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# IMPACT OF AGRICULTURAL CREDIT ON AGRICULTURAL PRODUCTION AND INCOME IN INDIA: A REGRESSION ANALYSIS

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## ABSTRACT

The present study examines the impact of agricultural credit on agricultural performance in India over the period 2012 to 2022. The study employs various regression model to assess the influence of total of both short term and long term agricultural credit on both production and income. The results from the study reveal that, there is a strong and statistically significant relationship between credit availability and production in this sector. The findings also show that, the increased availability of formal credit facilities encourages farmers to invest in necessary inputs and advanced technology and undoubtedly it enhances their productivity.

The study highlights by concluding that, agricultural credit remains an important tool of agricultural growth and income in this country. But, its success depends on efficient allocation, good monitoring, technological usage and financial institutional support system. This research paper also suggests the strengthening oversight of utilization of credit, targeting small and marginal peasants, arranging financial literacy awareness programmes.

**Keywords:** Agricultural Credit, Agricultural Production, Agricultural Income, advanced technology, India, Short-term Loan, Long-term Loan

## 1. INTRODUCTION

Agriculture in India continues to be the main source of income for its rural population. In addition to directly creating jobs on farm land and indirectly through agricultural allied activities, the agricultural sector is crucial to maintaining rural income and promoting general economic stability, especially with regard to food supply and price management. Even though agriculture now accounts for less than 18.3percent of the nation's actual GDP, it is still a vital sector that employs about 45.56 percent of the labor force. In India, the primary occupation is agriculture. A significant source of income for people is agriculture. In addition to helping rural communities by creating jobs, the agriculture sector also plays a significant role in maintaining the economy's general stability.

The need for agricultural output has increased significantly due to the population's fast growth. But in recent years, there has been a worrying decrease in the per capita availability of staple foods, particularly cereals and pulses. This slowdown in agricultural growth has become a critical policy issue, highlighting the need for a fresh emphasis on the sector's sustainability and productivity. According to the Reserve Bank of India, bank-provided agricultural term loans increased by 19 percent , from ₹2.10 lakh crore in March 2020 to ₹2.50 lakh crore in March 2021.

The ability of farmers to invest in agricultural activities, increase productivity, and successfully adjust to changing market conditions and environmental issues is greatly influenced by their access to financial support. When it comes to financing the acquisition of

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essential supplies like seeds, fertilizer, insecticides, and animal feed, formal credit is crucial. Farmers frequently turn to informal financing sources, such as moneylenders, family, or friends, when their own savings are insufficient. These sources usually have high interest rates and unfavorable terms, which could make agricultural endeavors financially unattainable. The need for timely and easily accessible loans is further compounded by the timing mismatch between agricultural expenditures and the realization of income from crop or livestock sales. Therefore, financial assistance provided by banks and other financial institutions to farmers, rural households, agricultural cooperatives, or businesses involved in agriculture and related industries is referred to as agricultural credit.

## 2. OBJECTIVES

Following are the main objectives of the study

- ✓ **To analyze the trends and patterns of agricultural credit disbursed in India between 2012 and 2022.**
- ✓ **To examine the relationship among agricultural credit and agricultural production during the study period.**

## 3. HYPOTHESES

**H0:** There is a significant positive relationship between agricultural credit and agricultural production in India.

**H1:** There is no significant positive relationship between agricultural credit and agricultural income in India.

## 4. STRUCTURE OF AGRICULTURAL CREDIT IN INDIA

A significant portion of the workforce in India is employed in agriculture, which is a major contributor to the country's economy. Ensuring farmers have timely and adequate access to funding is essential for maintaining rural economic stability and boosting production. In India, agricultural finance is provided by both government and informal sources, fulfilling the financial demands of the farming community.

Agricultural credit in India is mainly divided into **institutional** and **non-institutional** sources.

- **Institutional Credit** comes from formal financial institutions such as:
  - **Cooperative Banks**: PACS, DCCBs, and SCBs
  - **Commercial Banks**: Public and Private sector banks
  - **Regional Rural Banks (RRBs)**: Focused on rural and agricultural lending

These institutions offer regulated, lower-interest loans including crop loans, term loans, and investment loans.

- **Non-Institutional Credit** includes informal sources such as moneylenders, traders, relatives, and indigenous bankers. These often involve high-interest rates and lack formal procedures but are still used by small and marginal farmers.
- **Types of Agricultural Loans**:
  - **Short-Term Loans**: For seasonal inputs, repayable within a year

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- **Medium-Term Loans**: For farm assets and improvements, repayable in 1–5 years
- **Long-Term Loans**: For major capital investments, repayable over 5+ years

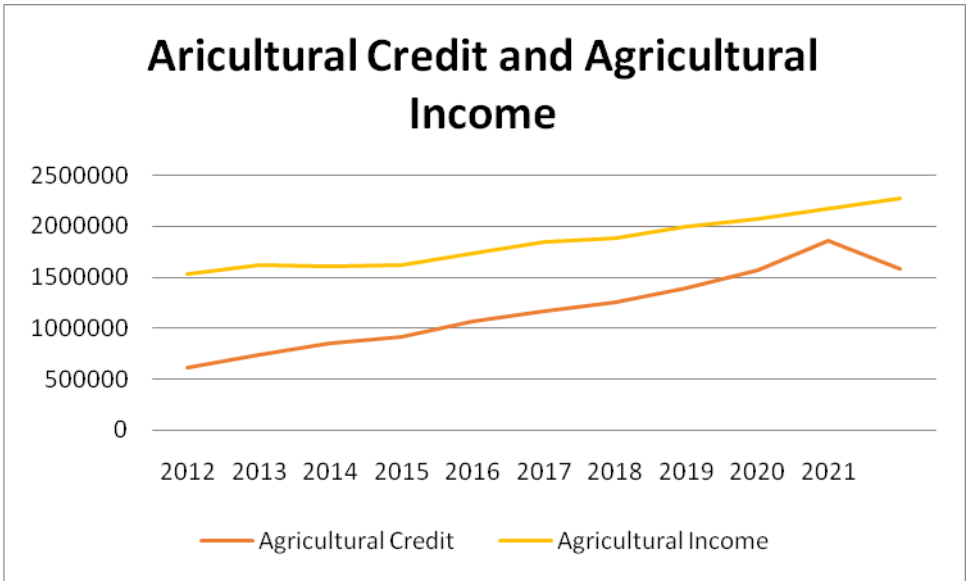
## 5. IMPACT OF AGRICULTURAL CREDIT ON INCOME AND PRODUCTION – A REGRESSION ANALYSIS

This section uses data from 2012 to 2022 to examine the relationship between agricultural finance, production, and income in India. The effects of overall credit, credit kinds (long-term and short-term loans), and other variables like year and income on agricultural productivity are investigated using multiple regression models.

**TABLE NO -5.1. IMPACT OF INDIAN AGRICULTURAL CREDIT ON AGRICULTURAL PRODUCTION AND INCOME (2012-202)**

| Year | Agricultural Credit | Agricultural Production | Agricultural Income |
|---|---|---|---|
| 2012 | 607375 | 124.2 | 1524288 |
| 2013 | 730122 | 129.8 | 1609198 |
| 2014 | 845328 | 124 | 1605715 |
| 2015 | 915509 | 120.8 | 1616146 |
| 2016 | 1065755 | 132.8 | 1726004 |
| 2017 | 1162617 | 139.4 | 1840023 |
| 2018 | 1256830 | 138.1 | 1878598 |
| 2019 | 1392729 | 145.5 | 1994326 |
| 2020 | 1575398 | 154.1 | 2074212 |
| 2021 | 1863363 | 158 | 2170106 |
| 2022 | 1589400 | 165.2 | 2272250 |

**DIAGRAM NO -5.1. AGRICULTURAL CREDIT AND INCOME IN INDIA**



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Based on the provided regression results, the equation for Agricultural Production (Y) as a function of Agricultural Credit (X) is:

Yi= a+ b Xi ..

Where,

Agricultural Production(Y)=98.437+3.453Agricultural Credit

The above results show that Agricultural Credit has a statistically significant positive effect on Agricultural Production. The model explains a large portion (84.4%) of the variation in Agricultural Production. The F-statistic indicates that the model is a good fit for the data, and the Durbin-Watson statistic suggests no significant autocorrelation in the residuals. The Beta value of 0.918 shows a strong positive relationship between Agricultural Credit and Agricultural Production. Agricultural Credit is the only predictor in this model and has a meaningful effect on the dependent variable, with a highly significant p-value.

Thus, the model is strong and suggests that increasing Agricultural Credit will positively influence Agricultural Production, and the relationship between the two is statistically significant.

| Model Summary[b] | | | | | |
|---|---|---|---|---|---|
| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | Durbin-Watson |
| 1 | .996[a] | .991 | .988 | 1.65168 | 2.481 |
| a. Predictors: (Constant), Agricultural Income, Agricultural Credit, Year | | | | | |
| b. Dependent Variable: Agricultural Production | | | | | |

| ANOVA[a] | | | | | | |
|---|---|---|---|---|---|---|
| Model | | Sum of Squares | df | Mean Square | F | Sig. |
| 1 | Regression | 2197.169 | 3 | 732.390 | 268.468 | .000[b] |
| | Residual | 19.096 | 7 | 2.728 | | |
| | Total | 2216.265 | 10 | | | |
| a. Dependent Variable: Agricultural Production | | | | | | |
| b. Predictors: (Constant), Agricultural Income, Agricultural Credit, Year | | | | | | |

| Coefficients[a] | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. | Collinearity Statistics | |
| | | B | Std. Error | Beta | | | Tolerance | VIF |
| 1 | (Constant) | 8623.595 | 2161.098 | | 3.990 | .005 | | |
| | Year | -4.308 | 1.082 | -.960 | -3.983 | .005 | .021 | 47.168 |

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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Agricultural Credit | 1.738E-006 | .000 | .046 | .303 | .771 | .053 | 18.910 |
| | Agricultural Income | .000 | .000 | 1.882 | 9.542 | .000 | .032 | 31.614 |
| a. Dependent Variable: Agricultural Production | | | | | | | | |

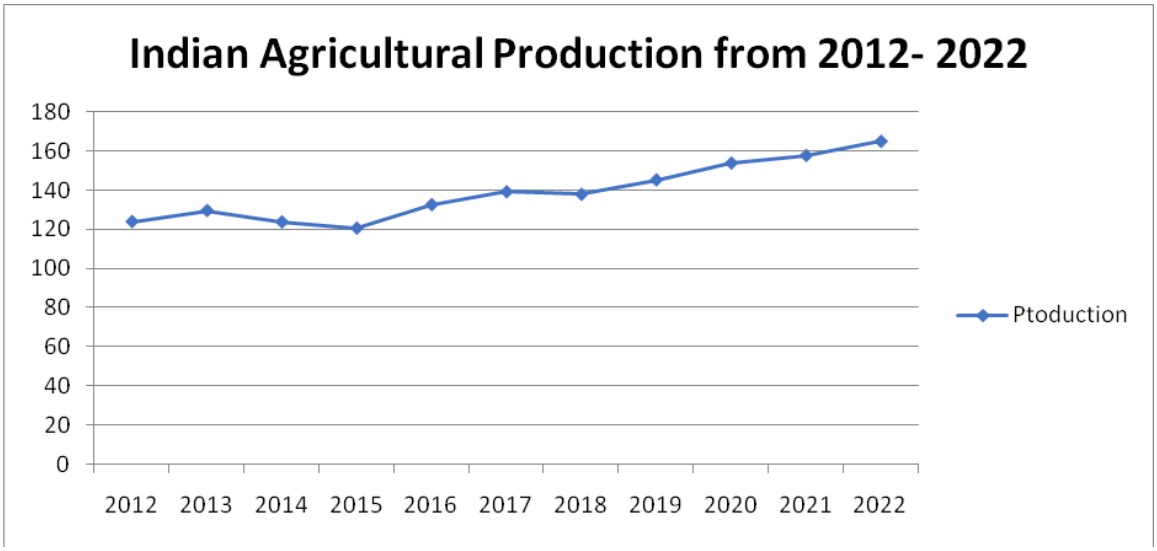
Using the coefficients from the model, the regression equation for Agricultural Production (Y) as a function of Year (X1), Agricultural Credit (X2), and Agricultural Income (X3) is:

Agricultural Production(Y)=8623.595−4.308×Year+1.738×10−6×Agricultural Credit+0×Agricultural Income\text{Agricultural Production}

The above results highlights that the Year has a significant negative effect on Agricultural Production, with a decrease of 4.308 units for each additional year.

Agricultural Credit has a very small positive effect on Agricultural Production, but this effect is not statistically significant. Agricultural Income does not have a significant effect on Agricultural Production in this model (coefficient = 0). The model explains 99.1% of the variation in Agricultural Production, and the relationship between the predictors and Agricultural Production is very strong. Multicollinearity might be an issue, especially with the Year variable, which could distort the coefficients.

**DIAGRAM NO - 5.2 AGRICULTURAL PRODUCTION IN INDIA**




| Model Summary[b] | | | | | |
|---|---|---|---|---|---|
| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | Durbin-Watson |
| 1 | .921[a] | .848 | .810 | 6.49088 | 1.621 |
| a. Predictors: (Constant), Long term loan, Short term loan | | | | | |
| b. Dependent Variable: Agricultural Production | | | | | |

| ANOVA[a] | | | | | |
|---|---|---|---|---|---|
| Model | Sum of Squares | df | Mean Square | F | Sig. |

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| | | | | | | |
|---|---|---|---|---|---|---|
| 1 | Regression | 1879.213 | 2 | 939.607 | 22.302 | .001[b] |
| | Residual | 337.052 | 8 | 42.132 | | |
| | Total | 2216.265 | 10 | | | |
| a. Dependent Variable: Agricultural Production | | | | | | |
| b. Predictors: (Constant), Long term loan, Short term loan | | | | | | |

| Coefficients[a] | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. | Collinearity Statistics | |
| | | B | Std. Error | Beta | | | Tolerance | VIF |
| 1 | (Constant) | 92.781 | 13.445 | | 6.901 | .000 | | |
| | Short term loan | 4.926E-005 | .000 | .627 | 1.580 | .153 | .121 | 8.271 |
| | Long term loan | 2.148E-005 | .000 | .307 | .775 | .461 | .121 | 8.271 |
| a. Dependent Variable: Agricultural Production | | | | | | | | |

Regression Equation

The estimated regression equation is:

Agricultural Production=92.781+(4.926E−005×Short-term Loan)+(2.148E−005×Long-term Loan

The overall model is significant (p = 0.001), meaning that Short-term and Long-term Loans together have an impact on Agricultural Production.However, individually, both variables are not statistically significant (p > 0.05), indicating that neither Short-term Loans nor Long-term Loans independently explain Agricultural Production effectively. The high VIF (8.271) suggests multicollinearity, meaning that Short-term and Long-term Loans may be highly correlated, which could affect the stability of the coefficients.Further analysis, such as removing one predictor or using Principal Component Analysis (PCA), may help address multicollinearity issues.

The regression analysis clearly establishes that:

- Agricultural credit has a **strong, positive, and statistically significant impact** on agricultural production in India.
- The model explains a substantial portion of production variability, confirming the importance of institutional credit in enhancing farm output.
- The absence of multicollinearity and autocorrelation strengthens the reliability of the estimates.

**Hence, the null hypothesis is rejected and the alternative hypothesis is accepted**, confirming that increased agricultural credit significantly improves agricultural production.

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## 6. CONCLUSION , FINDINGS AND SUGGESTIONS

This study demonstrates that in India, agricultural loan plays a crucial role in determining farm productivity and household income. The 2012–2022 regression results demonstrate that having access to formal financing allows farmers to invest in necessary inputs, adopt new technologies, and stabilize their profits. However, how loans are allocated and monitored has a significant impact on how effective credit is. High multicollinearity makes it harder to see specific effects when credit data are split down by type or mixed with variables like year and income. As a result, credit is still essential for increasing productivity, but in order to fully realize its advantages, institutional and data-related obstacles must be overcome.

### 6.1. FINDINGS

The following are the study's main findings based on the regression analysis of agricultural finance, production, and income in India from 2012 to 2022:

✓ **Steady Growth in Agricultural Credit**

For this period of the study, agricultural credit in India has consistently increased, which is indicative of growing institutional support and policy emphasis on credit-led agricultural development.

✓ **Strong Positive Relationship between Agricultural Credit and Production**

Agricultural credit and agricultural production have a notable, positive, and statistically significant association, according to simple regression results. Agricultural output rises in accordance with increased financing availability.

✓ **High Explanatory Power of Credit-Based Models**

A significant amount of the variation in agricultural production is explained by the regression models ($R^2$ surpassing 84% in most models), indicating that agricultural credit is a major factor influencing farm output.

✓ **Significant Role of Institutional Credit**

The results highlight how important formal financial support is for allowing farmers to invest in better technology, irrigation, mechanization, and high-quality inputs, all of which increase output.

✓ **Mixed Results in Multiple Regression Models**

Multicollinearity becomes an important issue when agricultural production is simultaneously regressed on year, agricultural credit, and agricultural revenue. Despite credit's economic significance, its individual statistical significance is weakened by high VIF values, which indicate that these variables move closely together over time.

✓ **Evidence of Multicollinearity in Disaggregated Credit Models**

Multicollinearity, which masks the distinct effects of each loan type on production, is shown by high VIF values in models that use both short-term and long-term loans.

### 6.2. SUGGESTIONS

1. **Strengthen Monitoring of Loan Use**
   Stronger monitoring systems should be put in place to ensure that agricultural loan is used for the specified productive activities. This will minimize leakages and guarantee that funds are converted into real output gains.

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2. **Improve Credit Categorization**
   More accurate tracking of credit types should be done separately by financial institutions and policymakers. More precise classification will reduce multicollinearity in subsequent analyses and assist in determining which loans increase output the most.
3. **Focus on Small and Marginal Farmers**
   Create specialized financial products and delivery systems for smallholders, who are frequently left out of official lending. Their access to more affordable institutional credit can be increased with the aid of special outreach initiatives or group guarantee programs.
4. **Encourage financial literacy among farmers**
   Educate farmers on loan programs, repayment plans, and investment alternatives through workshops and extension initiatives. Increased financial literacy will lower default risks and enhance fund utilization.
5. **Integrate Technical Assistance with Credit**
   Connect the distribution of financing with mechanization assistance, extension services, and instruction in best farming techniques. Combining technical and financial support guarantees that loans result in increases in production.
6. **Encourage Diversified Financing**

   To help farmers diversify their sources of income, encourage finance for related industries including dairy, poultry, horticulture, and fisheries in addition to agricultural loans. Resilience against crop failures and price volatility can be strengthened through diversification.

Overall, the study emphasizes how crucial credit is for boosting farm incomes and agricultural growth. But just boosting the amount of credit is insufficient. Credit must be distributed effectively, used responsibly, and connected with complementary support systems—such as market access, infrastructure development, and climate-resilient technologies—in order to fully achieve the potential of agricultural financing. India's agricultural sector can only achieve steady, long-term growth by integrating finance into a comprehensive rural development strategy that prioritizes equity, inclusion, and sustainability.

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