iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 9 **Issue:** VI **Month of publication:** June 2021

DOI: https://doi.org/10.22214/ijraset.2021.35143

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 9 Issue VI Jun 2021- Available at www.ijraset.com

The Role of Data Analytics in Kisan Credit Card for Sustainable Development

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Abstract: ***Agriculture is the main occupation in India as the large population is living in rural areas and having agriculture as their livelihood. According to the United Nations Development Programme, sustainable development in agriculture means national food security, upgrading the living standard of farmers, and conservation of the natural resources. The green revolution has called for high credit requirement for the purchase of high yielding seeds, irrigation systems, fertilizers, and chemical pesticides. Along with crop yields, the cost of production has raised drastically calling huge credit requirement. This huge credit requirement was not met by the cooperatives or commercial banks for their own limitations.The introduction of Kisan Credit Card (KCC) during the budget of 1998 has played a significant role in delivering the variable credit requirements in a flexible, easy, and timely credit The plan was launched by NABARD and Reserve Bank of India. The scheme aims to reduce farmer's dependency on informal banks for credit which is often lucrative yet very expensive. The card is offered by cooperative banks, regional rural banks, and public sector banks. Although KCC was a noble idea to help needy farmers, it has become a tool that is being misused by many, including people who are financially well off, and in this paper, we will discuss the misuse of Kisan credit card.***

The aim of this paper is to study the impact of Kisan credit card on agriculture development and how Kisan credit card has achieved sustainable development and what are the roadblocks still prevailing in achieving sustainable development and how the use of data analytics and artificial intelligence can help banks to provide Kisan credit card to farmers after analyzing their behavior and make sure that credit is being utilized only for agriculture development that can lead to sustainable development.

I. INTRODUCTION

Agriculture is an important sector of the Indian economy, accounting for 17-18% to the gross domestic production (GDP at a constant price) and more than 50% to employment during 2017-18 (India economic survey 2018). Expanding agricultural production increases the demand for other sectors notably fertilizers, pesticides, machinery, transportation and communication varying with the level of technology. In the sustained growth of the agricultural sector, credit plays an important role. Credit is not only one of the critical inputs in agriculture but also an effective means of rural development (Kumar et al. 2007). One of the objectives of credit policy is to minimize the role of non-institutional sources mainly money lenders in the flow of agricultural credit. The interest rate charged by the money lenders varied across the states but remained high in all the states as compared to that charged by the institutional agencies. The effective monthly interest rate charged by them was about 5 percent to more than 100 percent (Robinson, 2001). About 60 percent of the credit requirement of farmers is now met by the institutional sources and the remaining 40 by the informal sources like money lenders who charge higher interest rates. (Rao, 2003).

Credit plays an accelerator role in agricultural development if it is adequate in quantity, cheap and timely provided. (Galbraith, 1952 and Schultz, 1964). Credit is not only a critical input in agriculture but also an effective means of economic transformation of rural areas. Increasing commercialization, diversification and capitalization through the use of modern technologies, driven largely by the forces of globalization have increasingly enhanced the credit needs of the peasants (Gadgil, 1994 and Khan et al., 2007). Enhancing the rural credit can boost the production and investment in agriculture. Financing for agriculture has been a gigantic task for banks in India. Ensuring timeliness and adequacy of credit to farmers have posed the most serious challenging task for banks while financing to the agricultural sector.

NABARD has been playing a proactive and catalytic role in assisting the banks to meet emerging challenges. They focus the special attention on strengthening the rural credit delivery system to support the growing credit needs of the agricultural and rural sector To provide adequate and timely credit support from the banking system to the farmers for their cultivation needs and to improve farmers' accessibility to bank credit for production purposes to make the credit delivery mechanism simple and to bring more flexibility in the use of credit, Kisan Credit Card Scheme (KCCs) is being introduced for crop loans. This scheme was announced in Budget speech of the Finance Minister in 1998-99. This was implemented throughout the country by public sector commercial banks, RRBs and cooperative banks. The KCC is a powerful mechanism for cutting down transaction costs both for the farmer and the bank (Duvvuri Subbarao, 2012). NABARD has formulated a model scheme for issue of Kisan Credit Cards to farmers on the basis of their land holdings for uniform adoption by banks so that the farmers may use them to readily

purchase agricultural inputs such as seeds, fertilizers, pesticides etc. and also draw cash for their production needs. NABARD plays a vital role in providing the short term credit to the farmers through an innovative idea of Kisan Credit Card Scheme.

II. THE OBJECTIVES OF THE KISAN CREDIT CARD (KCC) SCHEME ARE AS FOLLOWS (ANONYMOUS, 2013)

A. To provide adequate and timely credit to the farmer.
B. To meet short term production needs for the cultivation of crops for the entire year.
C. To meet the working capital requirement for allied and ancillary activities.
D. To meet contingency expenditure for ancillary expenses as medical, education and other needs.

Crop loans disbursed under KCC scheme for notified crops are covered under National Crop Insurance Scheme. The purpose of the scheme is to protect the interest of farmers against crop loss caused by natural calamities, pest attacks etc.

III. HOW KISAN CREDIT CARD SCHEME WORKS?

Kisan Credit Cards are issued to the farmers on the basis of their land holdings and other criteria such as timely payment of past credits etc. Farmers covered under the Kisan Credit Card scheme are issued with a credit card and a passbook or a credit card cum pass book incorporating the name, address, particulars of land holding, borrowing limit, validity period, passport size photo of holder etc. which may serve both as an identity card and facilitate recording of transactions on an ongoing basis.

IV. BENEFITS OF KISAN CREDIT CARD SCHEME

- Simplifies disbursement procedures
- Removes rigidity regarding cash and kind
- No need to apply for loan for every crop
- Assured availability of credit at any time enabling reduced interest burden for the farmer.
- Helps buy seeds, fertilizers at farmer's convenience and choice
- Helps buy on cash-avail discount from dealers
- Credit facility for 3 years – no need for seasonal appraisal
- Maximum credit limit based on agriculture income
- Any number of withdrawals subject to credit limit
- Repayment only after harvest
- Rate of interest as applicable to agriculture advance
- Security, margin and documentation norms as applicable to agricultural advance
- Access to adequate and timely credit to farmers
- Full year's credit requirement of the borrower taken care of.
- Minimum paper work and simplification of documentation for drawal of funds from the bank.
- Flexibility to draw cash and buy inputs.
- Assured availability of credit at any time enabling reduced interest burden for the farmer
- Flexibility of drawls from a branch other than the issuing branch at the discretion of the bank.

V. FEATURES OF KISAN CREDIT CARD SCHEME

- Farmers eligible for production credit of Rs. 5000 or more are eligible for issue of Kisan Credit Card.
- Eligible farmers to be provided with a Kisan Credit Card and a pass book or card-cum-pass book.
- Revolving cash credit facility involving any number of drawls and repayments within the limit.
- Limit to be fixed on the basis of operational land holding, cropping pattern and scale of finance.
- Entire production credit needs for full year plus ancillary activities related to crop production to be considered while fixing limit.
- Sub-limits may be fixed at the discretion of banks.
- Card valid for 3 years subject to annual review. As incentive for good performance, credit limits could be enhanced to take care of increase in costs, change in cropping pattern, etc.
- Each drawls to be repaid within a maximum period of 12 months.
- Conversion/re-scheduling of loans also permissible in case of damage to crops due to natural calamities.
- Security, margin, rate of interest, etc. as per RBI norms.
- Operations may be through issuing branch (and also PACS in the case of Cooperative Banks) through other designated branches at the discretion of bank.
- Withdrawals through slips/cheques accompanied by card and passbook.

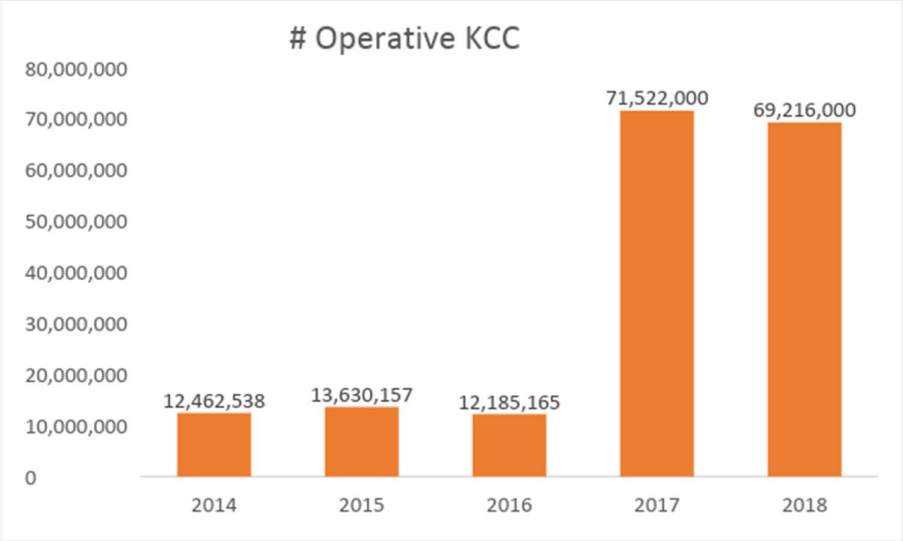
- The interest rates on Kisan Credit Cards varies from bank to bank and also on borrowing limits. Generally, 9% per annum interest rate is charged for KCC borrowing limit up to Rs. 3 Lakh.

VI. BENEFITS OF THE SCHEME TO THE BANKS

- Reduction in workload for branch staff by avoidance of repeat appraisal and processing of loan papers under KCC Scheme.
- Minimum paper work and simplification of documentation for drawl of funds from the bank.
- Improvement in recycling of funds and better recovery of loans.
- Reduction in transaction cost to the banks.
- Better banker-client relationships.

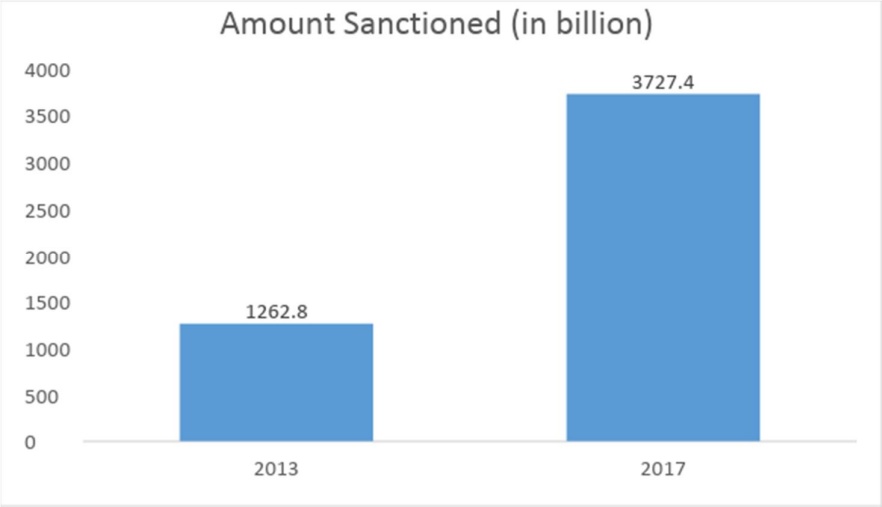
VII. HOW KCC HELPED IN SUSTAINABLE DEVELOPMENT

- The annual growth rate of KCC in India from 1998-1999 to 2012-2013 showed that there was 22.20% and 33.08% increase in the number of credit cards issued and amount sanctioned as credit.
- The number of operative KCC from 2014 to 2018 and amount sanctioned for KCC for 2013 and 2017 are as follows



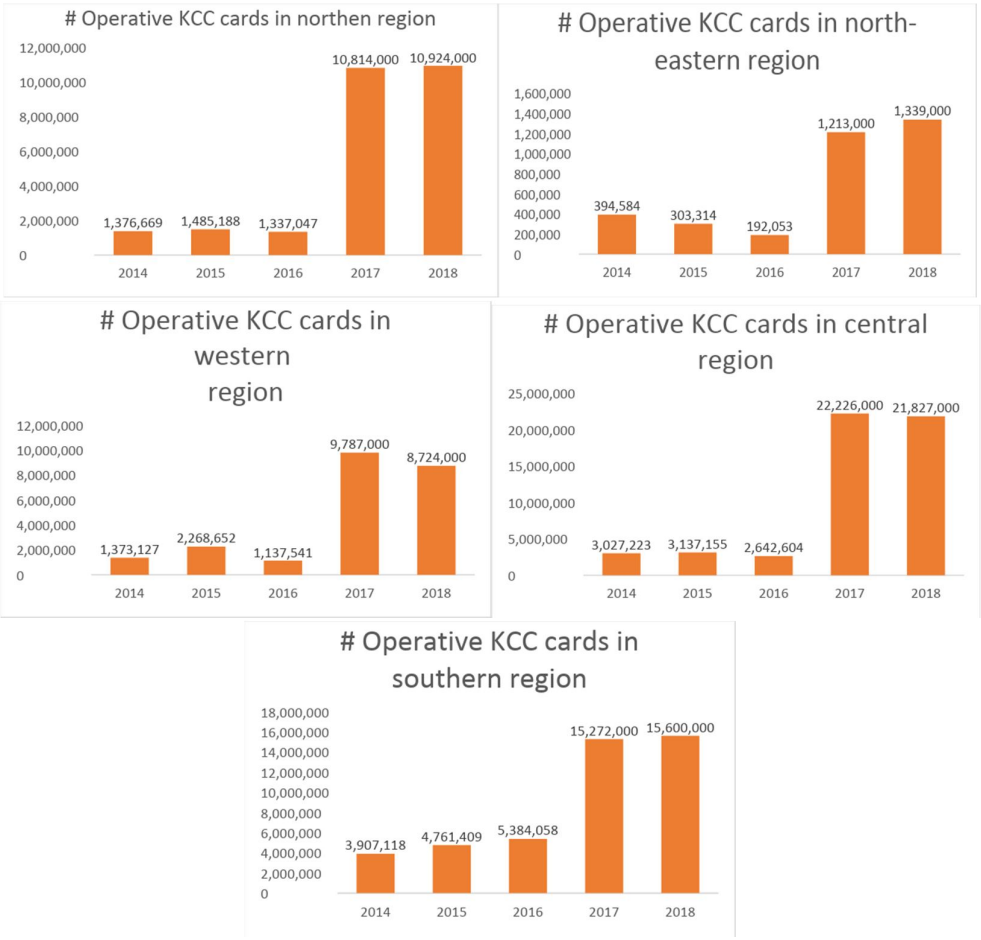
- The growth of # operative KCC has increased by 455% from 2014 to 2018, however, there is a minor decrease of 3% in # operational KCC from 2017 to 2018 , but it has shown a drastic increase in the last two years and there is a sudden hike of # operational KCC from 2016 to 2017 which is 487%

- Amount sanctioned for KCC for 2013 and 2017 are:

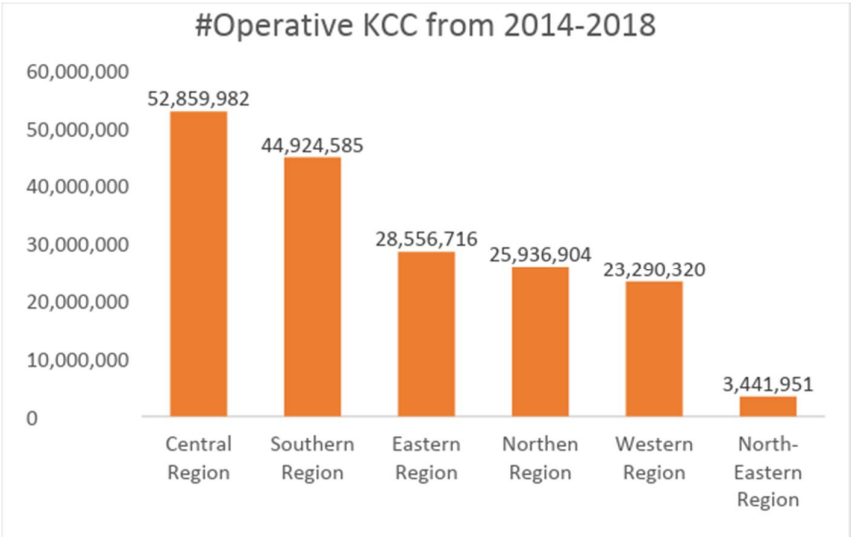


- There is an increase in the amount sanctioned for KCC from 2013 to 2017 and it has increased by 195%

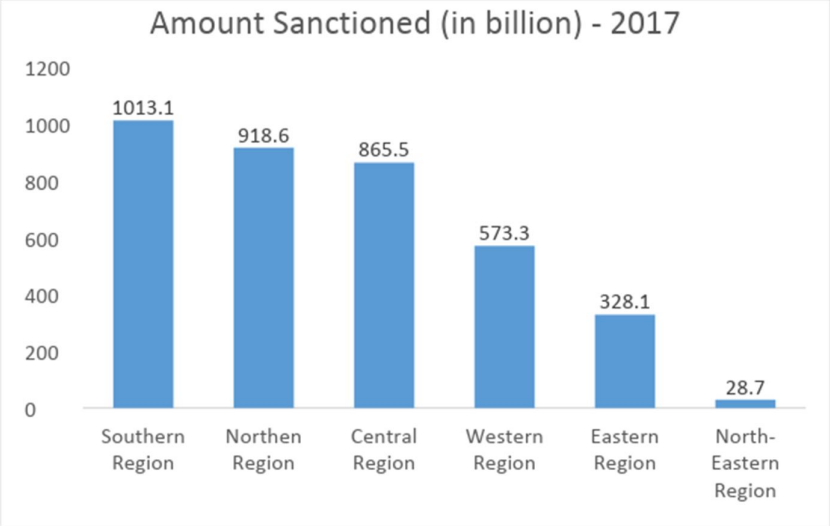
- The number of operative KCC from 2014 to 2018 for various regions and amount sanctioned in various regions in 2013 and 2017 are as follows:



- The 3% decrease in overall operative KCC was from western and central region, while other regions that are east, north, north-east and southern regions have shown an increasing trend in operative KCC.



- Thus # operative highest KCC is in central region followed by southern region, eastern region, northern region, western region and north-east region



- Thus the highest amount was sanctioned in Southern region followed by the northern region, central region, western region, eastern region and north-eastern region
- India is the second largest producer of wheat and rice/paddy in the world. Wheat is highly produced in Uttar Pradesh followed by Punjab, Haryana and Madhya Pradesh and rice is highly produced in Bengal followed by Uttar Pradesh, Andhra Pradesh, and Punjab. India is amongst the second largest producer and export of vegetables, Bengal has the highest production of vegetables followed by Uttar Pradesh, Bihar, and Madhya Pradesh. India is fifth largest producing country for coffee, Karnataka is the largest producer of coffee followed by Kerala, Tamil Nadu, and Andhra Pradesh, and India is fourth largest producing country for rubber, Rubber is highly produced in Kerala. India stands second in pulses production and pulses are highly produced in Madhya Pradesh followed by Uttar Pradesh, Maharashtra, and Rajasthan. India stands first in cotton production and Gujarat is the largest producer of cotton followed by Maharashtra, Telangana, and Karnataka. Thus Uttar Pradesh and Madhya Pradesh fall under the **central region**, West Bengal and Bihar fall under **eastern region** and Karnataka, Kerala, Andhra Pradesh, Telangana, and Tamilnadu falls under the **southern region**, Punjab, Rajasthan and Haryana fall under **northern region** and Gujarat and Maharashtra fall under **western region**. Thus it shows that credit is highly required for various regions of India and KCC have highly reached south, north and central region but it is more required to reach eastern and western regions of India.
- Thus good progress in the KCC scheme has been observed strengthening the agricultural sector of our country which has led to sustainable socio-economic development.

VIII. PROBLEM STATEMENT/ROAD BLOCKS

- Despite the penetration of KCC, farmers still rely on money lenders. According to the report of All India Rural Financial Inclusion Survey (NAFIS), 2018, found that only 10.5% of agricultural households held a valid KCC. It also showed against an average borrowing limit of Rs 1.39 lakh, the amount drawn was Rs 91000. This shows that schemes have largely facilitated drawing of credit for agricultural operations by reducing procedural hassles of getting the loan sanctioned for each crop cycle. However, lower drawings show that lack of confidence of earning enough profit to be able to repay the loan in time. Many farmers committed suicide due to indebtedness
- According to NAFIS report, it is also observed that 30.3% of agri-households still borrowed money from non-institutional sources like money lenders, relatives, and input suppliers etc. About 9% agri-households borrowed from both institutional and non-institutional sources
- NAFIS also covers the penetration of crop insurance, finding that out of households which had taken any loan for agricultural operations, only 6.9% reported they had any crop insurance. It is thus a myth that banks deduct the insurance premium from all farmers who have taken the loan on KCC. Premium is payable only on crops notified by the state government.
- Moreover, illiteracy of farmers is also one factor of lack of awareness amongst farmers for any beneficial schemes coming for farmers, according to a report of UNESCO 2015, there are 32% of India's population which is illiterate and for farmers percentage may be even higher

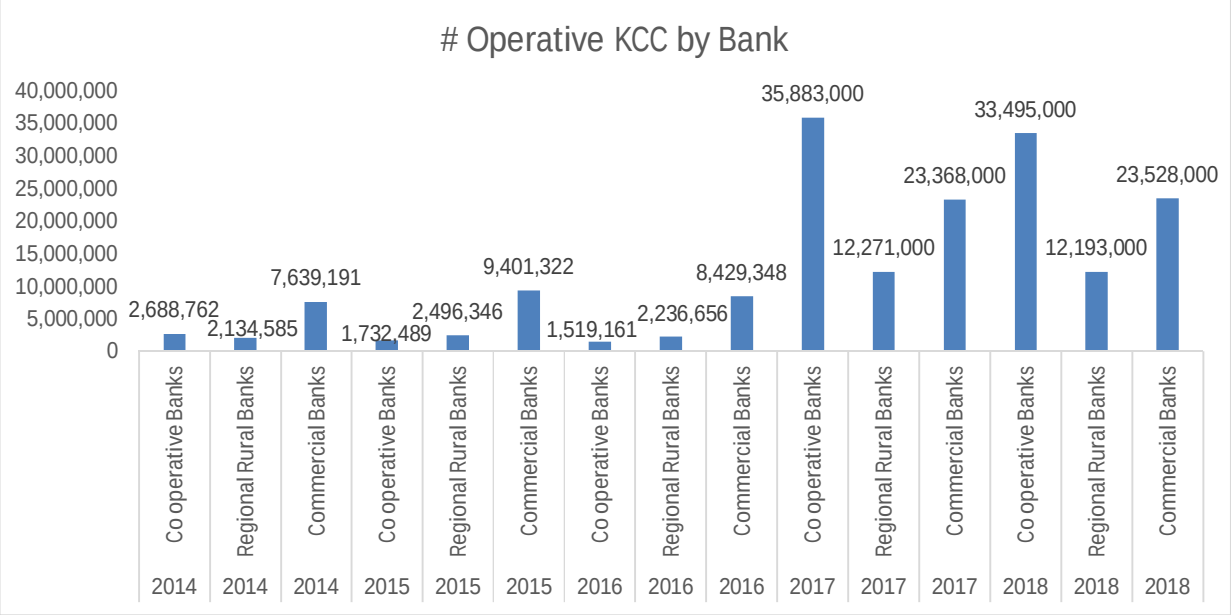
- Moreover, other factors such as monthly income and family responsibilities have also led to the utilization of KCC for other purposes, according to reports by Indian express as of August 2017, farmers utilized KCC for various other purposes which are as follows
    - 12% non- farm investment
    - 23% for the marriage of children
    - 10% for building new houses and for children's education
    - 6 % for sending family members abroad
- With the increase in cards, the outstanding balance on KCC has also increased in the last two years. It was Rs. 6496.2 billion in 2017 which increased to 6709.6 billion in 2018, thus outstanding amount increased by 3% from 2017 to 2018
- According to the latest article (by Business news) on 1st November 2018, the following are key points highlighted by former RBI Governor Raghuram Rajan.
    - Kisan Credit Cards (KCC) can be a potential credit risk for the economy, In India, even today, agricultural transactions are done predominantly in cash (which is permitted) and banks in most cases don't ask for documents to support a borrower's claim that the cash deposited is generated from agriculture purposes only. Hence, KCC provides an opportunity for unscrupulous borrowers to exploit the banking channel for placement and layering of black money generated in other business activities like real estate, indigenous money lending, and bullion traders, in order convert the same into white in the form of repayment of KCC loan amount. Hence, the KCC route being used for money laundering activities cannot be ruled out.
    - Borrowers commonly avail higher loans from banks by inflating the quantum of land under cultivation. This is achieved in two ways: (1) In case of owned lands, borrowers often resort to "double dipping"—borrowers and family members avail multiple loans either from the same bank or from different, for the same piece of land owned by them. This largely remains undetected by banks as, in many cases, checks are not performed by them to identify such instances. (2) In the case of leased lands, an oral lease agreement is permitted by banks and regulators, hence many borrowers disclose fictitious lease agreements that have the only acreage with no identifiable details to inflate the quantum of loan.
    - Revolving cash facility which entails unlimited withdrawals and repayments as long as it is within the prescribed limits makes KCC vulnerable to money laundering. Such a facility could be convenient if a customer wants to churn money in and out of the system in small amounts and facilitate terrorist financing or activity. Terrorist financing does not require cash in bulk or in huge amounts, but in smaller amounts as and when required, so most alert monitoring systems miss out on patterns of terrorist financing activity.
    - KCC could also be used for "nesting" due to lack of adequate documentation requirement. A customer can facilitate payments or deposits on behalf of someone which could easily be crime proceeds. Banks need to strengthen KYC norms, monitor end-utilization of funds, strengthen KCC policies and procedures, and extend KCC facilities only to the needy.
    - The use of field intelligence, mystery shopping as well as extensive **data analytics** can help banks to detect red flags at an early stage and fight this menace. In the absence of immediate remedial measures, KCC could well be the next bubble of money laundering.

IX. WAY FORWARD - ROLE OF DATA ANALYTICS

A. Recommendation system for farmers

1) According to an article published on November 14th, 2018 by financial express, digital farming will impact 70 million Indian farmers in 2020 and it will add $9 billion to farmer incomes. Moreover, there are 30 million smartphone owning farmers and an expected increase in internet usage in rural India to 315 million by 2020, which will be an easy way to connect, communicate and coordinate. Thus a recommendation website for farmers for choosing best KCC amongst various banks can be developed. Recommendation system will help to understand farmers regarding credit requirement and also assure they have not taken much credit which can lead them to debts.

2) In India, KCC is provided by Cooperative banks, regional rural banks, and commercial banks.



3) The highest KCC is provided by cooperative Banks followed by commercial banks and regional rural banks

4) Recommendation system will need data of farmers from across India of all banks of KCC. Data required for recommendation system will be farmer's information like his age, income, state, village, education, caste, size of family, type of family, social participation, aadhar card number, land holdings, experience of farmer, gender and also some performance data like past transaction behaviour, Loan amount / Credit Limit, extent of cultivation, collateral amount and also name of bank for KCC and also data from credit information companies like CIBIL score which helps to understand performance of farmers.

5) The data will be trained using Item-Item Collaborative filtering, that is it will find item look alike, the item look alike matrix will study the data of farmers who performed well on cards of various banks and it will recommend card of those bank which best suited farmer considering various information of farmers such as age, income, state, village, education, caste, size of family, land holding, past transaction behaviour, Loan amount/ Credit Limit, extent of cultivation, collateral amount, experience of farmer, gender and CIBIL score.

6) The recommendation system will first ask aadhar card number of farmer and this will look into the entire database and if any record already exists about that farmer then it will recommend next best KCC of any bank using algorithm and if farmer is new and doesn't have KCC and doesn't know about KCC and want credit from banks then recommendation system will ask questions on following topics:

Age
Gender
Income
State
Village
Education
Caste
Size of family
Landholding
Loan amount they need
Cultivation in the last 1 year
Experience in farming

7) Different banks come up with different KCC scheme and farmers doesn't know which bank to approach so, the recommendation system will understand the inputs given by farmers and on basis of historical data of various other farmers it will recommend the best suitable bank's KCC to farmer which performed well on similar condition and also it will recommend how much credit limit/loan should be taken by farmers so that farmers don't face high debts.

B. Intelligent System for Banks

1) The increasing misuse of KCC for the non-agricultural purposes has led to money laundering and also the debts are increasing.

2) Proper use of data and analytics can help to mitigate risk and develop the economy

3) The intelligent system will be different for banks to banks for tracking the behavior of farmers. If a farmer is approaching a bank for KCC then banks have to input their aadhar card number and then the system will check if that farmer has any KCC with other banks and if that farmer has taken any KCC from other banks then the intelligent system will give entire portfolio assessment of that farmer. This will help the bank to take further actions of sanctioning KCC to that farmer.

4) After providing KCC, the intelligent system will also help banks to identify risky accounts in the following way.

a) Data is required to understand the risky behavior of farmers and carry out campaigns like credit limit increase to encourage farming and credit limit decrease to reduce the burden of debt in the economy.

b) Data of farmer consist of various fields such as age, income, state, village, education, caste, size of family, land holding, collateral amount, extent of cultivation, experience of farmer and monthly performance data should have fields like Loan amount/ Credit Limit, CIBIL score, last statement balance, amount paid as of last statement balance, amount revolving as of last statement balance, amount delinquent and charge off amount, account status.

c) Markov decision process is a technique that deals with probabilities of future occurrences by analysing presently known probabilities, this technique will help to calculate the probability of amount that will be received and the amount that will go as bad debt in future.

d) Performance data which includes last statement balance, amount paid as of last statement balance, amount revolving as of last statement balance, amount delinquent and charge off amount will be taken for all months up to current month and with help of Markov decision process the probability of amount to be received and amount that will go as bad debt will help banks to predict the credit risk on KCC and they can plan strategy accordingly

e) Now Markov decision process will give the prediction at the overall level, but there should be a technique which indicates each farmer account as good or bad account with green or red flag respectively.

f) Machine learning algorithms like logistic regression, decision tree, and SVM algorithm can be used to develop predictive models which will trigger the risky accounts in advance and banks will know how much credit to grant and if necessary carry out credit limit decrease campaign. The model will have Account status (good and bad) as dependent variable which is calculated from performance data that is good accounts are those which are not overdue that is those accounts which have paid loan amount on time and there is no outstanding and revolving balance and those who have credit balance in their account and bad accounts are those who are charged off and has revolving balance or outstanding balance and also have delinquent amount. Independent variables will be age, income, state, village, education, caste, size of family, land holding, collateral amount, extent of cultivation, experience of farmer, Loan amount/ Credit Limit, CIBIL score, last statement balance, amount paid as of last statement balance, amount revolving as of last statement balance, amount delinquent and charge off amount.

g) Thus it will trigger banks in advance for risks and decrease their credit line and also will help farmers to decrease their expenses on credit card.

h) Further, if accounts are good and they don't carry risks then banks can increase the credit line on the credit card and it will encourage farmers to spend more on agricultural development.

i) Thus, mitigating credit risk by helping farmers with appropriate credit will lead to sustainable development.

X. PRACTICAL APPLICATION ON INDIAN OVERSEAS BANK FOR RISKY ACCOUNTS

A. Performance Data of MAHABUBABAD district (Indian state of Telangana) of 3 years from 2016 to 2018 was analysed to find the risky accounts

B. Data has fields like advance balance, amount debited, outstanding balance, amount received, interest received and drawing power on credit card.

C. There were 2707 total accounts, out of which 1753 accounts were good and 954 accounts were bad.

D. The following are the few findings:

1) Good accounts were labelled as 0 and Bad/Risky accounts were labelled as 1

2) Predictive model was developed by using SVM, Logistic regression and decision tree and following are some statistical results of 3 algorithms.

Algorithm	Accuracy	Sensitivity	Specificity	ROC/AUC
SVM	61%	91%	0.74%	45%
Logistic Regression	65%	91.32%	11.85%	51%
Decision Tree	54%	64%	33.71%	48%

3) Considering above parameters logistic regression was best performer and was able to correctly predict risk with 65% accuracy and high sensitivity and good ROC/AUC score in comparison to others

E. The analysis and prediction can be more strong if data of age, income, state, village, education, caste, size of family, land holding, collateral amount, extent of cultivation, experience of farmer and CIBIL score of farmers would have been considered and only the best predictors would have chosen for final prediction

F. Thus this would help banks to get triggers of risk in advance and mitigate credit risk while helping farmers with credit.

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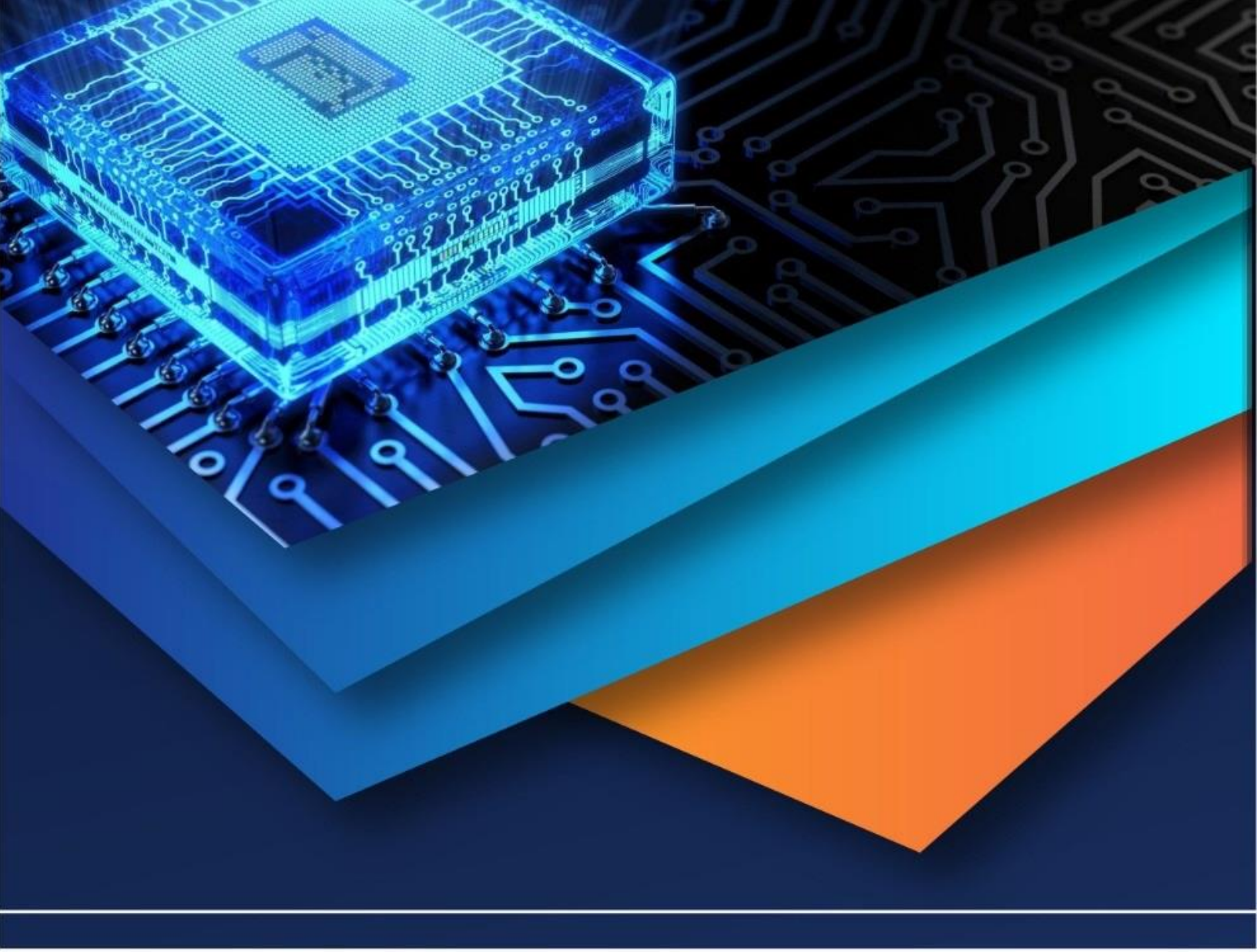

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