[18] Amount of credit cannot be considered because those are considered during the time of calculation of net farm income.

$$\text{NetFarmIncome}_i$$
$$= \alpha_0 + \alpha_1 \text{Education}_i + \alpha_2 \text{AvOpholding}_i + \alpha_3 \text{AvOpholding}_i^2 + \alpha_4 \text{Age}_i + \alpha_5 \text{TFlabforce}_i$$
$$+ \alpha_6 \text{Othnfincome}_i + u_i \qquad (3)$$
$$\text{AvOpholding}_i = \beta_0 + \beta_1 \text{SHG}_i + \upsilon_i \qquad (3A)$$

Similarly due to the existence of multicollinearity between 'AvOpholding', 'AGformal' and 'AGINFormal' we have to consider another model, which is framed in Equation 4 and Equation 4A respectively.

$$\text{NetFarmIncome}_i$$
$$= \theta_0 + \theta_1 \text{Education}_i + \theta_2 \text{Age}_i + \theta_3 \text{TFlabforce}_i + \theta_4 \text{Othnfincome}_i + \theta_5 \text{AGFormal}_i$$
$$+ \theta_6 \text{AGINFormal}_i + u_i \qquad (4)$$
$$\text{AGFormal}_i = \rho_0 + \rho_1 \text{SHG}_i + \upsilon_i \qquad (4A)$$

Here also 2SLS is applied where availability of institutional credit (which is treated here as a dummy in nature) is very much dependent on SHG membership of any female member of the sample marginal farmer household. The Durbin-Wu-Hausman test also supports the presence of an endogeneity problem in both the models and recommended the application of the instrumental variable method in the above two models.

The results of Equation 3 and Equation 4 are given in Table 5.

Table 5. The dependent variable is Net FarmIncome.

Explanatory Variables	Value of the Co-efficient/ Standard Error and Level of significance	Value of the Co-efficient/Standard Error and Level of significance
Education	340.63 (296.38)	296.38 (186.31)
Average Operational holding (AvOpholding)	1020.392*** (156.93)	
AvOpholding²	1.94.24* (0.084)	
Age	-37.91 (35.687)	-45.61 (35.21)
TFlabour	339.0584***(61.115)	382.06***(54.61)
Other Sources of Family Income (Othnfincome)	0.0157**(0.007)	0.312**(0.12)
AGFormal		745.886***(83.23)
AGINFormal		407.52**(105.87)
Constant	196.42***	145.62**
R²	0.66	0.73

Note: R² = .8694 ***=> significant at 1% level, **=> significant at 5% level and *=> significant at 10% level.

8. DISCUSSIONS AND POLICY IMPLICATIONS

It is observed that a higher average size of operational holding, availability of family labour force during the time of cultivation, other sources of family income, and incidence of taking agricultural credit only for agricultural production (both from institutional and non-institutional sources) creates a positive impact on farmer's net farm income. It has proved that formal credit at an institutional rate of interest is necessary to increase the net farm income of the farmer households. Here the SHGs are playing a very important role. So, to arrange institutional credit for agricultural purposes, expansion of membership of an SHG among the female members of the marginal farmer households is necessary. However, to enhance the net farm income of the farmers from the agricultural production process, apart from arranging institutional credit for them, one should give greater importance to the size of operational holding. It is also observed from Table 5 that the net farm income of the marginal farmers is increasing at a growing rate with the size of average operational holding. So, in the present situation, the importance of cooperative farming through the creation of farmers' groups among 10-15 marginal farmers just like a SHG is required, and that should be formally recognized and institutionalized. Only farmers whose cultivatable lands are adjacent are recommended to form a farmer's club or group so that they can cultivate their land jointly and can enjoy the benefit of positive economies of scale during the time of cultivation. In this system, each member farmer remains the owner of his land individually, but farming is done jointly. Here, the landless farmers who have taken land on a

lease can also join. At the end of the production process and after selling crops in the market, the net farm income can be distributed among the member farmers in proportion of the area of land owned by them. As in the cooperative farming system, the size of the operational holding is large, the size of aggregate net farm income and share of each member can be higher than the situation in which the farmer has to cultivate individually because in this situation the agricultural production process enjoys positive economies of scale. Here an SHG among the farmers can play a positive role to expedite this cooperative farming. The net earnings from agricultural production can also be increased if non-farm income-earning opportunities can be arranged in the rural sector through MGNREGP or any other type of employment-generating activities among the farm households. Earnings from non-farm occupations can help the farm households to invest more in the agricultural production process in the post rainy season, which can improve cropping intensity and net farm income from agricultural production.

9. CONCLUSIONS

West Bengal is a state in which agriculture plays a leading role in the rural economy. However, most of the farmers are marginal and economically poor. So, it is necessary to improve their livelihoods and to increase their earnings from agricultural activity. To help them to move towards multiple cropping, the availability of micro-credit is necessary. Supply of this type of institutional credit can help the farmers to obtain working capital to move towards multiple cropping mainly in the post rainy season. This can ultimately help them to increase their net farm income. Another important factor that is creating obstacles for the marginal farmers to increase farm income is the size of the operational holding. To enjoy positive economies of scale during the time of cultivation, the initiation of cooperative farming through the formation of a farmer's club or group is necessary. Income-earning opportunities among members of the marginal farmer household in addition to farming activity is also important in increasing their earnings from agricultural operations and livelihood.

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APPENDIX

The total number of sample farm households was 234. The total male-headed farm household was 210 and the total female-headed farm household was 24. If we look at caste wise distribution of the sample households, the number of General category sample farm households was 180 and from OBC and SC categories that were 54. The summary statistics of the explanatory variables are presented below:

Appendix 1. Summary statistics of some important variables.

Variable	Maximum Value	Minimum Value	Mean	S.D.
Size of Formal Agricultural Credit (Rs.)	15000	0	7482	3126
Size of Informal Agricultural Credit (Rs.)	15000	0	3314	808
The total size of Operational Holdings (bigha)	5	0.5	3.19	2.29
Total Non-farm income (Rs.)	90000	0	6438.74	8064.67
Per bigha earnings (Rs.)	80000	2600	13389	8805
Total Family labour force	5	0	1.89	0.937
Education (Years)	12	0	2	2.64
Age	65	19	37	10.2