

Research on Debt Risk and Default Behavior among Pastoral Households in Southern Xinjiang: Evidence from Field Surveys in Minfeng County

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Abstract

Pastoral households in Southern Xinjiang face increasing financial pressure driven by climate variability, fragile ecological conditions, and limited access to formal financial services. Using primary data collected from a field survey of 312 pastoral households in Minfeng County, this study examines the determinants of debt risk and the behavioral patterns associated with loan default. Descriptive statistics, logistic regression, and a household debt-risk index (HDRI) are employed to quantify risk exposure and identify the socio-economic, ecological, and institutional factors that influence repayment behavior. Results show that 62.8% of surveyed households hold outstanding debt, and 18.6% have experienced some form of repayment difficulty or partial default in the past three years. Herd size volatility, unstable market access, health-related shocks, and informal borrowing networks significantly elevate debt risks. Access to financial literacy training, stable livestock income, and diversified livelihoods reduce the probability of default. The findings highlight the structural constraints faced by marginalized pastoral communities in China's arid regions and underscore the need for targeted credit programs, early-warning monitoring tools, and adaptive pastoral-risk governance.

Keywords

Pastoral Households; Southern Xinjiang; Minfeng County; Debt Risk; Default Behavior; Field Survey; Household Finance.

1. Introduction

Pastoral households in Southern Xinjiang rely heavily on livestock production for their livelihoods, yet their economic activities are vulnerable to climate shocks, grazing restrictions, market fluctuations, and limited access to institutional credit. As livelihood pressures increase, borrowing has become an essential short-term coping strategy. However, rising debt burdens have created new financial risks, including repayment delays, partial defaults, and dependence on informal lending networks [1-2].

Minfeng County, located in Hotan Prefecture at the southern edge of the Taklamakan Desert, represents one of the most ecologically fragile and economically disadvantaged pastoral areas in China. Its households exhibit distinct financial behaviors shaped by mobility, limited collateral, and deep reliance on kinship-based credit relationships. Understanding debt risk and default behavior among these communities is therefore essential for designing inclusive rural finance systems and mitigating poverty-induced vulnerability [3-5].

This study is designed to systematically investigate the debt-related dynamics of pastoral households in Minfeng County through a multi-dimensional research framework [6-8]. First, it seeks to accurately measure the current debt status of these households, encompassing indicators such as debt scale, debt structure, repayment capacity, and the distribution of debt across different pastoral subgroups. Second, the study aims to empirically examine the key

determinants of debt risk, including both external factors and internal household-level characteristics. Finally, it intends to deeply analyze the behavioral drivers underlying loan default among pastoral households, exploring how decision-making processes, risk perception, and social norms shape their repayment behaviors, with the goal of providing targeted insights for debt risk mitigation and sustainable livelihood development in pastoral areas.

2. Study Area and Methods

2.1. Study Area: Minfeng County

Minfeng County, located in the arid inland region of northwest China, is characterized by an extreme desert climate where annual precipitation averages less than 40 millimeters, far below the threshold for sustainable dryland agriculture. This harsh climatic condition has shaped the county's economic and social fabric, with livelihoods almost exclusively anchored in pastoralism: local households rely primarily on raising sheep, goats, and Bactrian camels, species uniquely adapted to survive on sparse desert vegetation and withstand extreme temperature fluctuations.

Pastoral life in Minfeng County is defined by spatial dispersion and mobility: herding settlements are scattered across vast, arid landscapes, with no concentrated villages, and households practice seasonal transhumance to access viable pastures. In spring and summer, herders move their flocks to higher-elevation rangelands with relatively better forage; in winter, they retreat to lower-lying areas near oases or water sources to avoid freezing temperatures and snow cover. This mobility, while essential for sustaining livestock, creates challenges for social service access and economic integration.

A critical constraint facing Minfeng's pastoral communities is limited access to formal financial institutions. The county's remote location, scattered population, and the nomadic nature of pastoral livelihoods make it unprofitable for commercial banks to establish brick-and-mortar branches or deploy regular financial services. Most herders are excluded from formal credit, savings, or insurance products, forcing them to rely on informal financial channels—such as village-based moneylenders or mutual aid networks—for capital needs related to livestock purchases, emergency expenses, or drought relief. This financial exclusion exacerbates vulnerability to climate shocks and market volatility, reinforcing cycles of debt and limiting opportunities for livelihood diversification in one of China's most ecologically fragile pastoral regions.

2.2. Data Collection

To empirically investigate the debt dynamics of pastoral households in Minfeng County, primary data collection was conducted via a structured household survey implemented between June and August 2024, a period coinciding with the peak pastoral production season, ensuring maximum household participation and the capture of real-time livelihood and financial information. The survey encompassed a total of 312 pastoral households, selected through purposive sampling across seven representative pastoral villages distributed across the county's major rangeland zones. This sampling strategy was designed to account for variations in ecological conditions, livelihood strategies, and proximity to market and financial service hubs, thereby ensuring the sample's representativeness of the county's diverse pastoral populations.

The survey questionnaire was developed through an iterative process, incorporating insights from pre-survey focus group discussions with local herders, village leaders, and rural financial practitioners to ensure cultural and contextual relevance. It captured a comprehensive set of variables across multiple dimensions: household demographics; economic livelihoods;

borrowing behavior and debt characteristics; exposure to shocks; loan repayment behavior; and financial literacy indicators.

The structured survey approach, combined with face-to-face interviews administered by trained local enumerators fluent in both Mandarin and the regional pastoral language, minimized response bias and ensured the accuracy and completeness of collected data. This dataset provides a robust empirical foundation for analyzing the determinants of debt risk and the behavioral drivers of loan default among Minfeng's pastoral households, enabling evidence-based insights into the financial vulnerabilities of this ecologically and economically marginalized population.

2.3. Variable Construction

To quantitatively assess the debt vulnerability of pastoral households in Minfeng County, a composite Household Debt-Risk Index (HDRI) was constructed, integrating five key dimensions weighted by their theoretical and empirical relevance to pastoral livelihood resilience. The index assigns a 30% weight to the debt-to-income ratio—a core indicator of repayment capacity, calculated as total household debt divided by annual livestock and non-livestock income. Livestock income volatility captures fluctuations in income streams driven by climatic variability, market price shifts, and livestock mortality, measured as the coefficient of variation in annual livestock income over the past three years. Shock exposure quantifies the frequency and severity of adverse events experienced by households in the five years prior to the survey. The borrowing structure reflects the proportion of formal credit relative to informal borrowing, a critical factor in determining debt terms and repayment pressure. Finally, financial literacy is evaluated through a standardized score based on responses to questions measuring knowledge of interest calculations, credit terms, and risk management strategies. The HDRI is computed as a weighted sum of normalized scores for each dimension, with higher values indicating greater debt risk.

To identify the determinants of loan default behavior among pastoral households, a binary logistic regression model is estimated, where the dependent variable is a dummy indicator of default. The model regresses default behavior on a set of explanatory variables selected based on theoretical frameworks of household finance and pastoral livelihoods: household income; herd size volatility; health expenditure; access to formal credit; financial literacy; shock exposure; and social network strength. The model controls for unobserved heterogeneity at the village level and uses robust standard errors to account for potential clustering effects.

3. Results

3.1. Descriptive Statistics

Fig. 1 presents key descriptive statistics for the 312 pastoral households surveyed in Minfeng County, offering insights into their demographic, economic, and contextual attributes.

In terms of household structure, the average household size stands at 5.42 persons (SD = 1.63), reflecting the prevalence of extended family systems typical of pastoral communities in northwest China. Larger households often support labor-intensive livestock herding activities, where multiple family members contribute to grazing, animal care, and seasonal mobility, which are critical for sustaining livelihoods in arid rangeland environments.

Economically, the mean total annual household income is CNY 56,874 (SD = 21,502), with substantial variability indicating uneven economic outcomes across households. Notably, livestock income accounts for 71.6% of total income (SD = 18.4), underscoring the sector's dominance in local livelihoods and the vulnerability of households to shocks affecting livestock production. The high standard deviation in livestock income share further suggests that some

households have begun diversifying into non-livestock activities, while others remain almost entirely dependent on pastoralism.

Human capital, as measured by the household head's years of education (mean = 4.8, SD = 2.6), reveals relatively low educational attainment, a pattern linked to limited access to formal schooling in remote pastoral areas and the prioritization of herding skills over formal education. This may constrain households' ability to adopt advanced livestock management practices, access formal financial services, or pursue alternative livelihood opportunities.

Finally, the average distance to the nearest bank is 46.3 km (SD = 18.7), highlighting severe financial exclusion in the region. The vast geographic distances, combined with scattered settlements and seasonal mobility, create significant barriers to accessing formal credit, savings, or insurance products. This spatial constraint forces most households to rely on informal financial channels, which often carry higher interest rates and less favorable terms, exacerbating debt risk and limiting resilience to economic shocks.

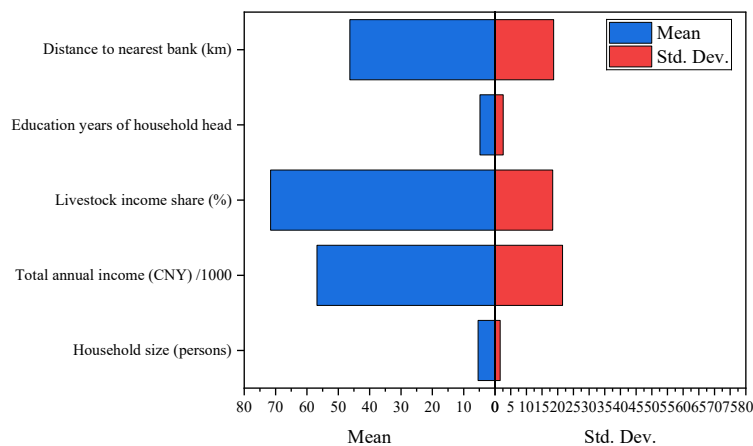


Fig. 1 Household Characteristics (N = 312)

3.2. Debt Status of Pastoral Households

Fig. 2 presents key indicators of debt conditions among the 312 surveyed pastoral households in Minfeng County, illuminating the prevalence, structure, and risks associated with household borrowing in this arid pastoral region.

First, the data reveal that 62.8% of households hold outstanding debt, indicating that borrowing is a common livelihood strategy among Minfeng's pastoral communities. This high debt prevalence reflects the structural vulnerabilities of pastoral livelihoods: households frequently rely on credit to mitigate income volatility from climatic shocks, cover unplanned expenses, or invest in herd expansion. The average outstanding debt of CNY 28,430 further underscores the material scale of this borrowing, when contextualized against the mean annual household income of CNY 56,874 (from Table 1), this debt level represents nearly half of a typical household's yearly earnings, creating substantial repayment pressure.

The dominance of informal borrowing (54.2% of total debt) is a striking feature of the local credit landscape, and one directly linked to the region's limited access to formal financial institutions. Informal credit often carries unregulated, higher interest rates and lacks the flexible repayment terms of formal loans, amplifying the risk of debt distress. This reliance on informal channels also reflects the failure of formal financial systems to adapt to the mobility and dispersed nature of pastoral livelihoods, leaving households with few sustainable credit options.

Debt risk is further manifested in the share of households facing repayment difficulties (18.6%) and those that have experienced default over the past three years (12.1%). These figures highlight the precarity of household debt positions: nearly one in five households struggles to

meet repayment obligations, while over one in ten has failed to repay loans in recent years. Such outcomes are rooted in the interplay of low and volatile livestock incomes, high informal borrowing costs, and exposure to recurrent shocks.

Collectively, Fig. 2 underscores a cycle of debt vulnerability in Minfeng County: structural livelihood risks drive high borrowing rates, limited formal financial access forces reliance on costly informal credit, and these dynamics culminate in significant repayment challenges and default. These findings contextualize the broader debt risk landscape for pastoral households, emphasizing the need for targeted interventions to expand formal financial inclusion and build resilience to shocks.

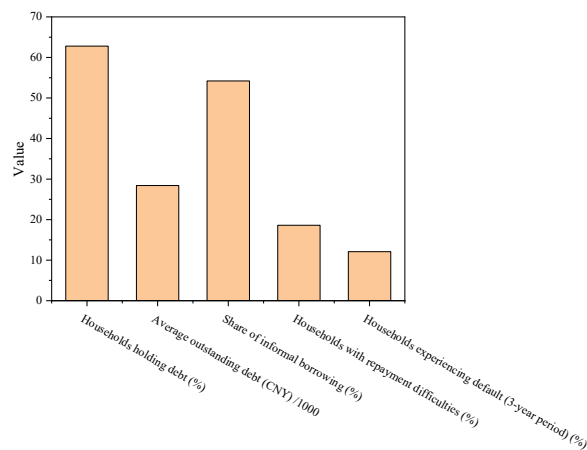


Fig. 2 Debt Conditions

3.3. HDRI Distribution

Table 1 presents the distribution of the Household Debt-Risk Index (HDRI) across 312 pastoral households in Minfeng County, offering a stratified view of debt vulnerability and its prevalence in the study population.

The HDRI results reveal a skewed but concentrated risk profile: the largest share of households (47.5%) fall into the medium-risk category, while 29.8% are classified as low-risk (0–0.33) and 22.7% as high-risk (0.67–1.00). This distribution underscores that debt risk is not an extreme or marginal phenomenon among Minfeng’s pastoral households but a widespread concern, with nearly three-quarters of surveyed households (70.2%) facing moderate to severe debt vulnerability.

The dominance of medium-risk households reflects the structural pressures shaping pastoral livelihoods: these households typically maintain a precarious balance between debt obligations and repayment capacity, with vulnerabilities stemming from moderate livestock income volatility, partial reliance on informal borrowing, and occasional exposure to shocks. While not currently in crisis, they lack sufficient buffers to absorb acute shocks, such as a major herd loss or sustained market price declines, which could quickly push them into the high-risk category. The 22.7% of high-risk households represent the most vulnerable segment, characterized by unsustainable debt-to-income ratios, heavy dependence on high-cost informal credit, frequent shock exposure, and low financial literacy. These households often face chronic repayment difficulties, with limited capacity to diversify income or access formal financial support, trapping them in cycles of debt that threaten long-term livelihood stability. In contrast, low-risk households (29.8%) tend to exhibit stronger financial resilience: they typically have lower debt levels, stable livestock income, greater access to formal credit, and higher financial literacy, enabling them to mitigate risks and avoid severe debt distress.

Collectively, the HDRI distribution highlights the need for targeted interventions tailored to different risk strata: low-risk households may benefit from preventive measures to maintain

resilience, medium-risk households require support to build buffers, and high-risk households need urgent debt relief and livelihood diversification assistance. This stratified approach is critical to addressing the heterogeneous debt challenges facing Minfeng’s pastoral communities and fostering sustainable financial resilience.

Table 1. Household Debt-Risk Index Categories

HDRI Level	Score Range	Share of Households (%)
Low risk	0–0.33	29.8
Medium risk	0.34–0.66	47.5
High risk	0.67–1.00	22.7

3.4. Factors Influencing Default Behavior

Fig. 3 presents the results of the logistic regression model estimating the determinants of loan default among pastoral households in Minfeng County, with all variables exhibiting statistically significant effects ($p < 0.05$) on default behavior.

Household income (logged) emerges as a key protective factor against default, with a coefficient of -0.372 ($p = 0.002$). This indicates that a 1% increase in household income is associated with a 0.372% reduction in the odds of loan default, confirming that income stability enhances repayment capacity. For pastoral households reliant on volatile livestock earnings, higher and more stable income provides a buffer against unforeseen expenses and reduces the risk of defaulting on debt obligations.

Conversely, herd size volatility (coefficient = 0.641 , $p = 0.001$) and health expenditure shocks (coefficient = 0.458 , $p = 0.003$) act as significant drivers of default. Herd size volatility reflects instability in the core livelihood asset of pastoral households; fluctuations in livestock numbers caused by drought, disease, or market shocks disrupt income streams and undermine the ability to service debt. Health shocks, meanwhile, impose unplanned financial burdens that divert resources from loan repayment, often forcing households to prioritize immediate medical needs over debt obligations.

Access to formal credit (coefficient = -0.713 , $p = 0.004$) and higher financial literacy scores (coefficient = -0.289 , $p = 0.017$) both reduce default risk substantially. Formal credit typically offers lower interest rates and more flexible repayment terms compared to informal moneylenders, easing the burden of debt service. Financial literacy, by enhancing households’ ability to manage credit, understand interest calculations, and plan for future expenses, further mitigates the likelihood of default. Social network strength (coefficient = -0.224 , $p = 0.019$) also exerts a protective effect, as robust social networks provide informal support during times of crisis, helping households avoid default.

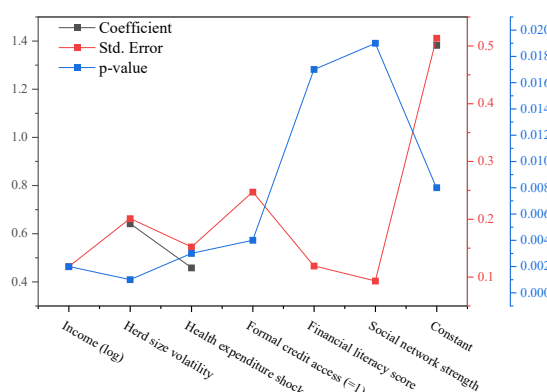


Fig. 3 Logistic Regression Results

Collectively, these results highlight that default risk is shaped by a mix of economic stability (income), production vulnerability (herd volatility), unplanned shocks (health expenses), financial inclusion (formal credit access), human capital (financial literacy), and social capital (networks). The findings underscore the need for interventions targeting income stabilization, formal financial inclusion, and shock mitigation to reduce default among Minfeng's pastoral households.

3.5. Factors Influencing Default Behavior

Fig. 4 outlines the primary drivers of loan default among pastoral households in Minfeng County, with multiple responses permitted to capture the complexity of factors contributing to repayment failure. The results reveal that default is predominantly rooted in livelihood shocks and structural vulnerabilities inherent to pastoral systems, rather than individual financial mismanagement.

Livestock disease or mortality emerges as the most prevalent cause, cited by 43.2% of defaulting households. For pastoral communities dependent on livestock as their core asset and income source, disease outbreaks or mass mortality events directly erode livelihood viability: lost animals reduce both current income and future production capacity, leaving households unable to meet debt obligations. This finding underscores the critical role of biophysical risks in shaping debt vulnerability in arid pastoral regions, where limited veterinary services and climate stress exacerbate livestock health challenges.

Medical expenses (36.5%) and over-dependence on informal lenders (31.7%) are the next most significant factors. Unplanned health expenditures often driven by limited access to affordable healthcare in remote areas act as acute financial shocks, diverting resources from loan repayment to cover urgent medical needs. Reliance on informal lenders, meanwhile, reflects the absence of accessible formal financial services: informal credit typically carries high, unregulated interest rates and rigid repayment schedules, which become unsustainable during periods of income decline, pushing households into default.

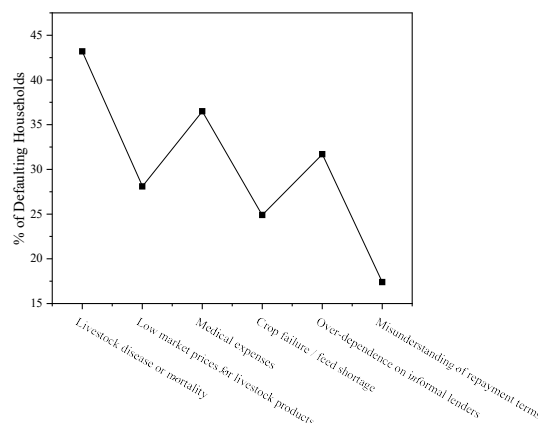


Fig. 4 Reasons for Default (Multiple Responses Allowed)

Low market prices for livestock products (28.1%) and crop/feed shortages (24.9%) further highlight the sensitivity of pastoral livelihoods to market and climatic variability. Fluctuations in livestock product prices directly reduce household income, while feed shortages increase production costs and constrain herd productivity, creating a double squeeze on repayment capacity. Misunderstanding of repayment terms (17.4%) is the least common factor, suggesting that default is driven more by external shocks than by lack of clarity around loan agreements, a finding that reframes default as a systemic issue rather than a failure of financial literacy alone.

Collectively, these results demonstrate that loan default in Minfeng County is a symptom of the fragility of pastoral livelihoods, where interconnected biophysical, market, and institutional risks converge to undermine debt sustainability. The dominance of livestock-related shocks and informal credit dependency calls for targeted interventions, such as livestock insurance, formal credit expansion, and improved healthcare access, to mitigate the drivers of default and build financial resilience among pastoral households.

4. Discussion

Pastoral households in Minfeng County face multi-dimensional debt risks shaped by ecological, market, and institutional constraints. Frequent climate-related shocks such as drought, forage shortages, and livestock disease create sudden income instability that directly affects households' repayment capacity. Market fluctuations in livestock prices further amplify financial vulnerability, while long travel distances and limited banking infrastructure restrict access to stable, low-cost credit. As a result, many households rely heavily on informal borrowing networks, which offer fast and flexible loans but often at high interest rates and with ambiguous repayment terms. These structural conditions mean that default behavior is typically driven not by unwillingness to repay, but by capacity constraints stemming from health expenditures, veterinary costs, or abrupt declines in herd size. Education, financial literacy, and diversified income sources significantly improve repayment outcomes, highlighting the importance of household-level capabilities in mitigating debt-related risks.

5. Conclusion

This study provides one of the first empirical assessments of debt risk and default behavior among pastoral households in Southern Xinjiang using primary field-survey data. Debt is widespread, and informal borrowing remains dominant. Default is primarily associated with ecological and health shocks, unstable income, and limited financial literacy. Strengthening formal credit channels, enhancing risk-mitigation tools, and improving financial education can significantly reduce household vulnerability. The findings can support policymakers, rural financial institutions, and poverty-alleviation programs in designing more resilient pastoral finance systems suitable for China's arid regions.

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