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Economic Hardship and Agrarian Pain: The Debt Crisis of Farmers in West Bengal

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Abstract

Debts can be both exploitative and emancipatory at the same time. Debts have the potential to trap rural households in new forms of exploitation. The agrarian crisis poses a significant challenge to the agricultural economy. Productive utilization of agricultural credit is very limited in West Bengal, as the farmers are experiencing financial distress. Debt distress is one of the main reasons for farmers' discomfort. The growing debt burden diminishes creditworthiness, trapping farmers in a cycle of debt accumulation. Defaulting credit increases the pressure on financial institutions' non-performing assets, leading to serious credit allocation problems. The present research aims to identify the influencing factors that are solely responsible for farmers' discomfort in West Bengal by using binary logistic regression analysis involving 280 borrower farmers. The study finds that larger family sizes, higher education levels, and greater farm experience significantly reduce farmer distress. On the other side, low credibility, consumption credit, and unproductive borrowing increase the financial vulnerability of the farmers. These results highlight the importance of socioeconomic stability and productive credit use in mitigating agricultural distress.

Keywords: Debt-distress, Credit worthiness, Debt accumulation, Defaulting, Non-performing asset

JEL Classification: Q14, D14, Q12, G51.

Introduction

Agriculture plays an imperative role in the West Bengal economy, and credit is one of the most indispensable inputs in expanding the sector. The economic importance of agricultural credit is very significant, as the majority of farmers in West Bengal are small and marginal farmers**.** Small and marginal farmers are particularly vulnerable to income shocks and distress. Debts in rural areas present a paradoxical situation. On the one hand, they are very important to rural households' sustenance: supporting them in adverse economic situations or availing them of unforeseen opportunities. On the other hand, thousands of households find themselves trapped in "escalating debt traps" (Taylor, 2013) and forced to significantly rearrange their economic, social, and cultural priorities (Gerber, 2014). In recent years, farmers have taken to the streets and demanded relief from debt, i.e., they have been urging the state to intervene and alleviate their financial burden (Dhawale, 2018). Productive credit utilization is very limited because the farmers in West Bengal are experiencing financial difficulties. Debt distress among the farmers has been known as one of the most notorious hindrances in the way of rural prosperity. Most farmers divert their credit into unproductive activities that yield minimal income, thereby increasing their debt burden and ultimately trapping themselves in a debt trap. Around 52 percent of farmers in West Bengal reported experiencing debt distress (NSSO, 2013).

The formal and informal credit markets operated simultaneously in the rural areas of West Bengal. Farmers encounter various obstacles, particularly those related to collateral security, when attempting to secure institutional credit, leading them to experience financial distress and resort to exploitative non-institutional credit sources. A large number of farmers rely on informal credit sources because formal credit is difficult to obtain. The terms and conditions of this type of credit are very tricky, and the cost of borrowing is very high. Consequently, the borrower farmers are entrapped under a vicious cycle of debt trap (NABARD, 2017). Debt distress affects farmers' socioeconomic condition in a variety of ways. Debt distress can also indirectly create pressure for smooth credit allocation by the financial institutions. This

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would lead to the breakdown of the agricultural credit system. The research aims to identify the factors causing farmers' discomfort in West Bengal.

The literature consistently identifies indebtedness—particularly to informal moneylenders—as both a primary cause and a manifestation of agrarian distress in India. Assadi (1998) revealed that mounting the debt to the moneylenders is the sole reason for the distress of the farmers. The expenses associated with this type of borrowing are significantly higher, occasionally exceeding farmers' financial capacity. Crop failure due to natural calamities is another important factor in farmers' distress. Radhakrishna (2002) explains that debt is a major sign of trouble for farmers. They struggle to repay loans because they often use credit unproductively and face high costs and low prices for their products. Many farmers rely on informal loans, which come with high interest rates, making it even harder to pay back. This financial stress compels farmers to mortgage or sell their land, thereby forfeiting their primary source of livelihood. Sidhu and Gill (2006) highlight the critical role of institutional credit in facilitating the adoption of modern agricultural technologies, noting that short-term advances have enabled farmers to use fertilizers and other improved inputs that substantially enhance productivity. However, the authors emphasize that despite the expansion of institutional agricultural credit, the cost of borrowing remains high due to procedural complexities and significant transaction costs. They further observe that rural indebtedness persists as a serious concern, reflected in high loan default rates and rising farmer suicides, particularly in states such as Punjab, Andhra Pradesh, and Karnataka.

The uneven distribution of institutional credit, coupled with persistent issues of accessibility, high operational costs, and the limited economic viability of rural credit institutions, continues to undermine the effectiveness of formal lending. Consequently, the authors stress the need for comprehensive policy reforms aimed at improving credit flow, ensuring more equitable regional distribution, and mitigating the growing indebtedness and distress among farmers. Sajjad and Chauhan (2012) examine agrarian distress in rural India and show that high indebtedness is closely linked to factors such as food grain productivity, production levels, net returns, and rising cultivation costs. Their analysis further reveals that states with relatively advanced agricultural development tend to exhibit higher interest rates, disproportionately burdening small and marginal farmers, who remain the most vulnerable to escalating debt. Narayana and Mehrotra (2019) argue that although loan waivers offer temporary relief to distressed farmers, they fail to address the structural weaknesses of Indian agriculture. The authors note that repeated waivers weaken credit discipline, reduce farmers' access to formal finance, and push them further toward informal lenders. They also highlight the substantial fiscal burden on state governments, which often rely on borrowings to fund waivers, thereby constraining private investment and widening fiscal deficits. The study recommends shifting from ad-hoc waivers to long-term measures such as loan insurance schemes, agricultural distress funds, and debt relief commissions to mitigate systemic risks and strengthen rural credit systems. Hota and Mishra (2023) found that small and marginal farmers in rural India have limited access to formal credit, relying heavily on informal sources, which contributes to distress sales and lower productivity, especially in non-irrigated areas. Larger farms, particularly in irrigated regions, receive more formal credit and achieve higher productivity. The study suggests increasing formal credit access for small farmers, reducing dependency on informal loans, enhancing market and storage infrastructure, creating tailored credit programs, and improving irrigation support to boost productivity and creditworthiness in underdeveloped regions to address these issues.

The existing literature thoroughly establishes a macro-level correlation between agricultural debt and farmer distress. A significant gap remains in micro-level, empirical studies that identify the specific socio-economic and credit-utilization factors which determine financial vulnerability at the individual farmer level in West Bengal. The distinct agrarian economy of the state necessitates a focused investigation to move beyond general correlations and precisely isolate the drivers of distress—such as family demographics, educational attainment, the diversion of agricultural credit into unproductive activities, or its use for consumption smoothing. This study aims to address this critical gap by employing binary logistic regression to pinpoint the exact factors influencing farmer distress within this specific regional context.

Data Sources and Methodology

The research is based on primary data collected from households through a survey of borrower farmers in selected rural areas of West Bengal. A multi-stage sampling method was used to gather 280 household samples between December 2024 and March 2025. First, the districts were selected, followed by subdivision, blocks, villages, and then borrower farmers.

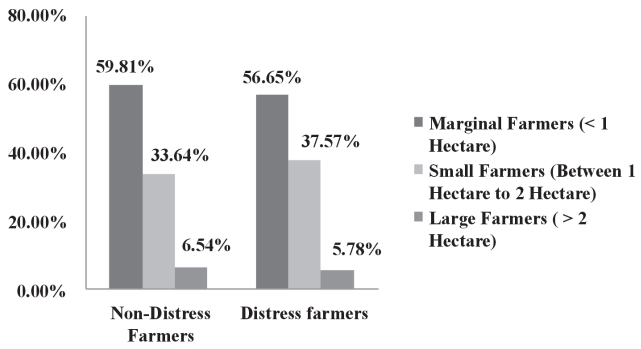
The study was conducted in the districts of North 24 Parganas, South 24 Parganas, Hooghly, and Bankura. Despite the strong agricultural dominance in all the districts, they exhibit a low financial inclusion index and a low credit-deposit ratio (below the State average), as reported by NABARD in the Financial Inclusion Report, 2023. Basirhat subdivision from North 24 Parganas, Kakdwip subdivision from South 24 Parganas, Arambagh subdivision from Hooghly, and Khatra subdivision from Bankura were selected, all of which are predominantly rural (Census Report 2011). Baduria block from Basirhat subdivision, Namkhana block from Kakdwip subdivision, Pursurah block from Arambagh subdivision, and Sarenga block from Khatra subdivision were selected based on their higher literacy rates (Census Report 2011). Two

villages from each block were selected, and finally, thirty-five borrower farmers from each village were chosen for the research. In this research work, the binary logistic regression model was applied to identify the factors contributing to the distress of the farmers. We assess farmers' distress based on their institutional credit repayment performance. Farmers with good institutional credit repayment performance are treated as non-distress farmers, while those with poor repayment performance are treated as distressed farmers. The logistic regression model is the appropriate method to observe the likelihood of a farmer being distressed or non-distressed. In order to find out the key determinants of distress, we first computed a dichotomous variable indicating whether the farmer is under distress or not. Table 1 shows how the sample farmers are divided based on their debt stress. Figure 1 shows the distribution of sample farmers based on the size of their land.

Table 1: Debt Stress wise Distribution of Farmers

Category of Farmers	No of Household Farmers
Non-distress Farmers	107 (38.21%)
Distress Farmers	173 (61.78%)

Source: Author's Calculation Based on Primary Survey Data



Source: Author's Calculation Based on Primary Survey Data

Figure 1: Distribution of Land Holdings according to Debt Stress of Borrower Farmers

Prior to estimating the logistic regression model, an extensive review was conducted on both the continuous and categorical predictor variables to assess the presence of multicollinearity and degree of association. This assessment was carried out using the variance inflation factor (VIF) and contingency coefficients respectively. The Variance Inflation Factor (VIF) values of the continuous explanatory variables indicate the absence of serious multicollinearity issues. We do not find any strong association among the categorical variables. The computed tables are provided in Appendix – I.

In logistic regression, the estimated coefficients provide valuable insights into the relationship between the independent variables (predictors) and the dependent variable (outcome). A positive coefficient indicates that as the predictor variable increases, the probability of the outcome (e.g., non-distress) occurring increases. A negative coefficient means that as the predictor increases, the probability of the outcome decreases. We performed a t-test for continuous explanatory variables. This was done to examine the mean difference between two categories of farmers. We also used a chi-square test for categorical variables. This test helped us to examine the significant differences between the two groups of farmers in Table 2.

Results and Discussion

Descriptive Analysis

The average family size of the distress farmers is marginally higher than the non-distress farmers, but the average working participation rate of the non-distress farmers is significantly higher than the distress farmers. It is because non-distress farmers have a higher percentage of education (schooling and above). The average off-farm income of the non-distress farmers is Rs.23,196**,** higher than the distress farmers. Non-distress farmers have a higher average off-farm income because they have a higher average work participation rate. The average farming exposure of non-distress farmers is much higher than that of distress farmers because of the higher average age of non-distress farmers. The average annual expenditure per hectare of distress farmers is Rs.76,298 higher than the non-distress farmers. This is primarily due to the fact that over 80 per cent of non-distress farmers own land with a higher and moderate cropping intensity, and they also have a higher average operating land holding. The non-distress farmers have an average net annual agricultural income of Rs.82,789. It is higher than the average net annual agricultural income of distressed farmers. This is because a higher percentage of non-distress farmers use credit for productive purposes and to access irrigation facilities in Table 3.

The average annual interest rate for distressed farmers' financial institutions is 6.54 per cent. This rate is significantly higher than that of non-distress farmers. This is explained by the fact that approximately 21.39 per cent of distressed farmers have medium and long-term credit, whereas around 12.15 per cent of non-distress farmers have medium and long-term credit. Medium- and long-term credit has a much higher interest rate than short-term credit. Lower credibility is the reason for the higher average annual financial interest rate. Approximately 59.96 per cent of distressed farmers have lower credibility. Consequently, they are not utilizing the government's interest subsidy program. The average annual interest rate of non-financial institutions of non-distress farmers is higher than that of distress farmers because 84.11 per cent of non-distress farmers depend on informal sources of credit, whereas around 79 per cent of distress farmers depend on informal sources of credit. Around 35 per cent of distressed farmers receive consumption credit because they

Table 2: Explanatory Variables of Binary Logistic Regression Model

Indicators	Variable	How the variable is measured
Socio- Economic Attributes	Family size	Number of Family Members
	Working Participation Rate	Proportion of Employed Persons in the Family to total Members in the Family
Financial Attributes	Savings	Total Savings (In Rupees)
	Other source of Income (Excluding Agricultural Income)	Earnings other than Agricultural Sources in Rupees (Monthly)
	Credibility based on Previously Obtained Institutional Credit	0 – High Credibility (Good Repayment Performance) 1 – Medium Credibility (Moderate Repayment Performance) 2 - Low Credibility (Low Repayment Performance)
	Consumption Credit	1 – If the Farmers have Consumption Credit 0 – Otherwise
Human Capital Attributes	Farming Exposure	Years of Farming Practice
	Literacy	0 – Illiterate 1 – School Education 2 – Above school Education
Agricultural Attributes	Net Income Sourcing from Agriculture per Hectare	Agriculture Income in Rupees per Hectare (Annual)
	Expenditure for Agriculture per Hectare	Agriculture Expenditure in Rupees per Hectare (Annual)
	Operating Land Holdings	Net Cultivated land in Hectare
	Cropping Intensity	0 – Low (Average Cropping Intensity <125) 1 – Moderate (Average Cropping Intensity <150) 2 – High (Average Cropping Intensity >150)
	Access to Irrigation	1- Accessing Proper Irrigation 0- Otherwise
Lending Attributes	Annual Institutional Interest Rate	Annual Cost of Institutional Credit per Hundred Rupees (Percentage)
	Annual Interest Rate of non-financial Institution	Annual Cost of Non-financial institutional Credit per Hundred Rupees (Percentage)
Credit Utilization Attributes	Repaying Back Dated Debt	1 – If the borrower repaying Back Dated Debt 0 - Otherwise
	Diversification of Credit	1 – If the borrower diversified the credit (Consumption Purposes) 0 – Otherwise
	Constant of the Regression Model	

have a higher average of savings.

Econometric Model Summary

The research included 280 borrowing farmers in Table 5. The log-likelihood statistic for the fitted model is -85.04, which was used to compare the nested model. The likelihood ratio chi-square test yielded a test statistic of 202.37, with a p-value of 0.000. This indicates that if the null hypothesis were true, the probability of obtaining this chi-square value (202.37) would be nearly zero. Since the p-value is below 0.000, the model is statistically significant; suggesting that at least one of the regression coefficients is not zero. Additionally, the McFadden's Pseudo R-square value for

Table 3: Descriptive Summary of Continuous Explanatory Variables

Variables	Non-Distress Farmers Mean (S.D.)	Distress Farmers Mean (S.D.)	|t| - Statistics
Family Size	4.62 (1.15)	4.67 (1.24)	0.37
Working Participation Rate	0.44 (0.14)	0.38 (0.14)	3.69***
Total Savings (Rs.)	38,616.82 (24611.95)	39,034.68 (24201.89)	0.14
Other Source of Income (Rs.)	23,196.26 (18751.82)	20,433.53 (15888.14)	1.27
Farming Exposure	22.01 (10.60)	18.90 (9.82)	2.46***
Net Annual Agricultural Income (Rs. per ha)	82,788.79 (10796.43)	81,801.16 (10094.96)	0.76
Annual Agricultural Expenditure (Rs. per ha)	75,001.87 (8051.04)	76,298.27 (8526.77)	1.28
Operating Land Holdings (ha)	0.88 (0.86)	0.89 (0.70)	0.13
Annual Interest Rate (Financial Institution)	5.65 (1.84)	6.54 (1.85)	3.93***
Annual Interest Rate (Non-financial Institution)	21.59 (9.88)	20.16 (10.68)	1.14

*Note: *** Significant level at 1%*
Source: Author's Calculation Based on Primary Survey Data

Table 4: Descriptive Summary of Categorical Explanatory Variables

Variables	Non-Distress Farmers Mean (S.D.)	Distress Farmers Mean (S.D.)	$\chi 2$ - Statistics
Credibility			
High	72 (67.29%)	22 (12.72%)	89.71***
Moderate	16 (14.95%)	49 (28.32%)	
Low	19 (17.76%)	102 (59.96%)	
Consumption Credit	14 (13.08%)	60 (34.68%)	15.86***
Otherwise	93 (86.92%)	113 (65.32%	
Literacy			0.64
Illiterate	21 (19.63%)	41 (23.70%)	
Schooling (Up to Higher Secondary)	67 (62.62%)	103 (59.54%)	
Above Schooling	19 (17.76%)	29 (16.76%)	
Cropping Intensity			4.45
High	48 (44.86%)	70 (40.46%)	
Moderate	32 (29.91%)	72 (41.62%)	
Low	27 (25.23%)	31 (17.92%)	
Accessibility of Proper Irrigation Facility	58 (54.21%)	80 (46.24%)	1.68
Otherwise	49 (45.79%)	93 (53.76%)	
Repaying Back Dated Debt	54 (50.47%)	126 (72.83%)	14.40***
Otherwise	53 (49.53%)	47 (27.17%)	
Diversification of Credit			
(Excluding Repaying Back Dated Debt)	29 (27.10%)	81 (46.82%)	10.78***
Otherwise	78 (72.90%)	92 (53.18%)	

*Note: *** Significant level at 1%*
Source: Author's Calculation Based on Primary Survey Data

the model is 0.543, while the count R-square value is 0.886.

Interpretation of Estimated Coefficients

The estimated coefficient of family size is negative and significant. It means the probability of being distress is reduced as family size increases. Increasing family size can reduce the distress of farmers by providing additional labour for agricultural activities, which can help lower production costs and improve farm productivity. Larger families can contribute to various farming tasks. It reduces the need for hired labour and spreading the workload across more hands. This collective effort can lead to more efficient resource management, timely planting and harvesting, and better care of livestock. Furthermore, having more family members allows farmers to diversify their income sources through off-farm activities, helping to buffer against economic shocks and uncertainties. This shared responsibility and diversified income reduce the overall financial and emotional burden on individual farmers, thereby alleviating distress (Meta, 2006).

The negative coefficient of working participation rate indicates an increase in the work participation rate can reduce the distress of farmers by boosting household income and improving economic stability. When more family members or individuals in the community engage in agricultural or non-agricultural employment, it generates additional financial resources that can help meet farming costs, reduce debt burdens, and provide a safety net during times of crop failure or market fluctuations. This increased labour force also enhances productivity on farms, leading to better yields and more efficient operations. Farmers with higher income and productivity are less vulnerable to financial stress. This allows them to manage risks better. It also improves their overall well-being (Singh and Gupta, 2020). The negative coefficient indicates increasing other sources of income can significantly reduce the distress of farmers by diversifying their financial base and reducing reliance solely on agricultural output. Non-farm income, such as earnings from small businesses, wage labour, or government schemes, provides a stable cash flow that can cushion farmers against unpredictable factors like poor crop yields, fluctuating market prices, or adverse weather conditions. This financial diversification enhances the household's resilience, allowing farmers to invest in better farming inputs, pay off debts, and manage household expenses without solely depending on the farm. Farmers can have multiple income streams. This helps them withstand economic shocks. It also ensures greater financial security. As a result, it alleviates the distress of the farmers (Reddy et al., 2020). A positive coefficient of moderate and low credibility indicates that farmers with moderate and low credibility are more likely to experience distress.

Moderate and low credibility farmers are more likely to be distressed because they face greater challenges in accessing financial resources, such as loans or credit, which are crucial for purchasing inputs, improving technology, and managing risks in farming (Table 4). Lenders often perceive these farmers as high-risk due to their lower repayment capacity or unstable income, leading to higher interest rates or rejection of loan applications. As a result, these farmers may struggle to invest in necessary resources, maintain their operations, or cope with crop failures and market fluctuations. Additionally, low credibility can limit their ability to engage in profitable business partnerships or government schemes, further deepening their financial instability and increasing their overall distress (Mishra, 2007). A positive coefficient of consumption credit suggests that farmers with consumption credit are more likely to experience distress compared to those without consumption credit. Consumption credit can increase the distress of farmers by adding to their financial burden without directly contributing to the productivity of their farms. This type of credit is often used to meet immediate household needs, such as food, healthcare, or education, rather than for agricultural investment. While it may provide temporary relief, the repayment of consumption credit, typically with interest, adds to the debt load of farmers. Since it does not generate income or improve farm output, farmers may struggle to repay these loans, especially in times of poor crop yields or market downturns.

The increased debt without corresponding growth in income can exacerbate financial stress, pushing farmers deeper into distress (Mishra, 2007)**.** The estimated coefficient of farming exposure is – 0.074 and significant at 1 percent level. It indicates that increasing farming exposure reduce the distress of the farmers. Farming experience reduces the distress of farmers by equipping them with valuable knowledge and skills to manage agricultural challenges more effectively. Experienced farmers are better at making informed decisions regarding crop selection, pest control, and soil management, which improves yields and overall farm productivity. They are also more adept at navigating market fluctuations, securing better prices for their produce, and accessing government support programs or credit options. Farmers with more experience tend to develop stronger networks within the farming community, allowing them to share resources, knowledge, and strategies for risk mitigation. This accumulated wisdom helps them avoid common pitfalls, better manage uncertainties, and ultimately reduce financial and emotional stress (Rathor et al., 2017). The coefficient for schooling (up to higher secondary) is -2.082708. It indicates the farmers who have the school education up to higher secondary are less likely to be distressed compared to illiterate farmers.

Educated farmers are less likely to experience distress than illiterate farmers due to their access to information, ability to adopt modern technologies, and stronger financial literacy. Education enables farmers to make informed decisions regarding crop management, understand government policies, and utilize resources effectively, which

Table 5: Maximum Likelihood Estimates of Binary Logistic Regression Model

Explanatory Variables	Estimated Coefficient	Standard Error	Z	P>|Z|
Family Size	-0.3530826	0.1950793	-1.81	0.070*
Work Participation Rate	-5.856371	1.763279	-3.32	0.001***
Savings	0.00000023	0.00000949	0.02	0.981
Other Source of Income	-0.0000359	0.0000154	-2.32	0.020**
Credibility (Reference: High Credibility)				
Moderate	4.109072	0.6901379	5.95	0.000***
Low	3.76553	0.6171519	6.10	0.000***
Consumption Credit (Reference: Not Having Consumption Credit)	2.659741	0.6001237	4.43	0.000***
Farming Exposure	-0.0742814	0.0238014	-3.12	0.002***
Literacy (Reference: Illiterate)				
Schooling (Up to HS)	-2.082708	0.5946309	-3.50	0.000***
Above Schooling	-0.7145107	0.8011125	-0.89	0.372
Net Agricultural Income	-0.0000504	0.0000288	-1.75	0.080*
Agricultural Expenditure	-0.000000904	0.0000335	-0.03	0.978
Operated Land Holdings	-0.5866814	0.3508623	-1.67	0.095*
Cropping Intensity (Reference: Low Intensity)				
Moderate	-4.204231	0.9879585	4.26	0.000***
High	-1.834877	0.672692	2.73	0.006***
Irrigation Accessibility (Reference: (Non-Accessibility of Irrigation)	-0.9197389	0.4153985	-2.21	0.027**
Annual Interest Rate (Financial Institution)	0.6161736	0.1384227	4.45	0.000***
Annual Interest Rate (Non-financial Institution)	-0.0280735	0.0219022	-1.28	0.200
Repaying Back Dated Debt (Reference: Not Paying Old Debt)	2.03267	0.4726067	4.30	0.000***
Diversification of Credit (Reference: Not Diversify the Credit)	0.8291815	0.4296322	1.93	0.054*
Cons	3.261822	3.4934	0.93	0.350

Note: * Significant level at 1%, ** Significant level at 5%, *** Significant level at 10%
Log Likelihood = -85.044226
Number of Observation = 280
LR Chi2 (20) = 202.37
Prob> Chi Square = 0.0000
Pseudo R Square or McFadden's R Square = 0.543
Count R Square = 0.886

Source: Author's Calculation Based on Primary Survey Data

helps reduce risks. Additionally, educated farmers are more likely to diversify their income through off-farm activities or agribusiness, providing a buffer against crop failures. They also have better access to financial services, insurance, and support systems like government schemes or cooperatives. In contrast, illiterate farmers often struggle to access these opportunities, making them more vulnerable to uncertainties and economic challenges in farming. The negative coefficient of net annual agricultural income indicates higher net annual agricultural income reduces the debt distress of the farmers. Net annual agricultural income per hectare reduces farmer distress by providing financial stability and greater flexibility in managing agricultural risks. Higher income allows farmers to cover operational costs, invest in better resources such as seeds, fertilizers, and equipment, and adopt modern farming techniques. It also enhances their ability to repay debts, reducing the risk of falling into debt traps. With increased income, farmers can invest in risk mitigation strategies like

crop insurance and improved irrigation systems, protecting them from external threats such as droughts or pests. Besides, higher income enables access to better markets and negotiation power, which further alleviates economic pressure and reduces distress (Ray and Kumar, 2019). The coefficient of net operated land holdings of the farmer is -0.587. It indicates higher net operated land holdings reduce the distress of the farmers.

Net operated land holdings reduce farmer distress by providing greater resources and opportunities for efficient land use. Larger land holdings allow farmers to diversify their crops, which helps mitigate risks associated with crop failures or price fluctuations. Farmers with more land can also implement more advanced farming techniques and utilize economies of scale, leading to higher productivity and profitability. Additionally, larger landholdings provide farmers with better access to credit, as they can use their land as collateral, helping them secure loans for investment in technology, irrigation, or other improvements. This financial flexibility and capacity to manage risks effectively contribute to reducing the overall distress experienced by farmers (Ray and Kumar, 2019).

The estimated coefficient of moderate cropping intensity and high cropping intensity are -4.204 and -1.835 respectively. It indicates middle and higher cropping intensity land reduce the debt distress of the farmers compare to the low cropping intensity land holding farmers. Higher and middle cropping intensity reduces farmer distress by increasing land productivity, allowing farmers to grow multiple crops per year and generate more income. Farmers with high cropping intensity land holdings can make better use of their land and resources, leading to improved yields and a more consistent flow of income throughout the year. This not only enhances financial stability but also reduces the vulnerability to seasonal fluctuations or crop failures. The ability to harvest more frequently helps farmers manage debts, invest in better inputs, and buffer against risks like price volatility or adverse weather conditions, thereby reducing overall distress (Udaykumar and Umesh, 2018).

A negative coefficient of irrigation accessibility indicates that farmers who have proper access to irrigation facilities can reduce their distress compared to those who do not. Irrigation accessibility reduces farmer distress by providing a reliable water supply, enabling farmers to grow crops more consistently and mitigate the risks of drought or insufficient rainfall. Farmers with access to irrigation can better manage their crops throughout the year, leading to higher and more stable yields. This improves food security and financial stability by allowing for multiple growing seasons and better-quality produce. Moreover, irrigation helps reduce dependency on unpredictable weather conditions, providing farmers with greater control over their farming operations, which in turn lowers the likelihood of crop failure and financial distress (Reddy et al., 2020). A positive coefficient of annual interest rate indicates higher cost of institutional borrowing can increase the distress of the farmers. The high cost of institutional borrowing increases farmers' distress by raising their debt burden, as higher interest rates lead to larger repayment amounts, making it difficult for them to clear debts on time. This reduces profit margins, as much of their earnings go toward loan repayment, leaving little for reinvestment or family needs.

The risk of default rises, especially during crop failures or price drops, which can result in losing access to future credit. In many cases, farmers are forced to turn to informal lenders with even higher interest rates, deepening their financial stress and pushing them into a cycle of debt (Reddy et al., 2020). The coefficient of repaying back dated debt is 2.033. It indicates that farmers who are using their current credit to repay backdated debt may be experiencing increased distress. Farmers who use their current credit to repay backdated debt are likely experiencing increased distress because they are caught in a cycle of debt without addressing the root causes of their financial challenges. When farmers take new loans to repay old ones, they miss the opportunity to generate additional income or invest in productive activities that could improve their financial situation. This practice can lead to higher interest payments, reducing their cash flow and leaving them with less money to cover essential farming expenses like seeds, fertilizers, and equipment. Over time, this debt accumulation can spiral out of control, increasing financial pressure and making it harder for farmers to break free from debt, ultimately exacerbating their distress. Additionally, this cycle reduces their creditworthiness, making it more difficult to access future credit for productive purposes, further trapping them in financial hardship (Lakkannavar et al., 2017). The estimated coefficient of diversification of credit is 0.829.

It indicates diversification of credit in unproductive activities can increase the distress of the farmers. Diversification of credit into unproductive activities increases distress because it diverts funds away from investments that could generate income or improve farming operations. When credit is used for non-productive purposes, such as personal expenses or non-agricultural purchases, it does not contribute to improving the farm's output or profitability. This can lead to a situation where farmers struggle to repay the loan without any additional income to offset the debt. As a result, they may face increased financial pressure, leading to greater distress and possibly even debt accumulation, as they lack the necessary returns to cover both the credit and their operational costs (Ray and Kumar, 2019).

Conclusions and Policy Implications

Agricultural crises prevail in the form of indebtedness among the farmers. Rural indebtedness is a complex issue.

This study tried to identify the influencing factors for rural indebtedness. Informal types of credit are predominated in the rural economy. The analysis clearly demonstrates that farmers' distress is shaped by a combination of socioeconomic, agronomic, and financial factors, with several variables showing strong protective effects. Larger family size, higher work participation, diversified income sources, greater farming experience, better education, higher net agricultural income, and larger operated landholdings significantly reduce the likelihood of distress by strengthening labour availability, improving productivity, and enhancing household resilience. Similarly, improved cropping intensity and access to irrigation contribute to financial stability by increasing output and reducing vulnerability to climatic uncertainties. In contrast, low credibility, reliance on consumption credit, higher interest rates, diversion of credit to unproductive uses, and the practice of repaying old debt with new loans aggravate distress by increasing debt burden and limiting productive investments.

Overall, the findings highlight that farmer well-being is strongly tied to productive resource use, income diversification, and access to supportive financial and irrigation infrastructure, while unproductive credit use and high borrowing costs deepen vulnerability. This underscores the need for policies that strengthen irrigation and crop management systems, and support income diversification to reduce farmers' distress effectively. these policy interventions directly address the structural vulnerabilities that drive farmers' distress. Improved irrigation infrastructure reduces farmers' dependence on erratic rainfall, stabilizes yields, and enables higher cropping intensity, which collectively enhance farm income and resilience during climatic shocks. Effective crop management policies—such as access to quality seeds, pest management support, and timely extension services—further improve productivity and reduce the risk of crop failure, thereby lowering economic uncertainty.

At the same time, encouraging income diversification through development of non-farm employment, rural enterprises, and skill training reduces the household's over-reliance on agriculture and creates alternative income pathways that buffer families during agricultural downturns. Together, these policy measures not only improve the economic security of farming households but also strengthen long-term sustainability, making them essential components for effectively reducing farmers' distress. Findings highlight the need for policy that expand access to low-cost productive credit. The government should emphasize the inclusion of the Kisan Credit Card scheme. The Kisan Credit Cards offer hassle-free, timely, and multipurpose credit facilities to farmers. However, the accessibility of this scheme is restricted to a small group of educated farmers, and increasing awareness and improving access could significantly boost agricultural development.

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Appendix

Table 6: Variance Inflation Factor (VIF) of Continuous Explanatory Variables

Variables	VIF	1/VIF
Operated Land Holdings	1.28	0.779
Net Agricultural Income	1.19	0.836
Total Savings	1.16	0.865
Agricultural Expenditure	1.15	0.872
Annual Interest Rate (Financial Institution)	1.10	0.912
Family Size	1.08	0.927
Annual Interest Rate (Non-financial Institution)	1.04	0.959
Work Participation Rate	1.04	0.961
Other Source of Income	1.03	0.975
Farm Exposure	1.02	0.977
Mean VIF	1.11	

Source: Author's calculation based on primary survey data

Table 7: Contingency Coefficient of Categorical Explanatory Variables

Variables	Consumption Credit	Family Type	Credibility	Cropping Intensity	Repaying Old Debt	Diversification of Credit
Irrigation	0.040927					
Credibility	0.066651	0.067251				
Cropping Intensity	0.12501	0.02669	0.188813			
Repaying Old Debt	0.057856	0.099604	0.148584	0.068184		
Diversification of Credit	0.017766	0.011495	0.213574	0.02464	0.04139	
Literacy	0.152916	0.119304	0.195875	0.1165	0.052168	0.052807

Source: Author's calculation based on primary survey data