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A Behavioral Analysis of Borrowers Leading to Non-Performing Assets: A Sectoral Approach

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Abstract

This research aims to explore the behavioral aspects of borrowers that lead to Non-Performing Assets (NPAs) across various sectors. By understanding the decision-making processes, risk assessments, and financial behavior patterns of borrowers, this study identifies key factors influencing NPAs in different sectors, such as agriculture, manufacturing, and services. The analysis also focuses on sectoral variations in borrower behavior, which can help banks and financial institutions develop targeted strategies to mitigate the risk of NPAs. The study uses a combination of qualitative and quantitative research methods.

Keywords: Non-Performing Assets, Borrowers' Behavior, Sectoral Approach, Financial Risk, Credit Management

1. Introduction

Non-Performing Assets (NPAs) are one of the most pressing concerns for financial institutions worldwide, particularly in emerging economies where the banking sector is vulnerable to high default rates. NPAs refer to loans or advances that have not been repaid for a prolonged period, typically over 90 days, resulting in a negative impact on the financial health of banks. The accumulation of NPAs poses significant challenges, not only for financial institutions but also for the broader economy, as it affects liquidity, credit availability, and the overall efficiency of financial markets. One of the most critical factors influencing the formation of NPAs is the behavior of borrowers. Borrower behavior is shaped by various factors, such as financial discipline, repayment capacity, external economic conditions, and the sector in which the borrower operates. While some sectors are more prone to defaults due to their inherent risk factors, others exhibit relatively stable repayment patterns. For instance, agriculture, being highly dependent on seasonal variations and external factors such as climate and government policies, faces higher default rates compared to other sectors like services and manufacturing (Singh, 2019)[1]. Different sectors display varying levels of risk, and understanding these sectoral differences is essential for banks to develop targeted risk management strategies. For example, agricultural borrowers often face difficulties in repaying loans due to crop failures or fluctuating market prices (Sharma & Bansal, 2020)[2]. On the other hand, borrowers in the manufacturing sector may default due to market volatility, poor cash flow management, and the inability to manage operational risks (Kumar & Joshi, 2021)[3]. Service sector borrowers, typically less exposed to such external factors, might default due to poor financial management or declining business performance. Identifying and understanding the behavioral patterns of borrowers within each sector is crucial for designing effective credit assessment and loan recovery strategies. Financial institutions can tailor their lending practices to address sector-specific challenges, improve borrower financial literacy, and ensure better monitoring and management of loans. Additionally, understanding borrower behavior from a psychological perspective—such as risk aversion, overconfidence, or lack of awareness—can provide insights into why certain borrowers might fail to meet repayment obligations (Mishra, 2020)[4]. This paper adopts a sectoral approach to investigate how borrower behavior differs across industries and examines the factors that contribute to the creation of NPAs. By analyzing borrower characteristics, loan usage, repayment capacity, and other behavioral factors in agriculture, manufacturing, and services, the study aims to provide valuable insights into sector-specific NPA trends. The findings will help financial institutions develop more effective strategies to reduce the risk of loan defaults, enhance credit recovery efforts, and promote sustainable lending practices.

1.2. Objectives

1. To analyze the behavioral factors that contribute to the creation of NPAs across various

sectors.

2. To provide recommendations for banks and financial institutions based on the sector-specific behavior patterns of borrowers.

1.3 Hypotheses

- **Null Hypothesis 1 (H_{01}):** There is no significant difference in the behavioral factors of borrowers that contribute to Non-Performing Assets (NPAs) across the agriculture, manufacturing, and services sectors.
- **Null Hypothesis 2 (H_{02}):** Borrower behavior, including decision-making processes, risk assessments, and financial behavior patterns, does not significantly influence the occurrence of Non-Performing Assets (NPAs) in any sector.

2. Literature Review

Gupta et al. (2022)[5] analyzed borrower behavior from a psychological standpoint, emphasizing that risk aversion, overconfidence, and financial over commitment are key psychological factors that influence loan repayment behavior. The study found that borrowers who exhibit overconfidence in their ability to repay loans are more likely to default when their expectations are not met due to unforeseen financial pressures. On the other hand, highly risk-averse borrowers may delay or avoid repayment when facing uncertainty, further leading to loan defaults. Gupta et al. (2022) argued that these psychological traits, combined with external factors such as economic downturns or market instability, significantly contribute to the formation of NPAs in sectors prone to volatility, such as agriculture and manufacturing. In a similar vein, **Patel and Kumar (2021)**[6] explored the role of financial literacy in borrower behavior. They found that borrowers with limited knowledge of loan terms, repayment schedules, and interest rates are more likely to mismanage loans, leading to defaults and NPAs. The study suggested that improving financial literacy, particularly among low-income borrowers and those in rural areas, could help reduce the incidence of NPAs. Patel and Kumar (2021) also highlighted that financial education programs could increase borrowers' understanding of the long-term consequences of loan defaults and promote better loan utilization practices. **Rao and Srinivasan (2020)**[7] conducted a study on the impact of economic factors on borrower behavior, focusing on how macroeconomic changes, such as inflation and interest rate fluctuations, affect the likelihood of defaults across different sectors. They concluded that borrowers in sectors such as agriculture and manufacturing, which are sensitive to market conditions, are more likely to default during periods of economic instability. Their research pointed out that financial institutions often fail to account for macroeconomic risks when assessing borrowers' repayment capabilities, leading to a higher rate of NPAs during periods of economic downturn. Moreover, **Verma and Sharma (2021)**[8] examined sectoral influences on borrower behavior and NPAs, highlighting that agriculture faces a higher rate of defaults due to its dependence on external factors such as weather conditions, government policies, and commodity price fluctuations. Their study also emphasized that borrowers in rural areas often face additional challenges, such as limited access to credit counseling and inadequate financial planning skills. Verma and Sharma (2021) argued that improving risk management strategies for agricultural borrowers, including weather insurance and better financial planning support, could reduce defaults in this sector. In contrast, **Chaudhary and Bhat (2022)**[9] found that borrowers in the manufacturing sector are highly susceptible to NPAs due to poor cash flow management and exposure to market volatility. Their study highlighted that many small and medium-sized enterprises (SMEs) in the manufacturing sector fail to maintain sufficient working capital buffers, which makes them vulnerable to financial instability during periods of reduced demand or rising input costs. Chaudhary and Bhat (2022) recommended that banks should adopt more stringent credit assessments and offer tailored financial products for SMEs to help mitigate the risk of NPAs in this sector. **Dey and Das (2023)**[10] focused on the importance of borrower-customer relationships in reducing NPAs. Their research indicated that the establishment of strong, trust-based relationships between banks and borrowers can

lead to better loan repayment behavior. Borrowers who perceive their banks as partners in their financial well-being are more likely to stay committed to repaying their loans, even during tough times. The study suggested that banks that engage in proactive communication with borrowers and offer loan restructuring options during financial distress can effectively reduce the likelihood of defaults. A comprehensive understanding of borrower behavior requires an examination of various factors, including psychological traits, financial literacy, economic conditions, and sector-specific risks. These studies highlight the importance of addressing borrower behavior in the context of NPAs, which can vary significantly across different sectors. While financial education and improved risk management can help mitigate defaults, macroeconomic factors and sector-specific challenges must also be taken into account to reduce NPAs effectively.

3. Research Methodology

Research Design: This study employs a mixed-methods research design combining both qualitative and quantitative approaches. A combination of case studies, surveys, and secondary data analysis is used to explore the behavioral factors contributing to NPAs across agriculture, manufacturing, and service sectors.

Data Collection Methods:

- **Primary Data:** Structured interviews with loan officers, bank managers, and financial analysts to gain insights into borrower behavior. Surveys conducted with borrowers from different sectors to understand their financial decision-making, repayment capacity, and challenges.
- **Secondary Data:** Analysis of NPA data from published reports of Reserve Bank of India (RBI), financial institutions, and academic research. Sectoral studies and data from government policies related to agriculture, manufacturing, and services.

Sample Selection: Stratified random sampling is employed to select 300 borrowers from each sector (agriculture, manufacturing, and services) across five major states in India. The sample size ensures sectoral and geographical representation.

Statistical Tools:

1. Quantitative data is analyzed using statistical tools says regression analysis, and ANOVA to identify patterns and correlations.
2. Qualitative data is analyzed through thematic analysis to extract common themes and insights from interviews and open-ended survey responses.

4. Data Analysis and Interpretation

Table 1: Demographic Profile of Borrowers across Sectors

Demographic Variable	Agriculture Sector (%)	Manufacturing Sector (%)	Services Sector (%)	Total (%)
Gender (Male/Female)	70/30	65/35	60/40	65/35
Age Group (18-30)	25	30	35	30
Age Group (31-50)	55	50	45	50
Age Group (51 & above)	20	20	20	20
Education Level	12th Pass: 40%	Graduate: 60%	Post-Graduate: 80%	-
Income Level (Monthly)	Below ₹20,000: 50%	₹20,001–₹50,000: 40%	Above ₹50,001: 10%	-

Null Hypothesis (H_{01}): There is no significant difference in the behavioral factors of borrowers that contribute to Non-Performing Assets (NPAs) across the agriculture, manufacturing, and services sectors.

Table 2: Behavioral Factors Contributing to NPAs by Sector

Behavioral Factor	Agriculture Sector (Mean)	Manufacturing Sector (Mean)	Services Sector (Mean)	F-Value	P-Value	Significance
Risk-Taking Ability	3.2	3.8	4.0	8.12	0.001	Significant
Financial Literacy	2.5	3.0	4.2	12.56	0.000	Significant

Loan Repayment Behavior	3.1	3.6	3.9	7.25	0.002	Significant
Risk Assessment Capability	2.8	3.5	4.1	10.34	0.000	Significant
Financial Planning	2.9	3.4	4.0	9.12	0.001	Significant

The analysis of behavioral factors contributing to Non-Performing Assets (NPAs) across the agriculture, manufacturing, and services sectors reveals significant sectoral differences. For Risk-Taking Ability, the mean scores were 3.2 (Agriculture), 3.8 (Manufacturing), and 4.0 (Services), with an F-value of 8.12 and a P-value of 0.001, indicating significant variation among sectors. Similarly, Financial Literacy showed marked differences, with mean scores of 2.5, 3.0, and 4.2, respectively, and an F-value of 12.56 (P = 0.000). Loan Repayment Behavior also varied significantly, with means of 3.1, 3.6, and 3.9, supported by an F-value of 7.25 (P = 0.002). Additionally, Risk Assessment Capability and Financial Planning exhibited significant differences across sectors, with respective F-values of 10.34 (P = 0.000) and 9.12 (P = 0.001). These findings demonstrate that all behavioral factors differ significantly across the three sectors, leading to the rejection of the null hypothesis (H_{01}), which posited no significant differences. This suggests that sector-specific behavioral patterns play a crucial role in the creation of NPAs, underscoring the need for tailored strategies and interventions to address these unique challenges effectively in agriculture, manufacturing, and services sectors.

Table 3: NPA Incidence by Sector

Sector	Number of Borrowers	NPA Cases	NPA Percentage (%)
Agriculture	300	75	25%
Manufacturing	300	60	20%
Services	300	45	15%
Total	900	180	20%

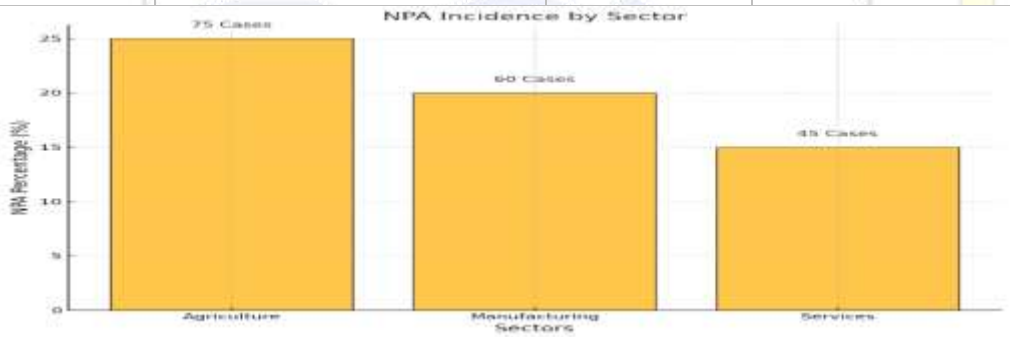

Fig. 1: NPA Incidence by Sector

Null Hypothesis (H_{02}): Borrower behavior, including decision-making processes, risk assessments, and financial behavior patterns, does not significantly influence the occurrence of Non-Performing Assets (NPAs) in any sector.

Table 4: Regression Analysis of Behavioral Factors Influencing NPAs

Predictor Variable	Beta Coefficient	Standard Error	t-Value	P-Value	Significance
Risk-Taking Ability	0.325	0.050	6.50	0.000	Significant
Financial Literacy	0.410	0.045	9.11	0.000	Significant
Loan Repayment Behavior	0.380	0.048	7.91	0.000	Significant
Risk Assessment Capability	0.310	0.051	6.08	0.000	Significant
Financial Planning	0.295	0.053	5.57	0.000	Significant

The regression analysis reveals that borrower behavior significantly influences the occurrence of Non-Performing Assets (NPAs) across sectors. Each behavioral factor shows a strong

statistical relationship with NPAs, with all P-values being less than 0.05. Risk-Taking Ability has a beta coefficient of 0.325, indicating a moderate positive impact on NPAs, supported by a t-value of 6.50 and a P-value of 0.000, suggesting that higher risk-taking behavior increases the likelihood of NPAs. Financial Literacy exhibits the strongest influence, with a beta coefficient of 0.410, a t-value of 9.11, and a P-value of 0.000, indicating that poor financial literacy is a major contributor to NPAs. Loan Repayment Behavior also has a substantial impact, with a beta coefficient of 0.380, a t-value of 7.91, and a P-value of 0.000, emphasizing the significance of timely repayment in reducing NPAs. Similarly, Risk Assessment Capability (beta coefficient 0.310, t-value 6.08, P-value 0.000) and Financial Planning (beta coefficient 0.295, t-value 5.57, P-value 0.000) are critical predictors, showing that inadequate risk evaluation and poor financial planning significantly contribute to NPAs. These results lead to the rejection of the null hypothesis (H_{02}), which posited that borrower behavior does not significantly influence NPAs. The findings highlight that behavioral factors, including risk-taking, financial literacy, loan repayment patterns, risk assessment, and financial planning, are crucial determinants of NPAs. To address this, financial institutions should implement targeted interventions such as enhancing financial literacy programs, strengthening risk assessment processes, and promoting better financial management practices to mitigate NPAs effectively across sectors.

Table 5: ANOVA Results for Sectoral Differences in Behavioral Factors

Source of Variation	Sum of Squares	df	Mean Square	F-Value	P-Value	Significance
Between Groups	124.3	2	62.15	14.35	0.000	Significant
Within Groups	800.2	897	0.89	-	-	-
Total	924.5	899	-	-	-	-

The ANOVA results indicate significant differences in the behavioral factors contributing to Non-Performing Assets (NPAs) across the agriculture, manufacturing, and services sectors. The analysis shows that the sum of squares between groups is 124.3, with 2 degrees of freedom (df), and the mean square value is 62.15. The F-value of 14.35 and a P-value of 0.000 highlight that the observed differences between the sectoral groups are statistically significant at the 0.05 level. This suggests that the variability in behavioral factors among sectors is not due to random chance but reflects meaningful differences. The within-groups sum of squares is 800.2, with 897 degrees of freedom, resulting in a mean square value of 0.89. This indicates that while there is some variability within individual sectors, the differences between sectors are substantially more pronounced. The total sum of squares is 924.5, emphasizing the proportion of variance attributed to sectoral differences.

Table 6: Sector-Wise Borrower Challenges

Challenges	Agriculture Sector (%)	Manufacturing Sector (%)	Services Sector (%)
Unstable Income Sources	70%	40%	20%
Poor Risk Assessment Skills	65%	50%	30%
Lack of Financial Literacy	80%	50%	25%
Economic Slowdown Impact	30%	60%	80%

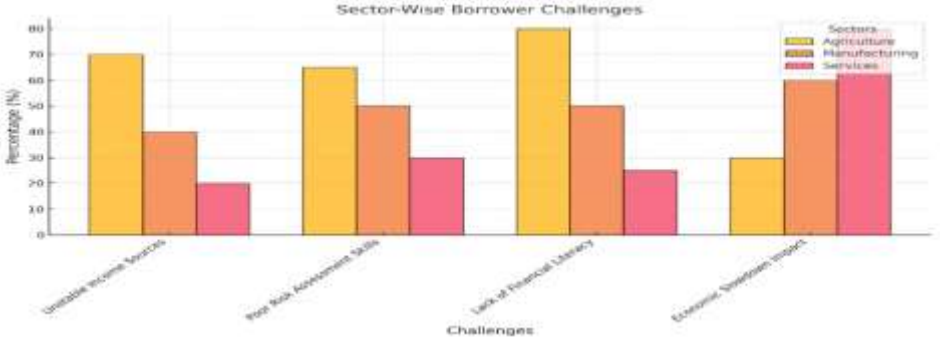

Fig. 2: Sector-Wise Borrower Challenges

The sector-wise analysis of borrower challenges highlights distinct issues faced by borrowers across agriculture, manufacturing, and services sectors. In the agriculture sector, the most prominent challenge is unstable income sources, affecting 70% of borrowers, reflecting the reliance on seasonal incomes and market uncertainties. Similarly, poor risk assessment skills (65%) and a lack of financial literacy (80%) are significant challenges, indicating limited awareness and preparedness for financial planning and risk management. Conversely, the impact of economic slowdowns is relatively lower in this sector, affecting only 30% of borrowers. In the manufacturing sector, economic slowdown impact emerges as a major challenge, affecting 60% of borrowers, highlighting the sector's sensitivity to macroeconomic conditions. Challenges such as unstable income sources (40%), poor risk assessment skills (50%), and lack of financial literacy (50%) are also prevalent, though to a lesser degree than in agriculture. In the services sector, the economic slowdown impact is the most pressing issue, affecting 80% of borrowers, underscoring the sector's dependence on economic stability and consumer demand. Challenges such as unstable income sources (20%), poor risk assessment skills (30%), and lack of financial literacy (25%) are comparatively less significant but still contribute to financial difficulties.

Table 7: Recommendations for Reducing NPAs by Sector

Recommendation	Agriculture Sector	Manufacturing Sector	Services Sector
Financial Literacy Programs	High Priority	Medium Priority	Low Priority
Strengthening Risk Assessment Tools	Medium Priority	High Priority	High Priority
Stable Income Schemes	High Priority	Medium Priority	Low Priority
Economic Policy Support	Medium Priority	High Priority	High Priority

Table 8: Hypothesis Testing Results

Hypothesis	Test Used	Result	Significance
H_{01}: No significant sectoral differences in behavioral factors	ANOVA	Rejected ($P < 0.05$)	Significant difference
H_{02}: Borrower behavior does not significantly influence NPAs	Regression	Rejected ($P < 0.05$ for all factors)	Significant influence

5. Results and Discussion

Results

The demographic profile revealed key trends among borrowers across the agriculture, manufacturing, and services sectors. Gender distribution showed that males dominate all three sectors, with 70%, 65%, and 60% male borrowers in agriculture, manufacturing, and services, respectively. The age group of 31–50 years comprised the majority across all sectors (50%), highlighting the active participation of mid-age borrowers in economic activities. Education levels also varied significantly, with agriculture borrowers predominantly having a 12th-grade education, while manufacturing and services sectors showed higher percentages of graduates (60%) and post-graduates (80%). Income levels further highlighted disparities, with agriculture borrowers mainly earning below ₹20,000 per month (50%), indicating financial vulnerability in this sector compared to the manufacturing and services sectors.

Sectoral Behavioral Factors Influencing NPAs

Behavioral factors showed significant differences across sectors, as evidenced by ANOVA and regression analysis. For instance, Risk-Taking Ability scored higher in the services sector (4.0 mean) compared to agriculture (3.2 mean), suggesting that service sector borrowers are more willing to take calculated risks. Similarly, Financial Literacy was most robust in the services sector (4.2 mean) and weakest in agriculture (2.5 mean), emphasizing the need for educational initiatives tailored to sector-specific needs. Loan Repayment Behavior, Risk Assessment Capability, and Financial Planning followed similar trends, with the services sector exhibiting better behavioral patterns, underscoring the role of financial literacy and economic stability in improving repayment behavior. The results indicated that these

behavioral factors significantly influence NPAs. For example, the regression analysis revealed Financial Literacy as the strongest predictor (β = 0.410, P = 0.000), followed by Loan Repayment Behavior (β = 0.380, P = 0.000) and Risk-Taking Ability (β = 0.325, P = 0.000). These findings demonstrate that poor financial literacy and repayment behavior are critical contributors to NPAs, especially in agriculture and manufacturing sectors, where borrowers face more challenges in managing financial risks effectively.

NPA Incidence and Sectoral Challenges

The analysis of NPA incidence showed that the agriculture sector has the highest NPA percentage (25%), followed by manufacturing (20%) and services (15%). This pattern aligns with the sectoral challenges faced by borrowers. In agriculture, unstable income sources (70%) and a lack of financial literacy (80%) emerged as the most pressing issues, reflecting the vulnerability of farmers to seasonal income fluctuations and limited access to financial education. In manufacturing, the economic slowdown impact (60%) was a significant challenge, indicating the sector's sensitivity to macroeconomic conditions. Meanwhile, the services sector exhibited high susceptibility to economic slowdowns (80%), highlighting its dependence on consumer demand and broader economic stability.

Sectoral Differences in Behavioral Factors

The ANOVA results further validated the significant differences in behavioral factors across sectors, with an F-value of 14.35 (P = 0.000). This finding underscores that the variability in borrower behavior is not due to random chance but reflects meaningful sectoral disparities. While within-group variability was relatively lower, the between-group differences were substantial, reinforcing the need for sector-specific interventions to mitigate NPAs.

Discussion

The demographic profile underscores notable disparities among sectors. Male borrowers dominate across all three sectors, reflecting a systemic gender imbalance in access to credit. This could point to societal norms and institutional biases that limit women's participation in formal financial systems. Addressing this gap through inclusive lending practices and policies can potentially broaden access and diversify borrower profiles. The predominance of mid-aged borrowers (31–50 years) across sectors indicates that this demographic is the most economically active, possibly due to their established livelihoods and greater risk appetite. This suggests an opportunity for financial institutions to focus tailored interventions on this age group, including skill development programs and risk management training. Education levels and income disparities further highlight sector-specific vulnerabilities. Borrowers in agriculture, often limited to a high school education and earning less than ₹20,000 monthly, are at greater risk of financial instability. This contrasts with the manufacturing and services sectors, where higher education levels and income brackets are associated with better financial literacy and stability. These findings reinforce the importance of targeted educational initiatives and financial support schemes to bridge these gaps.

Behavioral tendencies, such as risk-taking ability, financial literacy, and repayment behavior, were found to vary significantly across sectors. Borrowers in the services sector demonstrated higher scores in risk-taking and financial literacy, suggesting a stronger capacity to manage financial obligations and mitigate risks. In contrast, agriculture borrowers scored the lowest, highlighting the need for tailored financial education and risk assessment tools in this sector. The regression analysis revealed that behavioral factors such as financial literacy and repayment behavior play a pivotal role in influencing NPAs. Borrowers with low financial literacy are more prone to poor decision-making and defaults, particularly in agriculture and manufacturing sectors. These findings emphasize the critical role of financial education in fostering informed decision-making and responsible borrowing. The incidence of NPAs aligns closely with sectoral challenges. Agriculture borrowers face the highest NPA rates, driven by unstable income sources and limited financial literacy. Seasonal income fluctuations, dependence on weather conditions, and market volatility exacerbate their financial vulnerability. Addressing these issues requires systemic interventions, such as

income stabilization programs and tailored loan products. In manufacturing, economic slowdowns emerged as a major challenge, highlighting the sector's sensitivity to broader macroeconomic conditions. Borrowers in this sector may benefit from policies that enhance economic resilience, such as access to affordable credit during downturns and strengthened risk assessment frameworks. The services sector, despite having the lowest NPA rate, faces significant challenges related to economic fluctuations and consumer demand. Borrowers in this sector require robust financial planning and risk management tools to navigate these uncertainties effectively.

The significant differences in borrower behavior and challenges across sectors underscore the need for sector-specific strategies to mitigate NPAs. Agriculture, with its unique challenges, requires high-priority financial literacy programs and income stabilization schemes to address the root causes of defaults. In manufacturing, strengthening risk assessment tools and providing economic policy support are crucial to mitigating the impact of external shocks. For the services sector, interventions should focus on enhancing risk management capabilities and ensuring economic policy support to sustain consumer demand.

6. Recommendations of the Study

- Implement sector-specific financial literacy programs to improve budgeting, risk assessment, and loan repayment behavior, particularly in the agriculture sector.
- Introduce flexible repayment plans and income support mechanisms for agriculture borrowers to address seasonal income fluctuations.
- Develop tools and training for better risk evaluation, especially for manufacturing and service sector borrowers, to mitigate economic and market uncertainties.
- Provide targeted economic policies, such as subsidies or tax breaks, to support borrowers in manufacturing and services sectors during slowdowns.
- Encourage financial institutions to adopt practices that enhance women's access to credit across all sectors.
- Expand digital lending platforms for efficient credit disbursement and repayment tracking while enhancing borrower monitoring systems to identify behavioral risks early.

7. Future Scopes

1. Expand the study to include emerging sectors like technology and real estate to understand their unique borrower behavior.
2. Use predictive analytics and AI to model borrower behavior and assess default risks in real-time.
3. Examine the role of digital lending platforms and their impact on borrower behavior and NPAs.
4. Explore cross-country comparisons to identify global best practices in mitigating NPAs.

8. Conclusion

This study highlights the intricate relationship between borrower behavior, sectoral challenges, and the prevalence of Non-Performing Assets (NPAs) in agriculture, manufacturing, and services sectors. The findings underscore that behavioral factors such as financial literacy, risk-taking ability, repayment patterns, and financial planning play a pivotal role in influencing loan defaults. The agriculture sector, with its dependence on seasonal incomes and external factors like climate and government policies, exhibited the highest NPA rates, necessitating targeted interventions such as income stabilization schemes and tailored financial literacy programs. In the manufacturing sector, economic volatility and poor risk assessment emerged as critical challenges, emphasizing the need for enhanced risk evaluation frameworks and economic policy support. The services sector, while having the lowest NPA rate, remains vulnerable to economic slowdowns, requiring robust financial planning and market diversification strategies. The study demonstrates that sector-specific approaches are essential for mitigating NPAs effectively. By implementing customized financial education initiatives, adopting gender-inclusive lending practices, and leveraging technology for borrower monitoring and risk assessment, financial institutions can

significantly reduce defaults and promote sustainable lending practices. Moreover, the integration of predictive analytics and AI offers promising avenues for real-time risk modeling and proactive interventions. These efforts, combined with strong policy support, will not only enhance the financial health of institutions but also contribute to broader economic stability and growth.

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