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Research Article

Does Institutional Agricultural Credit Drive Agricultural GSDP? Evidence from Assam

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Abstract: Agriculture sector plays a crucial role in the state of Assam by providing livelihoods to the majority of the rural population and contributing significantly to the Gross State Domestic Product (GSDP). Despite its importance, the sector continues to face persistent productivity challenges. Using 28 years of time-series data, this study examines the impact of institutional agricultural credit on agricultural GSDP, along with other explanatory variables, namely total cultivated area and fertilizer consumption. The Autoregressive Distributed Lag (ARDL) model was employed to analyse both the short-run and long-run impact of these explanatory variables on agricultural GSDP. The findings reveal that institutional credit has no statistically significant impact on agricultural GSDP in either the short run or the long run. However, cultivated area has a positive short-run effect on agricultural GSDP with a one-year lag. In contrast, consumption of fertilizer exerts a negative short-run effect on agricultural GSDP with one-year lag.

Keywords: Agricultural GSDP, Institutional Agricultural Credit, Total Cultivated Area.

Introduction

Agriculture serves as the backbone of Assam's economy, providing vital sustenance to the majority of the state's population. The sector contributes 23.91% of the gross state domestic product and also supports 70% of the rural population of the state [1]. Despite its importance in the economy of Assam, both the productivity and performance of agriculture sector lag behind other agriculturally prosperous states in India [2,3]. At the time of the country's independence, the state's agricultural productivity was significantly higher. However, following the nationwide adoption of agricultural mechanization, the state has fallen behind due to its inadequate adoption of modern agricultural machinery, limited irrigation facilities, low cropping intensity, and underdeveloped marketing structure. Increased input utilization, technological advancement, and technical efficiency are the three factors indispensable for ensuring the growth of the agriculture and credit helps them to implement in agriculture [4]. Agricultural credit has been considered as the catalyst as it can raise the intensity of input use in agriculture to promote the productivity and performance of the sector [5]. As the majority of the agricultural households in Assam (according to agricultural census 2015-16, 85% of the agricultural households belongs to small and marginal farmers group) fall in the small and marginal farming group and possess little savings, thereby they need credit more intensely to meet working capital requirements. Besides, the farmers of Assam also face challenges to raise productivity of the sector due to increasing inputs cost. In this regard credit acts as an intermediate input that helps farmers to purchase other agricultural inputs [6]. Agriculture credit alone cannot contribute to growth of the agriculture, credit must ensure proper channeling to bring other agricultural inputs into the agriculture [7]. The study aims to assess the productivity of agricultural credit along with other important agricultural inputs namely: total cultivated area and consumption of fertilizers.

Productivity of agricultural credit in India: some empirical evidence

The existing literature on the relationship between agricultural credit and productivity does not establish a clear one-to-one relationship. While some researchers consider credit as a direct input in agricultural production, others treat it as an intermediate input that facilitates the use of other productive resources.

In Indian scenario, the relationship between agricultural credit and productivity can be best known by the research done by [8]. In their research they found a significant positive relationship between formal agricultural credit and aggregate agricultural output. Their result exhibits that rural cooperative credit has an elasticity score of 0.063 with respect to total agricultural output. The study conducted by [4] examined the impact of agricultural credit on production in India and found that direct agricultural credit exerts an immediate, positive, and statistically significant effect on agricultural output. In contrast, indirect agricultural credit was observed to have a similar positive impact on output, but with a one-year lag. The study further highlighted a rising trend in the share of agricultural credit as a percentage of both the value of inputs and the value of output. However, it also pointed out the persistence of regional disparities in the disbursement of credit by scheduled commercial banks. Another significant study by [9] examined the productivity of agricultural credit across 16 major states in India. They found a statistically significant and positive relationship between direct agricultural credit and agricultural productivity. In contrast, indirect agricultural credit was observed to exert a significant negative impact on agricultural productivity. The study further established that key inputs such as fertilizer consumption, infrastructure development, and electricity availability have a significant and positive effect on agricultural productivity [10] in their study on the impact of institutional credit on agricultural productivity, reached a similar conclusion, finding that institutional credit possesses a significant and positive effect on agricultural productivity. Using panel data, they conducted a region-wise analysis by categorizing Indian states into different regions. The study also examined the volume of institutional agricultural credit disbursed across states and highlighted the heterogeneity of disbursement of agricultural credit across the different states of India. Furthermore, their result consistent with the work of [5], who demonstrated that formal credit is positively related to agricultural output, although the magnitude of this relationship varies across states. The study argues that credit enhances productivity indirectly by enabling farmers to access and utilize essential production inputs more effectively. Using cross-sectional data for the period 2003–06, [11] observed that a 1% increase in formal credit leads, on average, to a 0.85% increase in the use of key agricultural inputs such as fertilizers, tractors, and tube wells. However, the responsiveness of input use to credit expansion is not uniform across regions. The elasticity tends to be substantially higher in technologically backward regions compared to more advanced ones, indicating that the impact of credit is shaped by regional variations in technological development and production conditions. The findings of [11] are backed by the conclusions of [12]. Using data from Punjab for the period 1981–82 to 2003–04, [13] found that agricultural credit had a statistically significant and positive impact on the use of agricultural inputs.

Thus, existing literature demonstrate that, agricultural credit associates with productivity by two ways. First, it has capacity to increase agricultural output directly by improve existing production technology with given a combination of inputs constitutes productivity improvement of agricultural credit. Additionally, credit enhances productivity indirectly by enables households to adopt more superior and modern inputs within the existing production frontier called efficiency improvement of agricultural credit [5].

Motivation of the Study

Previous studies conducted to assess the productivity of agricultural credit, sought to find out the relationship between institutional agricultural credit and agricultural output using state-wise panel data analysis, only a few studies have been done to examine the impact of the former on the latter exclusively within the state of Assam. This approach left a way to conduct further research using time series data to assess the relationship between institutional agricultural credit and agricultural output in Assam. Furthermore, early studies on agricultural credit in Assam have largely focused on accessibility and its effects on farmers' welfare, left enough space to establish the relationship between agricultural credit and its productivity.

Data Source and Methodology

Data Source

Agricultural GSDP and institutional agricultural credit data of Assam used in this study were obtained from Indiastat.com. The agricultural GSDP data for Assam are compiled by Indiastat from the Central Statistics Office (CSO) and the Directorate of Economics and Statistics, Government of Assam, while the institutional agricultural credit data are compiled from the Reserve Bank of India (RBI) dataset titled "State-wise Disbursement of Institutional Agricultural Credit (ON1197)". Total cultivated area data of Assam have been accessed from the different reports of the land use statistics published by the Directorate of Economics and Statistics, Department of Agriculture and Farmers Welfare, Government of India. The data of the variable consumption of fertilizers compiled from the International Crops Research Institute for the Semi-Arid Tropics' (ICRISAT) data portal. The Agricultural GSDP of Assam has been taken at current prices in rupees in crores, consistent with the measurement of institutional agricultural credit, which is also expressed in rupees at current prices in crores. Total cultivated area has been measured in thousand hectares. The variable consumption of fertilizers is expressed in thousand tonnes.

In this study institutional agricultural credit comprises of both short - term and long-term agricultural credit that flowed from schedule commercial banks to agriculture and allied sector. Agricultural gross domestic product involves final monetary value of all goods and services produced from agriculture and allied activities. Consumption of fertilizers includes consumption of Nitrogen, Phosphorus and Potassium (N + P + k) in production of crops.

Methodology

The study aims to assess the impact of institutional agricultural credit (IAC), total cultivated area (CULT), and consumption of fertilizers (COF) on agricultural Gross State Domestic Product (AGSDP) of Assam using 28 years of time-series data in the post reform period. The explanatory variables used in the study have been selected based on the existing literature surveyed. Augmented Dickey-Fuller (ADF) Unit Root test had conducted to see the stationarity of the variables which is presented in the table 2. The result shows variables are stationary at different level. Further, ARDL bound test for cointegration confirms that, there exists long run relationship among the variables (since, F-statistics > Upper Bound I) [1], which is shown in the table 3. Therefore, to address this issue and to see the both short run and long run impact of the explanatory variables on the dependent variable we used Auto Regressive Distributed Lag Model (ARDL). The optimal lag of the variables for ARDL has been selected following Akaike Information Criterion (AIC) presented in the table.4. The general form of ARDL model used in our study is presented below:

$$AGSDP_t = \beta + \sum_{i=1}^{4} \alpha AGDSP_{t-1} + \sum_{i=0}^{4} \delta IAC_{t-1} + \sum_{i=0}^{4} \lambda CULT_{t-1} + \sum_{i=0}^{4} \phi COF_{t-1} + \epsilon_t$$

Here, i = 1, 2, 3, 4 and t = 1, 2, 3,…,28.

The model is fit after confirming no collinearity among the variables through multicollinearity testing. Table 5 is the presentation of multicollinearity diagnostic for variables.

Results and Discussion

The result of ARDL (4,4,2,2) Error Correction Model is presented in the below tables.

Table 1A: ARDL (4,4,2,2) Long run and short run Dynamics.

Variables	Long-Run Coefficient	Short-run Coefficient	t-statistics (short run)	Prob. (short run)
IAC	3.079	-3.0362	-0.98	0.0355
CULT	497.9.623	132.5051*	2.11	0.068
COF	-349.280	-59.946*	-2.17	0.062
ECM(-1)		0.2466	0.55	0.597
Constant		337402.3	1.00	0.347
* At 10% level of significance				
Source: Author's calculation using STATA 17				

Table 1B: Model Diagnostic.

Statistics	Value
R^2	0.9788
Adjusted R^2	0.9390
Root MSE	1736.2729
Number of Observations	24
Source: Author's calculation using STATA 17	

The ARDL (4,4,2,2) coefficients estimation exerts that, in the long run explanatory variables institutional agricultural credit (IAC), cultivated area (CULT), and consumption of fertilizers do not possess statistically significant impact on agricultural gross state domestic product (AGSDP) in Assam. While, in the short run coefficient of cultivated area shows statistically significant positive impact on agricultural gross state domestic product. The result demonstrates that, 1 unit increase in cultivated area leads to 132.5051 units increase of the agricultural gross state domestic product with one year lag. Unlike cultivated area, consumption of fertilizers in the short run negatively effects agricultural gross state domestic. The resultant coefficient of consumption of fertilizers highlights that, with one year lag 1 unit increase in the consumption of fertilizers reduces agricultural gross state domestic product by 59.946 units. The short run coefficients of the explanatory variable institutional agricultural credit do not show any statistically significant impact on agricultural gross state domestic product like in the long run.

Table 2: Augmented Dickey–Fuller (ADF) Unit Root Test Results.

Variables	Level ADF Statistic (Test Statistic)	First Difference Statistic	Second Difference Statistic	1% Critical Value	5% Critical Value	10% Critical Value	Order of Integration
AGSDP	3.288**			-3.736	-2.994	-2.628	I(0)
IAC	3.073**			-3.736	-2.994	-2628	I(0)
CULT	-1.649	-2.021	-2.653*	-3.750	-3.000	-2.630	I(2)
COF	-2.353	-2.454	-2.831*	-3.750	-3.000	-2.630	I(2)
* At 10% level of significance, ** At 5% level of significance							
Source: Author's calculation using STATA 17							

Table 3A: ARDL Bound Test for Co-integration.

Test Statistic	Value
F-statistic	25.105
T-statistic	0.511

Table 3B: Critical Values (Pesaram et al. 2001).

Significance Level	I(0) Lower Bound	I(1) Upper Bound
10%	2.71	3.77
5%	3.23	4.65
1%	4.29	5.61
Source: Author's calculation using STATA 17		

Table 4: Optimal Lag Selection Criteria.

Lag	Log Likelihood	LR	FPE	AIC	HQIC	SBIC
0	-715.785		1.3e + 21	59.281	60.0341	60.1784
1	-608.065	215.38	6.5e + 17	52.3412	52.6017	53.323
2	-577.903	60.384	2.3e + 17	51.1586	51.6274	52.9257
3	-533.87	88.066	3.2e + 16	48.8225	49.4997	51.375
4	-491.652	84.437*	8.6e + 15*	46.6376*	47.5232*	49.9755*
* At 10% level of significance						
Source: Author's calculation using STATA 17						

Table 5: Result of Multicollinearity Test.

Variable	VIF	1/VIF
IAC	3.34	0.299526
CULT	1.84	0.542993
COF	2.86	0.350158
Mean VIF	2.68	
Source: Author's calculation using STATA 17		

Conclusion and Limitations

The study tried to find out the relationship between institutional agricultural credit and agricultural GSDP in the state of Assam. Study also tried to assess the impact of total cultivated area, consumption of fertilizers to the agricultural GSDP. The findings of the study present insignificant impact of institutional agricultural credit to agricultural GSDP in the state both in the short run and long run. This inefficacy of institutional agricultural credit can be attributed as the limited access of institutional credit by marginal and small farmers, lower per hectare availability of credit than the national average, lack of provision of the complementary factors such as irrigation, technology and market infrastructure, non-productive usage of credit, and prevalence of the dependency on non-institutional credit sources.

In contrast the explanatory variables cultivated area and consumption of fertilizers show significant impact on the agricultural GSDP in the state. Cultivated area influenced agricultural GSDP positively, while coefficient of consumption of fertilizers indicates negative relationship with agricultural GSDP.

The limitations of the study primarily arise in context of the dropping some of the important explanatory variables. Due to unavailability of year wise agricultural labour force data in Assam, we did not incorporate this variable in our model. Besides, we have dropped another important variable i.e., net irrigated area to avoid the problem of multicollinearity. Therefore, it paves way to conduct similar type of study by incorporating these two important variables. Further, we have taken institutional agricultural credit data which were disbursed exclusively by Schedule Commercial Banks, which limits our study to incorporate institutional agricultural credit data disbursed by Regional Rural Banks and other institutional sources like Cooperatives. The study also confines with institutional agricultural credit, whereas credit from non-institutional sources is still prevalent in agricultural credit market in Assam.

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