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Climate Risk and Access to Agricultural Credit: Do Climate Adaptation Strategies Matter?

Cludio Kumbirai Chikeya¹, Samuel Nkala²

Abstract: The study aims to determine the relationship between climate risk, adaptation strategies and access to agricultural credit among agribusinesses in Bulawayo Province in Zimbabwe. It endeavours to reveal if climate adaptation strategies alleviate the problem of access to credit for firms in climate risk prone areas. The research builds on research on climate risk and access to credit by examining the role of climate adaptation strategies in a semi-arid region. It relies on survey data from 367 agribusinesses, collected through structured questionnaires and interviews. Thematic analysis and logistic regression were used to analyse data. The results indicated that climate risk significantly lowers the chances of credit access. Financial institutions react to climate risk by imposing stricter lending standards, increased collateral requirements, and pulling out of vulnerable segments. Though results show that adaptation strategies positively influence credit access, lenders do not directly incorporate these in credit models. Therefore, climate risk will continue to act as a constraint to finance availability unless climate-sensitive credit scores and adaptation strategies are incorporated into the lending models. The study brings out the impact of climate adaptation strategies on credit access of agribusinesses operating in semi-arid regions.

Keywords: Climate risk; agricultural credit; adaptation strategies

JEL Classification: D01, D02, D52, E51, G21, Q14, Q54

¹ Senior Lecture, Ph.D., University of the Western Cape, Cape Town, South Africa, Address: Robert Sobukwe Road, Bellville, 7535, Cape Town, South Africa, Corresponding author: cchikeya@uwc.ac.za.

² MSc., National University of Science and Technology, Zimbabwe, Address: Corner Gwanda Road and Cecil Avenue, Bulawayo, Zimbabwe, E-mail: samuel.nkala@yahoo.com.



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1. Introduction

The world is experiencing the transformation of agriculture due to climate change, and Zimbabwe is not an exception. Over the past couple of years, the erratic weather conditions, extended dry seasons, and increase in temperatures have affected agricultural productivity, exerting pressure on farmers, other agribusinesses and the financial institutions that finance them. This has particularly been the case with regions such as Bulawayo where the agribusinesses are experiencing increasing climate risks and yet they lack access to credit that would allow them to adapt and expand. This has resulted in business stagnant growth, company failures and higher unemployment. Climate change remains one of the most pressing threats to global agricultural systems, posing significant challenges to food production and rural livelihoods. Projections by the Intergovernmental Panel on Climate Change (IPCC) (2022).

indicate that global agricultural yields could decline by 5% to 30% by 2050 due to rising temperatures, erratic rainfall, and an increase in extreme weather events. The resulting alterations affect the smallholder farmers negatively as they contribute over 70 percent of the world food supply yet do not often have access to adaptive technologies, formal insurance, and financial services (Food and Agriculture Organization (FAO), 2023).

Numerous studies have shown that agricultural systems based on smallholders cannot be sustained without structural adaptation to the pressure of climate change (Mwadzingeri et al., 2021; Jiri et al., 2015). One of the building blocks of resilience would be agricultural credit that enable investment in drought-resistant seeds, irrigations, and improved storage (Chigunhah et al., 2020). There is empirical evidence indicating a change in the approach of financial institutions in agricultural sector funding due to climate-related risks (Chigunhah et al., 2020; Kuipa, 2019; Moyo et al., 2012). This change and its impact on access to credit forms the basis of this research. Evidence shows that financial institutions are implementing conservative lending practices after an upsurge in default rates in response to extreme weather events (Chigunhah et al., 2020; Kuipa, 2019). Banks have cited higher non-performing loan ratios among agricultural customers; as a result, they have either pulled out of the rural markets or tightened loan terms (Chigunhah et al., 2020; Kuipa, 2019; Moyo et al., 2012). Resultantly, the percentage of agribusinesses who have access to formal agricultural loans is decreasing because of the increased risks of non-repayment and rigid collateral arrangements (Chigunhah et al., 2020;

Moyo et al., 2012). Though relevant, these studies have taken an oversimplified view of the Zimbabwe experience in terms of failing to take into consideration geographical variations in vulnerability, financial behaviour, and agro-ecological setting (Jiri et al., 2015). Therefore, this study aims to fill this gap by paying attention to Bulawayo Province which is a strategic yet unique region. Bulawayo is the second-largest province in Zimbabwe, and it is estimated to have more than 650,000 inhabitants (Zimbabwe National Statistics Agency, 2022). It is a semi-arid region characterized by long dry spells which largely relies on resilient agriculture and innovative urban farming. Bulawayo, as is the case in many peri-urban areas, has been left out in the national studies of agricultural financing that mostly generalize the rural situations and fail to consider the local dynamics (Jiri et al., 2015). A local investigation will provide important clues as to how macro pressures related to climate are translated into financial behaviors and distortions in the credit market on the micro level.

The current seeks to bridge this gap by examining the impact of climate risk on agriculture financing in a semi-arid peri urban set up forcing on agribusinesses. Furthermore, it explores role of climate adaption strategies in enhancing agriculture finance. Utilizing surveys and logistic regression, the results show that climate risk reduces access to agriculture finance. Even through climate adaptation strategies improve access to finance, financial institutions do not directly include them in lending models. Financial literacy, record keeping, collateral security and registration status influence credit access for agribusinesses.

2. Literature Review

This paper is anchored by two interconnected theories, Risk Management Theory and the Access to Finance Framework, to gain insight into the climate- risks and agricultural credit nexus.

2.1. Risk Management Theory

Risk Management Theory (RMT) focuses on how organizations prepare and react to operational and environmental shocks. This essentially involves identifying, assessing and management of risks that might impact the organisation. Smith (2015) highlights that effective risk management allows organisations to take advantage of

opportunities while at the same time minimising losses. The RMT therefore assumes that financial institutions, embody organized procedures of detecting, measuring, and mitigating risks that may impair income streams or capital repayment to enhance performance and create shareholder wealth (Gates et al., 2012). This helps lenders to determine the likelihood and severity of default situations, and to design mitigation strategies. Response strategies to risk such as climate risk could include recovery lending, reallocation and repricing of loans, and relational transformation (Brüggemann & Lueg, 2026). There is ample evidence that climate risk has been incorporated by banks in their risk management framework, however challenges around nonlinearity, industrial and location dependence and in some instances, measurability remains (Redondo & Aracil, 2024). Implementing risk management can be challenging in instances where risk cannot be objectively measured. This might not be true for small to medium enterprises exposed to new threats that are unpredictable, for example climate risks. Qualitative aspects like adaptation strategies could be difficult to capture due to under or inconsistent reporting, resulting in misrepresentation of borrower realities.

2.2. Access to Finance Framework

The Access to Finance Framework (AFF) was initially developed by Beck et al. (2007), emphasising how obstacles to access formal financial services were negotiated by individuals and firms. It is relevant in developing economies such as Zimbabwe where informal economies and a lack of financial infrastructure may tend to exclude the marginalised sectors such as smallholder agriculture. The framework distinguishes between supply-side and demand-side constraints based on the level of transaction costs, poor rural branch networks, and risk aversion of lenders on the supply side and the absence of collateral, poor financial literacy, and informal land title on the demand side. These structural factors strengthen credit rationing, which determines whether uncreditworthy borrowers access credit at all or on very disadvantageous terms (Khan et al., 2024). This is even worse in agriculture where the seasonal income, high exposure to risk and dependence on natural resources contribute to the unwillingness of lenders to engage (World Bank, 2022). At the core of the concept is the belief that financial access is not only about the geographical access to banks but also about the willingness of the institutional unit to lend to risky or low-income individuals. Banks could justify these decisions citing regulatory and

risk management constraints as the reasons to exclude them, more so in areas with constant droughts or economic disruptions (Mhlanga & Dzingirai, 2024).

2.3. Conceptualization of Climate Risk

Climate risk is defined as the possibility of negative consequences because of the climate variability and long-term climate change, and it includes both the extreme weather and the slow environmental changes (IPCC, 2022). It encompasses both physical risks, e.g. droughts, floods, heatwaves, and storms and transition risks that are caused by the shift toward policy and technology and the preferences of the markets to mitigate climate (World Bank, 2022). The risks are not only to the ecosystems and infrastructure but also to economic sectors dependent on environmental stability like agriculture and finance (FAO, 2021). In agricultural sector, climate risk has a direct impact on production, investment and access to finance. Climate change, manifests through irregular rainfall, warmer climate, and increased cases of extreme weather. This reduces crop production, complicates planting cycles, and introduces unpredictability among lenders and farmers. This volatility reduces income stability and repayment predictability of agribusinesses and increases the perception of risk among the financial institutions who then tighten their lending terms or even give up on agriculture lending (Abate et al., 2016; Mhlanga & Dzingirai, 2024). When lenders restrict lending they do not affect current production but they also increase susceptibility of agribusinesses through depriving them infrastructure and technology that improves resilience and adaptability (World Bank, 2022). In the semi-arid areas like Bulawayo, the main form of climate risk manifests as rainfall variability, long dry periods, and a reduction in the level of groundwater, which affects both rainfed and irrigated agriculture (FAO, 2021). Coupled with macroeconomic instability that characterise Zimbabwe, financial institutions become cautious about lending to agriculture businesses (Mhlanga & Dzingirai, 2024).

2.4. Conceptualisation of Access to Agricultural Credit

Access to agricultural credit means that the farming households and agribusinesses can access timely, affordable, and appropriate funding to use in production, marketing, and capital investment. It does not only depend on how close a person is to financial institutions, but also on a complex of structural, institutional and

behavioural processes that define whether credit is accessible, to whom, and on what terms (World Bank, 2022; FAO, 2021). Credit allows agribusinesses to use productivity-enhancing technologies and diversify production to allow smooth functioning under stressful conditions. It affords them to hire skilled labours, source raw materials, market their products and fight competition (FAO, 2021; World Bank, 2022). However, financial system still fails to serve the small agricultural producers effectively, especially in low- and middle-income countries, because of the perceived risk, lack of collateral, and informality of land ownership and enterprise structure (Khan et al., 2024). This does not only impact viability of farmers in these communities but also impact the whole ecosystem of agribusinesses that rely on supplying goods and services to farmers, process agriculture produces and distribute agriculture products. Mhlanga and Dzingirai (2024) found that commercial banks view agriculture as a high-risk and low-margin activity and, therefore, adopt a conservative lending policy that leaves out small-scale or informal actors. Access barriers are compounded by the spatial barriers, poor infrastructure, inefficiencies of the institutions, regulatory barriers, and lack of investment which disproportionately impact women, the youth, and the producers in the peri-urban areas (IFAD, 2023). Although the use of innovations in mobile money and microfinance has enhanced reach in certain countries, the tools are usually limited in terms of their depth or scale to transform agriculture in the long run (FAO, 2021; World Bank, 2022).

Most agribusinesses are informal, without formal land titles or registration and cannot take advantage of most credit products provided by formal financial institutions. In addition to that, macroeconomic instability and high inflation have shaken the confidence of lenders and raised the cost of borrowing, which supports the tendencies of exclusion (Mhlanga & Dzingirai, 2024). Resultantly, most agribusinesses in the economies rely on informal credit, that is inadequate and expensive.

2.5. Determinants of Agricultural Credit Access

The structural, social-economic and institutional factors that restrict access to agricultural credit are well documented. The lack of collateral, especially land titles or registered assets, is one of the major impediments as this is a key requirement of most commercial lending institutions. Lack of verifiable security means that even when businesses are productive or have commercial potential, they may be ineligible to take out loans (Abate et al., 2016). Financial literacy is another important

determinant. There is an increasing amount of evidence showing that businesses unable to prepare basic farm budgets, financial statements, and loan repayment plans are less likely to be allocated formal credit (Changwasha & Mutezo, 2023). It also impacts usage of credit, decision making based on knowledge of interest accumulation, amortization, and loan compliance procedures (Abate et al., 2016). This could negatively affect business viability and repayment capacity when financial literacy is low. Socio-demographic factors including gender, age, and education also have a long-term influence on access to credit. For instance, women are often discriminated against with regards to access to financial resources, in large part because of gender differences in land ownership, legal vulnerabilities and patriarchal attitudes (Patt et al., 2010; Ceballos et al., 2019). The level of education, also, tends to be correlated with access to credit as it determines how well a person will be able to navigate the application process, digital literacy, wealth accumulation and trustworthy (Adjognon et al., 2017). Other constraints include the geographical nearness to financial institutions, availability of infrastructure, interest rates, education and design of credit products, (Abate et al., 2016). For instance, the structure of repayments might discourage borrowers with seasonal and weather-dependent income (Ceballos et al., 2019).

2.6. Climate Adaptation Strategies and Creditworthiness

There is a growing role of climate adaptation in the discussion of agricultural resilience and finance, but its connection with creditworthiness has not been adequately explored. The types of adaptation include technological responses in the form of solar irrigation and seed varieties resistant to drought, as well as behavioural responses, including revenue diversification, soil conservation, early planting, planting trees and land-use change (Gebru et al., 2020). Research demonstrates that such adaptations may considerably enhance the productivity of agribusinesses and limit the risk of exposure to climate shocks thereby improving productivity (Ogundeji, 2022; Sawadogo et al., 2025). Unfortunately, such adaptations are frequently funded by informal savings or remittances. Such self-financed resilience may not enhance creditworthiness to formal lenders as there are no institutional structures that can convert adaptation into financial soundness. The first big explanation of this disconnect is in the character of adaptation itself. In contrast to formal financial indicators, e.g., credit history or audited balance sheets, climate adaptation plans tend to be qualitative, situation- and context-specific, and they are

often implemented without any documentation. As an example, a farmer who decides to change his farming method to conservation tilling can lessen the amount of soil erosion and enhance drought resistance, but when this is not reflected in any official reporting, banks will not see it. The fact that many agribusinesses in Zimbabwe are not registered only exacerbates the situation because these businesses cannot rely on formal data systems (Mhlanga & Dzingirai, 2024). Such invisibility becomes a self-reinforcing cycle: adaptation is not acknowledged, no trust is built and credit is out of reach.

A wider meaning of creditworthiness should consider adaptive capacity involving social capital, innovation practices, and climate knowledge. However, adaptation investments, such as the installation of small-scale irrigation, the adoption of agroforestry, or cooperative marketing, are often ignored, as the collateral security and repayment history are prioritised by the institutions. Due to institutional attitude towards innovation, other banks view innovation, including changing the crop varieties or un-proven farming techniques, as speculative behaviour (IFAD, 2023). When borrowers that seek change to reduce risk are punished for being unconventional. This conservatism is not only based on financial rationale but the lack of training on sector specific knowledge (Mhlanas speculative, 2024).

2.7. Empirical Review

Adjognon et al. (2017) examined the determinants of access to agricultural input credit in Sub Saharan Africa. The results showed that cooperative membership and closeness to urban markets were the most common determinants of credit access, and exposure to climate was not a significant element in the regression models. Matondi and Dekker (2011) studies the effect of Fast Track Land Reform Programme in Zimbabwe on credit access. The study revealed that lack of formal land titles was a major hindrance to farmers to access formal credit since most financial institutions were not ready to use untitled land as security. Liu et al. (2025) show that climate risk reduces agriculture production, farmer's ability to repay loans, demand for credit and increases credit constraints in China. Jonas et al. (2025) found a positive association between climate resilient assets and credit access for farmers in South Africa. Sawadogo et al. (2025) found evidence that adaptation strategies enhance food security and farm income in Burkina Faso. Similar evidence was found by Ogundeji (2022) in South Africa. The examined studies highlight climate risk as an important factor in accessing to agricultural credit. Adaptation strategies are

shown to improve productivity and income. However, the studies do not directly link climate adaptation strategies to credit access for agribusinesses. This study addresses this gap.

3. Methodology

The research utilised a mixed-methods approach, combine both quantitative and qualitative techniques. This facilitated the gathering and analysis of both numerical patterns and narrative observations to have a multidimensional picture of how climate risk and adaptation strategies affect credit availability. We utilised logistic regression to analyse relationships between climate risk variables and access to credit. In-depth interviews with loan officers, investigated institutional perceptions and risk ratings that are difficult to capture in numerical data. This convergence of methods boosted the validity of the findings and made it possible to triangulate behavioural information and statistical evidence.

3.1. Econometric Model Specification

The study used binary logistic regression to study the determinants of access to agricultural credit in the presence of climate risk. This selection was suitable because the dependent variable, access to formal credit, is binary, coded as 1 whether credit was accessed or 0, otherwise.

3.2. Model Specification

The logistic regression is expressed as:

$$\begin{aligned} \text{Logit}(P_i) &= \ln\left(\frac{P_i}{1 - P_i}\right) \\ &= \beta_0 + \beta_1 CR_i + \beta_2 AD_i + \beta_3 FL_i + \beta_4 FS_i + \beta_5 ES_i + \beta_6 G_i \\ &\quad + \beta_7 REG_i + \varepsilon_i \end{aligned}$$

Where: P_i is probability of accessing formal credit (Access = 1, No Access = 0), CR_i is climate risk exposure indicator, AD_i is adaptation strategies measure, FL_i is financial literacy score, FS_i is financing source (categorical dummy), ES_i is enterprise size (micro, small, medium), G_i is gender of business owner, REG_i is registration status and ε_i is the error term.

Table 1. Variables for Logistic Regression

Variable	Definition	Measurement	Expected Sign
Access to Credit (Dependent)	Whether the agribusiness accessed formal credit	Binary: 1 = Accessed; 0 = Not accessed	N/A
Climate Risk Exposure (CR)	Frequency/severity of droughts, floods, erratic rainfall	Index (0–5 events in 5 years)	–
Adaptation Strategies (AD)	Number of climate-smart practices adopted	Count of practices adopted (0–5)	+
Financial Literacy (FL)	Ability to keep records, prepare statements, understand credit	Scale from questionnaire (1–5)	+
Financing Source (FS)	Type of institution approached for credit	Dummy: Bank = 1, MFI = 2, Cooperative = 3, Government = 4	Mixed
Enterprise Size (ES)	Firm size (employees)	Dummy: Micro = 1, Small = 2, Medium = 3	+
Gender (G)	Gender of owner	Binary: Male = 1, Female = 0	Mixed
Registration Status (REG)	Formal registration with authorities	Binary: Registered = 1, Not registered = 0	+

3.3. Population and Sample

The study concentrated on events that affected the firms between 2020 and 2025. This period was chosen to represent the recent changes in climatic conditions, credit access and lending patterns. The target population comprised of two groups that included agribusiness people and loan officers from commercial banks, microfinance institutions, and agricultural cooperatives. Agribusinesses encompassed participants in agricultural production and value addition, which included smallholder farmers, agro-processors, and suppliers of agricultural inputs. A sample size of 367 businesses was deemed enough to draw meaningful conclusions.

3.4. Data Collection Methods

Structured questionnaires were administered to agribusiness operators who were identified. Further processing resulted in eliminating operators who had not applied for funding in the past five years. The questionnaire contained dichotomous

questions, ordinal questions on a Likert scale and continuous variables all of which could be subject to econometric processing. To supplement the quantitative data the study also carried out semi-structured interviews with credit officers. These interviews were intended to gain some deeper insights into decision making about credit approval and borrower experiences about climate variability.

3.5. Ethical Considerations

The study was given ethical approval by the appropriate university ethics committee before the fieldwork was initiated. Clearance of the institutions meant that the research process satisfied the general ethical expectations of the social science research, particularly regarding human participants. Every participant was well educated on the intention of the study, what was expected of them and their rights which included the right to withdraw at any stage without penalty. Data were anonymised during transcription and storage to maintain privacy of the participants.

4. Results

4.1. Response Rate

A total number of 367 questionnaires were administered to businesses that had applied for funding in the past 5 years. Out of these, 289 questionnaires were returned and used in analysis, constituting a 78.7% response rate. A total of 18 interviews were carried out successfully across the commercial banks, micro finance institutions, agricultural cooperatives.

4.2. Frequency of Climate Events

A large proportion of respondents reported experiencing multiple climate events.

Droughts (82%) and erratic rainfall (68.2%) were the most common, followed by heatwaves (42.9%). Flooding (18.7%) and hailstorms (8.0%) were less frequent but still contributed to agricultural losses. Majority of respondents (85%) confirmed that climate events had negatively affected production and sales, thereby potentially heightening the riskiness of these businesses to lenders. A paltry 15% indicated no impact from these reported weather events. However, this could indicate failure of business owners to link business performance to these unfamiliar events.

4.3. Credit Application and Approval Rates

Out of 289 respondents that applied for credit, 153 (53%) were approved. Though the figure is above half, 47% of applicants fail to access credit.

4.4. Distribution by Institution Applied To

As shown in Figure I, applications were concentrated in commercial banks (50%), followed by microfinance institutions (30%), cooperatives (15%), and government schemes (5%). The distribution indicate that commercial banks remain the funding source of choice for most agribusiness. However, this preference could also explain the low approval rate since banks are more risk averse compared to other lenders.

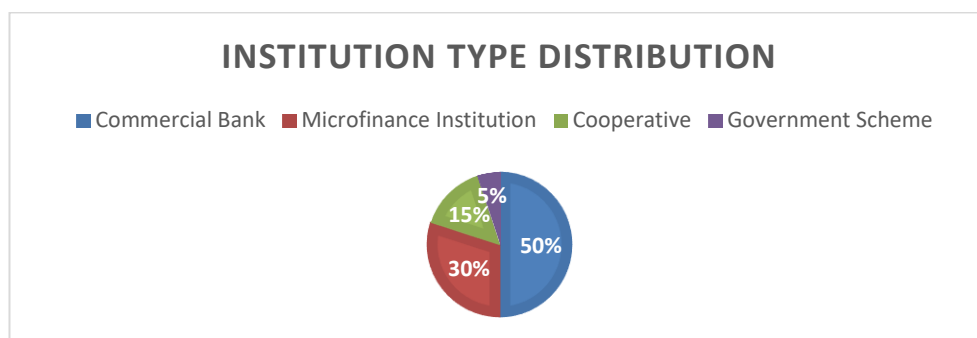


Figure 1. Institution type distribution

4.5. Reasons for Loan Rejection

Figure II shows that the most frequently cited reason for loan rejection was insufficient collateral (47.8%), followed by lack of business records (29.4%). Poor credit history accounted for 13.2% of rejections. In 6.6% of cases, no reason for rejection was communicated to the applicant, while 2.9% cited other reasons.

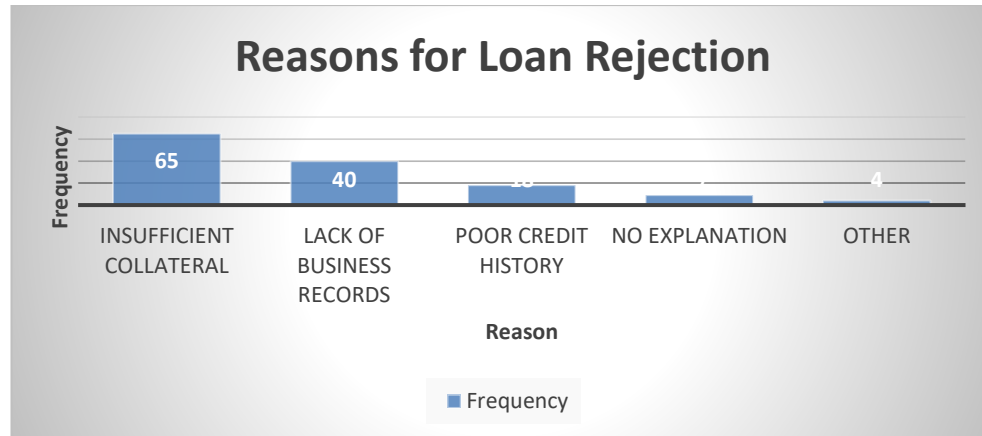


Figure 2. Reasons for loan rejection

4.6. Lender Attitude Due To Climate Risk

Respondents from financial institutions recognized that especially recurring droughts and irregular precipitation, has played a major role in risk evaluation in agricultural lending. However, there were different policy responses from the various lenders. Three key themes are presented here.

4.6.1. Climate Risk as a Credit Risk Multiplier

Majority of the loan officers (78%) indicated that climate variability has had a direct impact on their perception of agricultural default risk. The shift was mostly attributed to the severe droughts and the increase in non-performing loans (NPLs) on agricultural portfolios. The other remaining officers (22%) acknowledged presents of climate risk but highlight that the ability of borrowers to adapt to these risks can counter perceived risk. They gave examples of horticulture and poultry clients who were experiencing good repayment performance even in the face of climate shocks. This suggests that sensitivity to climate risk is dependent on type of business.

4.6.2. Adjustments to Lending Terms

Most loan officers (61%) highlighted that their institutions have tightened lending standards as a reaction to climate risk. Adjustments that are common include increasing interest rates to accommodate higher risk premiums, collateral requirement of 150 per cent or higher on high-risk agricultural areas like dryland maize and shorter repayment periods to reduce exposure to long-term production

risks. The remaining lenders outlined other corrective measures such as limiting the amounts of loans issued to limit exposure; favouring short-term working capital loans over long-term investments and selectively lending to borrowers with demonstrable adaptability measures.

4.6.3. Selective Withdrawal from High-Risk Segments

A smaller number of loan officers (33%) indicated that their institutions had already pulled out of some of the climate-vulnerable sectors, especially smallholder production of maize without irrigations. Recurrent defaults, failure to obtain insurance cover, and failure to put in place risk-sharing mechanisms made it financially unsustainable to expose lenders further. The remaining majority said that their institutions have not pulled out altogether. Instead, they have transitioned lending into less risky forms of lending (poultry, horticulture, agro-processing) and continued lending to crop producers who had sound adaptation plans (e.g., irrigation, conservation agriculture, secured off-take contracts).

4.7. Strategies Used by Agribusinesses and Financial Institutions to Adapt to Climate-Induced Risks

4.7.1. Adoption of Adaptation Strategies

Respondents highlighted several adaptation strategies that range from revenue diversification, adopting climate proof crops, water security, out of region sourcing, conservation agriculture, smart agriculture, parametric insurance, regenerative practices and climate scenario modelling. Businesses relied on more than one strategy.

4.7.2. Lender Response to Adoption Strategies

Interviews with loan officers revealed that the degree to which adoption of mitigation strategies influenced lending decisions varies significantly across institutions.

4.7.2.1. Proactive Production Adjustments

A majority (67%) of the loan officers indicated that they recognise use of mixed cropping systems, revenue diversification, use of drought tolerant varieties and shifting planting schedules to meet changes in rainfall patterns. However, although these were factors that reduce risk, they were not yet factored into risk scores. The remaining officers (33%) recognised that these adjustments are in place, but their

use is restricted to the better-capitalised businesses, suggesting that their impact on lending affect businesses that would otherwise qualify for credit due to high collateral and quality financial statements.

4.7.2.2. Investment in Irrigation and Water Harvesting

There was agreement (61%) that relying on irrigation systems and water harvesting techniques and selling the same stabilise income. However, most of these are self-funded investments. The remaining (39%) concurred that there are signs of increasing adoption, but pace was limited by high upfront costs. This largely impacted small agribusinesses, forcing them to rely on rainfed systems. These usually approached microfinance institutions for credit as opposed to commercial banks.

4.7.2.3. Limited Institutional Recognition of Adaptation

Although there is evidence of adaptation on the part of borrowers, 33% of loan officers indicated that their institutions do not formally incorporate such measures into credit risk measures. Adaptation measures like irrigation, conservation agriculture, revenue diversification are usually unofficially recognized during client appraisal, but there are no systematic ways to formalize them into better credit terms or risk grades. The majority (67%) reported that although formal recognition is not yet in place, there is an emerging internal debate on working out lending products or risk models that will reward the borrower who adopts proven adaptation measures.

4.8. Financial Literacy, Adoption Strategy and Credit Uptake

The statistical analysis provides validation of the patterns identified in the descriptive and qualitative findings.

4.8.1. Pearson's Correlation Analysis

The results show that there is a moderate positive correlation between the financial literacy and adaptation strategies ($r = 0.412$), and between the financial literacy and the uptake of credit ($r = 0.389$). Similarly, there is a positive correlation between adaptation index and credit uptake. This result suggests that agrobusiness owners who exhibit higher levels of financial literacy were likely to utilise more adoption strategies and demand credit.

Table 2. Pearson's Correlation Matrix

Variables	Financial Literacy	Adaptation Index	Credit Uptake
Financial Literacy	1.000	0.412**	0.389**
Adaptation Strategy Index	0.412**	1.000	0.365**
Credit Uptake Level	0.389**	0.365**	1.000

** $p < 0.01$

4.9. Determinants of Access to Credit

Results in Table 3 show that climate risk exposure has a negative impact on access to credit (OR = 0.481). A 1 unit increase in exposure to climate risk the log odds of accessing credit reduces by 0.732. Adoption strategies enhance credit access with a 1-unit increase associated with higher odds accessing credit (86% increase). Similarly, registration status and financial literacy increase the chances of accessing credit for agrobusinesses.

Table 3. Logistic Regression Results

Variable	Coefficient	Wald χ^2	Odds Ratio
Climate Risk Exposure	-0.732** (0.258)	8.04	0.481
Adaptation Strategy Index	0.621** (0.221)	7.89	1.861
Financial Literacy Score	0.452* (0.187)	5.84	1.571
Gender (Male=1)	0.238 (0.214)	1.23	1.269
Registration Status	0.819** (0.247)	10.96	2.269
Enterprise Size	0.194 (0.121)	2.56	1.214
Constant	-2.318** (0.634)	13.35	
Hosmer–Lemeshow Test (p)	0.421		
Nagelkerke R ²	0.372		

The gender of the owner and size of enterprise were not statistically significant. A Hosmer-Lemeshow p-value of 0.421 means that the model fit the data well implying the predicted probabilities are not statistically different from the actual outcomes. Nagelkerke R² of 0.372 show a strong explanatory power, indicating that the predictors account for 37% of the variability in predicting credit access.

4.10. Discussion of Findings

The results show that climate events have frequently impacted agribusinesses in Bulawayo province. This heightened climate risk, which is viewed as a risk multiplier by lenders, thereby making agribusinesses highly risky. This resulted in tightening of credit standards through increasing collateral requirements, risk premiums and total withdrawal out of the agribusiness segment. Most of agribusinesses seek loans from commercial banks as opposed to other sources of credit, indicating capacity issues and concentration risk. However, a significant portion of businesses are still denied access to credit due to lack of collateral and financial statements. This suggests existence of systematic barriers. This does not only impact survival and growth of firms in this sector, but it also limits their capacity to build resilience. To mitigate the effects of climate change, agribusiness have adopted mitigation strategies such as use of climate proof crops, revenue diversification, irrigation and conservation agriculture. Those along the value chain have resorted to out of region sourcing and showing a bias towards goods and services that assist in drought mitigation such as irrigation equipment, greenhouse construction and smart agriculture. However, lenders are not factoring these efforts in credit scores despite recognising their positive impact.

Despite this, evidence from regression results show that adaption strategies positively impact probability of accessing credit among other factors such as registration status and financial literacy. This suggests that even if banks are not factoring adoption of adaptation strategies in their models, these strategies impact financial health of firms as found by (Oguedhi, 2022; Sawadogo et al., 2025). This in turn positively impact credit access. More light is shed by correlation results, that show positive correlation between financial literacy, adaptation strategies and credit access. This suggests that firms demonstrating higher financial literacy are likely to implement good financial management, adaption strategies, thereby accessing more credit. As expected, climate risk exposure reduced access to debt in line with results by (Liu et al., 2025). Climate risk result in cashflow volatility for all businesses along the agribusiness value chain since most rely on good weather conditions. As a result, financial institutions responded heightening credit standards to reduce their exposure to credit risk. This concurs with the risk management theory, which brings out presence of institutional risk aversion when there is environmental uncertainty. Similarly, the study results also support the access to finance framework that suggests that systematic perceptions of sectoral risk including risk brought about by

climate exposure can limit access to credit despite the high demand (Beck et al., 2007).

The findings review important institutional failures. Most commercial banks are not flexible enough to alter their decision-making processes either because policy decisions are made in overseas head offices that are far away from their operating ground or due to lack of innovation. Moreover, they tend to be more risk averse compared to NGOs, government agencies and microfinance institutions. Inflexibility of loan products contributes to such structural inhibitors. The terms of the repayment do not always reflect the reality of agricultural production cycles, especially in times of drought. Over reliance on commercial banks as the main lender reflect their capacity to lend but could also explain low access to credit. Lack of climate-informed credit scoring and risk-sharing arrangements meant that high climate exposure was still inhibiting agricultural finance despite adoption strategies put in place. Results demonstrate a tendency of moving towards risk avoidance where climate variability has become an overt consideration in risk assessment. This has resulted in restructured internal lending models that make agriculture ineligible even where there are risk abatement mechanisms like irrigation and other adaptation strategies. Resultantly, there has been tightening of lending conditions due to higher collateral requirements, increased interest rates, and reduced repayment periods and other institutions have cut lending or ceased lending to the most climate-vulnerable crop sectors. These findings agree with access to finance framework (Beck et al., 2007) as it points out that many otherwise viable borrowers tend to be shut out by systemic institutional practices. Lack of collateral and poor record keeping are important impediments to credit access. This difficulty is further complicated by the fact that 99-year leases or communal tenure arrangements held by most farmers are still not accepted as security.

Results are robust different techniques, showing the negative impact of climate risk exposure, limited recognition of climate adaption strategies and different levels of sensitivity to climate risk depending on nature of operations. These results are an important extension to practice. Banking models being applied in climate sensitive regions are inappropriate, depriving lenders access to credit and limiting shareholder profits by failing to capture climate adaption strategies in risk modelling. Considering this, there is need for governments to bridge this gap to address this market failure. Promoting emergence of microfinance institutions and NGOs could reduce the gap, since their appetite for risk, operating objectives and management incentives could be different from those of commercial banks. On the side of

agribusinesses, access to credit requires a holistic approach that improves different facets of their operations ranging from improving financial literacy, adopting adaptation strategies, investing in tangible assets, formally registering business and keeping financial records. Piecemeal improvements are not enough.

5. Conclusion

The study sought to examine the role of climate adaptation strategies in the climate risk- credit access finance matrix in a semi-arid region. The study demonstrate that that climate risk lowers credit access for agribusinesses. Lenders consider agribusiness borrowers in Bulawayo to be highly risky borrowers due to their exposure to climate risk. However, the riskiness of the firms depend on the line of business. This had resulted in a significant portion of borrowers failing to access credit. Climate adaptation strategies enhance credit access, but they are not directly incorporate in credit risk models. There exists a glaring gap between the enterprise level resilience and institutional credit rating. The results bring out weaknesses on the part of financial institutions, particularly in the design of credit models. Incorporating adaptation strategies in lending decisions could enhance credit access, increase profitability and shareholder wealth. Therefore, the current lending systems do not incentivize resilience, and it contributes to under investments in adaptation. Agribusiness owners should improve financial literacy as this promote financial management, adoption of adaption strategies and improve credit access. Government on the other hand can bridge the gap left out by commercial banks through promoting an environment in which microfinance institutions, cooperatives and NGOs can thrive. In higher climate exposed regions, government should extend funding to help firms to build resilience. Lastly government should change 99-year leases into bankable tittle deeds to allow farmers to use them as collateral. The results lack generalisability to businesses outside the agribusiness value chain and analysing different forms of business along the agribusiness value chain could have brought more insight. Future research should focus on comparative studies across regions. Also, sub-sectors would bring granular understanding of whether credit access patterns and institutional reactions are universal across different exposure levels to climate.

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