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**Research Article**

# Evaluating the Impact of the Kishan Credit Card (KCC) Scheme on Sustainable Development Goal 1 (No Poverty) in India: A Multivariate Statistical Inquiry

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**ABSTRACT**

An initiative by the Government of India, Kishan Credit Card (KCC) Scheme, is targeted towards alleviating rural poverty and filling the credit gap in smallholder farmers' sectors. This research examines how it plays a role in contributing towards the SDG 1-No Poverty using mixed methods, combining primary survey data collected from 500 farmers across five states in India with the existing data collected from governmental and financial institutions. The study employs multivariate statistical methods, such as factor analysis, ANOVA, and paired t-tests, which show that there are positive effects of the KCC scheme on farmers' income ($p < 0.01$) and on the reduction of informal credit usage (factor loading=0. 79), which are the core ingredients for this financial inclusion. Yet, structural constraints include bureaucratic red-tape and low awareness. These findings offer empirical evidence for policymakers to enable the redesign of the implementation strategy and boost the impact of the scheme on poverty reduction.

**Keywords:** Agricultural credit, Kishan Credit Card, SDG, No poverty, Financial Inclusion

## 1. INTRODUCTION

While SDG-1, the first of the Sustainable Development Goals, deals with the removal of poverty as an urgent need, over 700 million people globally still live under extreme deprivation (United Nations, 2023). In India, where 58% of the population depends on agriculture and contributes 18% of the nation's GDP (World Bank, 2023), rural poverty remains a significant challenge. Smallholder farmers face challenges due to structural constraints such as fragmentation in access to formal credit, dependence on exploitative informal lenders charging exorbitant interest rates, often up to 24% per annum, as well as vulnerability to climate shocks (Reserve Bank of India [RBI], 2022). To address these challenges, the Government of India launched the Kishan Credit Card (KCC) Scheme in 1998 to provide farmers with less cumbersome access to credit, which would enable them to obtain collateral-free loans for agricultural inputs and non-farm activities at truly subsidized rates: an interest of 7% with extra subsidies for timely repayments (Ministry of Agriculture, 2021).

Even if some previous studies evaluated the KCC Scheme's contribution to credit accessibility (Kumar & Sharma, 2020) and agricultural productivity (Singh & Dhaka, 2021), some pertinent gaps still exist. Again, much of the ongoing literature fails to connect, with careful empirical underpinning, the scheme and the important poverty-section index relating to income stabilization, debt reduction, and financial inclusion. Patel et al. (2019), for example, only assessed disbursement rates, without looking into the substantial effects of income, while Nair (2020) employed a qualitative study that completely overlooked regional variation in implementation. This work attempts to fill these gaps by means of multivariate analysis, including 500 farmers surveyed in five states in India and utilizing advanced inferential statistical tools (such as factor analysis and ANOVA), to fully discover the impact of the KCC Scheme on SDG-1. Suyin to which some secondary insights from the RBI and NABARD by integrating primary survey data,

contribute to assess the worth of the scheme, while structural bottlenecks like bureaucratic delays and ignorant awareness would be flagged for targeted policy reforms.

## 2. LITERATURE REVIEW

Financial inclusion serves an important role in poverty alleviation (Beck et al., 2007). In agrarian economies like India, formal credit access helps farmers invest in productivity-enhancing inputs that break the cycle of poverty (Kumar and Sharma, 2019).Through the KCC Scheme, dependence on informal moneylenders has decreased due to exorbitant interest (Singh and Dhaka, 2020). Recent studies show a 15% to 20% increase in agricultural productivity among KCC beneficiaries due to easy access to improved seeds, fertilizers, and irrigation (Government of India, 2020).Though, some challenges in implementation--the delay in disbursement of loans, low awareness among the marginalized farmers, etc.--dilute the spirit of the plan (RBI, 2021). The gap in research literature is addressed through the use of multivariate statistical techniques aimed at quantifying the impact of the scheme.

## 3. OBJECTIVES OF THE STUDY

The study aims to achieve the following objectives, aligned with the research gap and policy relevance of the Kishan Credit Card (KCC) Scheme in India:

1. **To Assess the Impact of the KCC Scheme on Poverty Reduction**

○ Quantify the scheme's contribution to Sustainable Development Goal 1 (No Poverty) by analyzing changes in farmers' income levels and financial behavior pre- and post-KCC adoption.

2. **To Evaluate the Role of the KCC Scheme in Enhancing Farmers' Income**

○ Investigate how access to formal credit under the KCC Scheme influences agricultural productivity and household income through statistical comparisons (ANOVA and t-tests).

3. **To Examine the Promotion of Financial Inclusion**

○ Assess the extent to which the KCC Scheme reduces dependence on informal credit sources (e.g., moneylenders) and integrates farmers into the formal banking system using factor analysis.

4. **To Identify Key Determinants of the KCC Scheme's Effectiveness**

○ Uncover latent factors (e.g., timely credit access, income enhancement, financial inclusion) driving the scheme's success through principal component analysis (PCA) with Varimax rotation.

5. **To Measure the Statistical Significance of Observed Outcomes**

○ Validate the robustness of findings using inferential statistics (e.g., paired t-tests, ANOVA) to ensure observed income differences and factor loadings are not due to random chance.

6. **To Provide Evidence-Based Policy Recommendations**

○ Propose actionable strategies for policymakers to address implementation challenges (e.g., delayed disbursement, low awareness) and amplify the scheme's impact on rural poverty alleviation.

## 4. METHODOLOGY

### 4.1 Data Collection

Stratified random sampling was used to survey 500 farmers from five Indian states (Uttar Pradesh, Maharashtra, Punjab, Tamil Nadu, and Odisha). These states were chosen based on their agro-climatic diversity and KCC penetration indices (NABARD, 2022). To capture the variables involved, pre-SILK and post-SILK income, credit access, and financial behavior were reconstructed in a questionnaire. Other secondary sources of data include RBI, National Bank for Agriculture and Rural Development (NABARD), and Ministry of Agriculture from 2018 to 2022.

### 4.2 Analytical Framework

• Reliability Analysis: Cronbach's Alpha (α) assessed the internal consistency of survey items.

• Factor Analysis: Principal Component Analysis (PCA) with Varimax rotation identified latent constructs influencing the KCC Scheme's effectiveness.

• ANOVA and t-tests: Evaluated income differences pre- and post-KCC adoption.

## 5. RESULTS

### 5.1 Reliability and Validity

According to Field (2018), Cronbach's Alpha ($\alpha = 0.87$) shows high reliability which exceeds the threshold of 0.7. The Kaiser-Meyer-Olkin value (KMO = 0.82) and Bartlett Test of Sphericity which is $p < 0.001$ indicate that factor analysis is appropriate.

### 5.2 Factor Analysis

Three factors explained 81.2% of the cumulative variance (Table 1):

**Table 1: Rotated Factor Loadings (Varimax Rotation)**

| Variable | Factor 1: Access to Credit | Factor 2: Income Enhancement | Factor 3: Financial Inclusion | Communality |
|---|---|---|---|---|
| Timely loan disbursement | 0.78 | 0.12 | 0.09 | 0.73 |
| Adequate credit amount | 0.82 | 0.08 | 0.11 | 0.81 |
| Increased agricultural yield | 0.15 | 0.85 | 0.07 | 0.79 |
| Increased income | 0.09 | 0.88 | 0.06 | 0.83 |
| Access to formal banking | 0.11 | 0.07 | 0.81 | 0.72 |
| Reduced dependence on moneylenders | 0.13 | 0.09 | 0.79 | 0.69 |

**Interpretation:**

• Factor 1 (Access to Credit): High loadings for timely disbursement (0.78) and credit adequacy (0.82).

• Factor 2 (Income Enhancement): Strong correlation with increased yield (0.85) and income (0.88).

• Factor 3 (Financial Inclusion): Driven by access to formal banking (0.81) and reduced moneylender dependence (0.79).

### 5.3 Income Enhancement (ANOVA)

A one-way ANOVA confirmed significant income differences ($F = 12.45$, $p = 0.001$, $\eta^2 = 0.20$):

**Table 2: ANOVA Results**

| Source | SS | df | MS | F-value | *p*-value | Partial $\eta^2$ |
|---|---|---|---|---|---|---|
| Between | 120.45 | 1 | 120.45 | 12.45 | 0.001 | 0.20 |
| Within | 480.30 | 498 | 0.96 | | | |
| Total | 600.75 | 499 | | | | |

### 5.4 Significance Testing

A paired t-test revealed a statistically significant increase in income post-KCC ($t = 167.71$, $p < 0.001$, Cohen's $d = 2.68$):

**Table 3: Pre- and Post-KCC Income Comparison**

| Group | Mean Income (₹) | SD | 95% CI | t-value | *p*-value |
|---|---|---|---|---|---|
| Pre-KCC | 45,000 | 5,000 | [44,500–45,500] | 167.71 | <0.001 |
| Post-KCC | 60,000 | 6,500 | [59,200–60,800] | | |

## 6.DISCUSSION

The KCC Scheme has brought about measurable impacts on SDG-1 by augmenting farmers' income (mean difference = ₹15,000/year) and thereby melding them into the formal financial system (factor loading > 0.7). This is in line with Beck et al. (2007), emphasizing the significant role formal credit plays in minimizing poverty. Nonetheless, 32% of respondents mentioned delays in loan disbursement, which lends credence to views expressed by the Government of India (2020).

### 6.1 Policy Implications

1. Digitization of loan disbursement: Integrate KCCs with other platforms like Aadhaar-linked payment systems to fast-track timely disbursement.

2. Awareness campaigns: Work with organizations like PRADAN to create awareness regarding these schemes to tough-to-reach farmers.

3. Expand reach: Include tenant farmers and women-led households, who are underrepresented (RBI, 2021).

### 6.2 Limitations and Future Research

Because of how the research was designed, the result cannot be interpreted as causal. Studies with a longitudinal design should be conducted to assess the impacts in the future. Moreover, self-reported income data could be biased so it is better to triangulate with official data.

## 7. CONCLUSION

This study shows how the KCC Scheme has made great strides toward SDG-1 in rural India: the average post-intervention income increase among farmers has been ₹15,000 annually ($p < 0.01$), with a 40% anticipated reduction in every farmer's dependence on informal moneylenders. It revealed three factors that contribute to success when factor-analyzed: actually accessing credit in a timely manner (loading = 0.82), enhancing incomes (loading = 0.88), and financial inclusion (loading = 0.79), which together account for 81.2% of the total variance in the outcomes. This is in line with Beck et al.'s (2007) argument that access to formal credit reduces poverty by enabling investments in productivity and risk coping strategies. Notwithout challenges, however: around 32% of the respondents reported a lag of over 30 days for loan processing, repeating the RBI's 2022 report of inefficiency in the system. Further underrepresented were important marginal groups-surveyed were tenant farmers and women-headed households, reflecting a 22% coverage gap when considered among the total in the surveyed regions (NABARD, 2023). In terms of how to enhance impacts, policymakers are advised to very strongly prioritize the digitization of the loan disbursement process through Aadhaar-linked platforms, increase outreach through partners like PRADAN (NGO), and integrate climate-resilient credit products for agrarian vulnerability. This study-inherent cross-sectional design which limits causal inference paves the way for a longitudinal study to really investigate some long-term socioeconomic outcomes. Future studies need to focus on inter-state differentials and the interplay of caste, gender, and land holdings in relation to access to credit. Addressing these would allow the KCC Scheme in India to contribute to poverty alleviation and act as a catalyst for overall rural development, boosting interlinked SDGs like education (SDG-4) and gender equality (SDG-5). This research, opposing a "leave no one behind" world, spots a window to reach the other side of the poverty divide by inclusive financial policies.

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