

# EXTRANEOUS ~~SHOCKS~~SHOCK AFFECTING AGRIBUSINESS LOANS DEFAULT RATE IN AGRICULTURAL FINANCE CORPORATION, MOUNT KENYA REGION

## ABSTRACT

AgriAgro-shocks create stochastic disturbances to agribusiness performance, which spills over to the performance of credit markets. The beneficiaries of farm loans from the Agricultural Finance Corporation (AFC) in the Mount Kenya Region have recorded poor loan repayment at a rate of 20.33% ~~against~~versus 10%, which is the benchmark for all types of loans in Kenya. Given that agribusiness is a priority sector ~~infor~~ addressing food and employment concerns, the performance of agri-loans is sacrosanct. This study ~~meant~~aimed to determine the effect of extraneous shocks on ~~agribusiness loans~~the default rate ~~in of~~ agribusiness loans in an agricultural finance corporation, in the Mount Kenya Region. In 11 branches with a population of 3,002 agribusiness borrowers, a sample of 300 respondents was drawn using systematic random sampling with an interval of ten. In a descriptive design using a structured questionnaire, primary data ~~was~~were collected on the effect of extraneous shocks on ~~AFC loans~~the default rate ~~of AFC loans~~. To analyse the data, the Statistical ~~Paekages~~Package for Social Sciences (SPSS V.27) was used. The effect of variables in predicting the default rate was estimated using regression analysis. To derive the F-statistic ~~in order~~ to test the adequacy of the regression model, ANOVA was performed. ~~Multiple~~A multiple regression model was used to ~~specify~~determine the statistical relationship between extraneous shocks and AFC loan default. The model estimates revealed that the three indicators of extraneous shocks explained 23.90% of the AFC loan default rate. Two indicators (agroclimatic extremes and market volatility) positively and significantly ~~effected~~affected the AFC ~~loans~~loan default rate at the 5% level of significance ( $p$ -values=0.00<0.05). The ~~associations of~~ indicators ~~associated~~ with the default rate were:—agroclimatic extremes (21.7%), market volatility (30.6%) and biological hazards (17.3%). ~~The~~This study is significant because it may guide ~~the~~ credit stakeholders on ~~the~~ strategic imperatives pointing to interventionist policies through protectionism, partnerships, ~~and the~~ mitigation and internalization of extraneous shocks. The study recommends the need for loan actors to provide for contingencies and be alert ~~so as~~ to absorb risks emanating from shocks. Credit players should collaborate in pursuit of bespoke insurance schemes ~~whieh~~that can suitably cover farmer projects; ~~lastly~~ultimately, credit stakeholders should adopt coping strategies ~~so as~~ to cushion farmers from emerging distresses and devastating constraints.

~~Key words~~Keywords: AFC loan; default rate; borrower: extraneous shocks: repayment.

## INTRODUCTION

Extraneous shocks trigger stress in one dimension and spread it into another dimension, thus making them an important aspect of the farming business [1]. Extraneous shocks are unpredictable ~~and originates,~~ originate from outside the operations of the ~~phenomena~~phenomenon and have an impact that is significant and visible [2]. ~~Their~~The impacts of extreme events create stochastic perturbations that

~~creates disturbances to disturb~~ agribusiness performance, which spills over to the performance of credit markets [3]. Loan guarantees should be extended to cushion borrowers from defaulting if their investments are climate-friendly [4]. However, banks do not reduce credit flows indiscriminately ~~as because~~ they shield their core markets strategically [5]. Shocks present decision makers with limited information and ~~knowhow, knowledge~~ regarding the occurrence of ~~outcome outcomes~~ linked to a certain course of action [6].

The ~~effect effects~~ of extraneous shocks ~~is the are~~ risk outcomes such as ~~a~~ decline in agricultural productivity and poor performance in credit markets [7]. Risk management knowledge may equip ~~the borrower borrowers~~ with ~~the~~ skills to overcome revenue loss [8]. Risks posed by extraneous shocks impede the provision of credit, and where it is extended, there is potential for much higher default rates among agricultural clients [9]. Production risks emanate from bad weather, and they influence the ensuing price spikes [10]. Farmers also ~~experienced experience~~ institutional risk, which ~~are is~~ tied to unforeseen changes in government policy [11]. Risks cause spillover ~~effect effects~~ by producing different risky outcomes [12]. For example, flooding may engender financial and human risks, which makes it ~~hard difficult~~ to realize the projected yield [13]. This makes it ~~hard difficult~~ to raise money for loan repayment, thus making compliance in loan repayment a mirage [14]. Risk implies that farm decisions are met with uncertainty about the occurrence of an event ~~which that~~ causes unpredictability in ~~the~~ farming business [15]. Extraneous shocks cause transition risks, which occur as costs to ~~enterprise enterprises~~ due to unforeseen climatic ~~happening events~~ [16]. Ultimately, loan default arises because it is a risk eventuality ~~which that~~ borrowing farmers ~~had have~~ not anticipated [17].

Past studies have linked extraneous shocks to agribusiness loan ~~default: defaults.~~ Kanwal [18] observed that there was ~~a~~ high perception of bad weather; flooding ~~area areas~~ compelled ~~the~~ households to ~~be~~ proactively ~~engaged engage~~ in control measures and ~~also~~ monitor risks ~~so as~~ to reduce loan ~~default: defaults.~~ Hess [19] reported that agricultural enterprises were integrally knotted on unpredictable circumstances; hence, ~~the~~ constraints and uncertainties ~~which~~ point to low yield risk. The impact of ~~COVID-19~~ and floods caused ~~a~~ disbursement lag; ~~decrease,~~ ~~decreased~~ the value of loans accessed by farmers, ~~and~~ increased cost and effort during loan recovery, thus increasing default in loans. Kibrom [20] agreed that market problems such as market unpredictability, price volatility and insufficient marketing channels are the main ~~cause causes~~ of default in agribusiness credit. These studies exhibit ~~a~~ methodological, conceptual and contextual gaps. To address ~~the these~~ gaps, this study analysed ~~the variable on variables from~~ a broader perspective by studying a whole region, adopting more indicators and increasing the sample size.

Shocks induce risks in ~~the aspects of producing terms of production,~~ pricing, ~~and~~ financing and to ~~the institution and human [21].~~ institutions and humans [21]. Shocks include price ~~disparity disparities~~ and fluctuations [22]; bad weather challenges such as drought, flooding, strong winds and depressed rainfall [23]; variability in soil quality Suppan [24]; and natural hazards such as pest and disease infestations, flooding, fire ~~disaster disasters~~, thunder and lightning. They are also indicated ~~in for~~ weather, pests, floods, and disease or price variability, and they reduce farm production income, thus making loan repayment difficult [25]. This study adopted three indicators ~~which that~~ extraneously ~~effected affected~~ default in AFC agribusiness ~~loan loans~~. These

~~includes:include~~ agroclimatic extremes, market volatility and biological hazards. The objective of this study is to determine the effect of extraneous shocks on the AFC loan default rate. ~~Extraneous shocks~~ The impact of extraneous shocks on agribusiness projects thus ~~contributing~~ contributes tremendously to the problem of default, which hinders the sustainable recycling of farm loans; if unchecked, the trend would make the future of credit markets ~~to be~~ bleak since agribusiness investors would be risk averse, thus declining to borrow and use loans in farming.

Agroclimatic extremes are indicated ~~in~~ by drought, which is the main element [26]. This is because drought is a template for how climate change-induced water shortages could impact farming communities in the future [18]. Even if farmers rely on irrigated agriculture, drought brings great water ~~shortages~~ shortages since the available amount ~~would be of~~ water is prioritized ~~to be taken~~ to for urban centres rather than ~~to~~ for agriculture [16]. Agricultural production is intrinsically hooked on weather uncertainties, especially in relation to rain ~~fluctuation~~ fluctuations [27]. Bad weather events ~~caused~~ cause enormous damage to the economy and risk to the lender if loans ~~were~~ are not ~~insured~~ secured [28]. Extreme climatic anomalies exert biophysical stress and ~~is~~ are a source of yield ~~fluctuation~~ fluctuations in harvest-failure scenarios, thus indicating yield stress [29].

Market volatility is caused by inelastic ~~responses~~ responses to market gestures, ~~deficiency of~~ deficiencies, the risk of production ~~occasioned by~~ due to the vagaries of agroclimatic circumstances and ~~outset of~~ the onset of disease [30]. Consequently, volatility may not stabilize prices, thus causing the delivery of low volumes of produce and constraining ~~producer's strategy of~~ producers' strategies for participating in the marketplace [31]. Market volatility increases the cost of borrowed capital because the prices are distorted ~~bringing,~~ resulting in financial losses and wasted ~~labour~~ labor [32]. Agricultural markets are ~~characterized~~ characterised by volatile market dynamics [33]. Any sudden market change alters commodity prices due to ~~shortage or surplus~~ shortages or surpluses; this depresses the borrower's revenue, hence resulting ~~to~~ in loan default [34].

Biological threats (epidemics, infection by insects and accidents with animals) result from exposure to living organisms and their corresponding toxic substances (venom or mould) or ~~to~~ from diseases transmitted by vectors [35]. Infiltration of the environment by pests and diseases affects credit markets by limiting access to agricultural loans and credit [36]. This also hampers the performance of loans that are already being repaid [37]. Therefore, they are not ~~accounted for~~ as considered provisions during preparation for project undertaking [38]. ~~Covid~~ COVID-19 caused yield stress and unprecedented disbursement delays, which increased the cost and effort during loan recovery, thus increasing default in loans [39]. The recent occurrence of biohazards in Kenya changed the food security situation and agricultural livelihoods, which resulted in chaos and disruption, culminating ~~in~~ in a credit crisis [40].

## RESEARCH METHODOLOGY

### 3.1 Study Area

The study was conducted between June 2022 and December 2022 in the Mount Kenya region, which is one of the AFC catchment areas within the country. This

region was selected through convenience sampling because of its good branch network, variety of agribusiness activities and agroclimatic zones. The GPS coordinates of this region are 36.561, 2.168 and 37. 852, -0.85 [41]. The branch network of this region comprises ~~of~~ 11 branches, which ~~includes~~include Meru, Chogoria, Embu, Kerugoya, Thika, Murang’a, Nyahururu, Maralal, Nanyuki, Nyeri and Karatina. These branches are spread ~~in the~~across 9 counties ~~which include,~~ namely, Meru, Tharaka-Nithi, Embu, Kirinyaga, Kiambu, Murang’a, Samburu, Laikipia and Nyeri.

### 3.2 Research Design

The study used a descriptive research design. The aim of this design is to systematically obtain information ~~so as to~~ be in a position of phenomenon description, ~~or to~~ describe a situation, or population [42]. The design utilizes a myriad of research methods to explore the variables in question by chiefly employing quantitative data for descriptive purposes, collection and analysis of numerical data [43]. This design was accurate and systematic in collecting and describing extraneous shocks in the region of Mount Kenya ~~region~~, the default problem and the determinants of default. The choice of this design was guided by the possibility of using diverse methods of research to examine, observe and measure variables ~~which that~~ concern default in agribusiness loans in ~~AFC~~AFCs. This design was adopted by Chege [44] in examining practices of managing loans and credit ~~non~~non-repayment ~~AFC~~AFCs in Kenya. In addition, Adusei [45] adopted this design to study the determinants of ~~agribusiness entities~~ loan default in agribusiness entities in Ghana. Mwirigi [46] used a descriptive research design to study the managing relationships of customers and ~~Satisfaction of Account Holders of Commercial Banks~~ the satisfaction of account holders of commercial banks in Nairobi County, Kenya.

### 3.3 Population, Sampling Procedures and Sample Size Determination

#### 3.3.1 Study Population

The population of study was farmers who ~~have~~ borrowed agribusiness loans from the 11 branches of the Mount Kenya region for the period ~~2018/2022~~of 2018–2022. All agribusiness loans disbursed by the AFC are serviced in 36 months. These borrowers comprise ~~of~~ all current beneficiaries without regard to their loan level and repayment performance. The Agricultural Finance Corporation branch reports of 2022 show the performance of borrowers who are servicing 3-year agribusiness loans ~~totalling~~totaling 3,002 (Table 1).

Table 1: Distribution of Borrowers, Respondents and ~~Default~~Defaults in Mount Kenya Branches

Branch	County	Agribusiness Borrowers	Distribution of respondents	Averaged default rate for 5 years (%)
Meru	Meru	401	40	22.82
Chogoria	Tharaka-Nithi	217	22	24.96
Embu	Embu	211	21	22.86

Kerugoya	Kirinyaga	251	25	23.91
Thika	Kiambu	311	31	25.61
Muranga	Muranga	301	30	21.98
Nanyuki	Laikipia	241	24	25.75
Nyahururu	Laikipia	271	27	24.87
Maralal	Samburu	196	20	26.12
Nyeri	Nyeri	341	34	24.58
Karatina	Nyeri	261	26	24.39
Totals/percent		3,002	300	24.15%

Source: AFC Annual Reports (2022)

### 3.3.2 Sampling Procedures

The population was included 3,002 borrowers from which sampling was designed to identify the default cases and non-default nondefault cases (controls). Default was for all those with loans whose repayments were not regularized regardless of the cause of noncompliance. The controls were selected based on the absence of a history of nonconformity. According to the AFC records as per the close of financial year 2022, there were 3,002 agribusiness borrowers in the Mount Kenya region. Using a systematic random sampling method with a 'skip' of ten, a sample of 300 borrowers was retrieved and reviewed (Table 1).

The interval was used to avoid clustered selection, thus ensuring that respondents were spread across the branches under study. By "skipping" at the interval intervals of 10, overconcentration in one branch was eliminated; thus, a fair distribution which guaranteed representativeness. With this interval, the count loops from any point to finish the count that is needed required. Besides In addition, the interval guarantees that the sample is drawn from both defaulters and non-defaulters nondefaulters [47]. To conduct sampling, an element was randomly selected from the list randomly, and then every  $k^{\text{th}}$  element in the frame is picked was selected. This was calculated as follows:  $k = N/n$ , where  $k$  is the sampling interval (sometimes known as the skip),  $n$  is the sample size, and  $N$  is the population size. In our case, the sampling interval was determined thus:  $k = 3,002/300 = 10$ . This means that, the respondents were selected from the AFC list at random after skipping ten.

### 3.3.3 Sample Size Determination

It was important to select a sample to represent a population from a comparatively relatively similar population. Stratification aims to reduce the standard error by providing some control over variance. To calculate the size of the sample, the Daniel [48] formula was used as follows:

$$n = \frac{Z^2 P (1-P)}{d^2}$$

where;

$n$  = sample size,

$Z$  = Z statistic for a level of confidence,

$P$  = expected default or proportion (in proportion of one; if 20%,  $P = 0.2$ ), and

$d$  = precision (in proportion of one; if 5%,  $d = 0.05$ ).

Z statistic (Z): For At the level of 95% confidence of 95% level, which is conventional, the standard level, the Z value is 1.96. In these studies, investigators present their results with 95% confidence intervals (CICIs).

Using 1.96 as the standard deviation for the 95% level of confidence interval, with a known sample size and a known proportion, the precision can be determined. To calculate the margin of error, the non-negative square root is considered [49]. In our case, there were 3,002 agribusiness loan beneficiaries. Defaulters represented 24.15% of the total beneficiaries. For the sample size, the following calculation was done:

$$n = \frac{1.96^2 \times 0.2415(1-0.2415)}{(0.04843)^2} = 300$$

Z=confidence level =1.96

P=Default=0.2415

d=precision=0.04843

n=300

The distribution of 300 respondents as per branch is indicated in Table 1.

$$n = \frac{Z^2 P (1-P)}{d^2}$$

where;

n = sample size; Z = Z statistic for a level of confidence; P = expected default or proportion (in proportion of one; if 20%, P = 0.2), and d = precision (in proportion of one; if 5%, d = 0.05). At a confidence level of 95%, the Z value is 1.96. To establish the sample size, the calculation was done given that the default was 24.15:

$$n = \frac{1.96^2 \times 0.2415(1-0.2415)}{(0.04843)^2} = 300$$

Z=confidence level =1.96; P=Default=0.2415; d = precision=0.04843; n=300

### 3.4 Pilot Study

The pilot study was conducted in the Central Rift region, where respondents were drawn from 4 branches, namely, Nakuru, Naivasha, Molo and Kericho, using 30 respondents who were agribusiness borrowers. The distribution of respondents was as per customer size such that 9 were drawn from Nakuru, 8 from Kericho, 7 from Naivasha and 6 from Molo. The Central Rift is more similar to Mount Kenya due to its weather conditions and diversity of agribusiness projects. The pilot study helped to identify whether the questionnaires were ambiguous, unclear or biased so as to determine the necessary adjustments that could be made to the data collection instruments. It was used to determine the feasibility of research design, forming a preliminary, small-scale “rehearsal” in which to test the methods planned for use in the research project [50]. The results were used to guide the methodology of the large-scale investigation. The recommended overall sample size of 30 for the pilot study, especially when the pilot study sample is 10% of the sample projected for the larger parent study [51].

### 3.5 Validity

The study employed a questionnaire which was tailored keenly and thoroughly to ensure that all relevant material facts were captured. This was to ensure the

accuracy and accommodation of all pertinent details. The structured questionnaire was piloted in the Central Rift region at the Nakuru, Kericho, Molo and Naivasha branches. This established its relevance to the study of producing accurate results. Construct validity was achieved through the operationalization of the variables, which reflected the theoretical assumptions that supported the conceptual framework of the study [52]. Content validity was assessed by testing the data sheet in the main areas of the study. Statistical conclusion validity was attained by determining various relationships and the cause-effect of variables, especially due to the moderation of extraneous shocks. The criterion-related validity of the conceptual framework was determined by examining the multiple correlation coefficients of all the independent variables and the measure of dependent variable [53].

### 3.6 Reliability

The reliability of the research instrument (questionnaire) was evaluated using Cronbach's alpha coefficient. The questionnaire was evaluated by estimating the internal consistency of the responses to examine the reliability of the scales. Cronbach's alpha is appropriate for dichotomous variables coded as 0 or 1 [54]. Zero means that there is no internal consistency between items in the questionnaire, while one means that the internal consistency is perfect [55]. A higher value of greater than 0.9 indicates excellent quality, while a lower Cronbach's Alpha of less than 0.5 indicates unacceptable quality [56]. The results of this study indicated that the questionnaire was reliable since the scale reliability coefficient was 0.7318 (>0.7), which is the acceptable scale. This is because the Cronbach's Alpha values for different dimensions of the present study are more greater than 0.7, meaning that the data are taken as considered sufficiently reliable and consistent (Table 2).

Table 2: Reliability Test Using Cronbach's Alpha

Variable	Value
Average interim covariance	2.365
Number of items in the scale	15
Scale reliability coefficient	0.7318

George [57] suggested that the scale reliability coefficient of any research instrument should be greater than 0.7 for it to be deemed acceptable and reliable. This observation was supported by Hair [58], who agreed that the value of more than 0.7 for Cronbach's Alpha indicates that the collected data were sufficiently reliable and consistent.

### 3.7 Data Collection

This study used both primary and secondary data as sources of information. All questions from the five sections of the questionnaire were used to collect quantitative data where borrowers provided answers regarding their socioeconomic profile, their decision making about enterprises, their lender behavioural characteristics and the extraneous shocks which caught up with them as the project cycle progressed. Primary data were obtained from the respondents who were current beneficiaries of AFC farm loans. Secondary data were sourced from AFC and published

works from relevant authorities, such as articles, journals, magazines, AFC manuals and reports, published financial statements and the internet. The 300 selected farmers were telephoned to inform and request ~~them to that they~~ suggest how they could be reached for ~~interview interviews~~. All respondents were guided on how to answer questions by enumerators. The secondary data that ~~was were~~ collected included data on ~~the~~ performance of branches, type of loan products, administrative units and agribusiness activities.

### 3.8 Data Analysis

#### 3.8.1 Data Analysis Techniques and Tools ~~analysis techniques and tools~~

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The software ~~used~~ for analysis was ~~the~~ Statistical ~~Paekages~~Package for Social Sciences (SPSS V. 27.0). The ~~output from~~ quantitative data ~~was given in were~~ ~~analysed analyzed via~~ descriptive statistics and regression analysis. Regression analysis was used to describe the relationship between ~~the~~ independent and dependent variables. The econometric models that were used ~~include Logit included logit~~, binary logistic regression, probit and ~~the~~ multiple linear and stepwise regression models. Each of the objectives was regressed using its own model ~~respectively~~. Correlation analysis was used to evaluate the strength of ~~a relationship the relationships~~ between the variables. This is because correlation analysis illustrates both the direction and the strength of the relationship between the two variables [59]. ANOVA was performed to ~~get obtain~~ the F-statistic ~~so as~~ to test for the adequacy of the regression model.

#### 3.8.2 Model Specification

##### 3.8.2.4 ~~To determine~~ ~~Determining~~ the effect of ~~Extraneous~~ ~~extraneous~~ shocks on ~~the~~ AFC loan default rate

~~The appropriate model in the achievement of this objective is multiple regression models~~ Multiple regression models are appropriate for achieving this objective. The regression equations were formulated as follows:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon \dots \dots \dots (i)$$

where, the probability ~~to default or comply in of defaulting or complying with~~ loan repayment is influenced by extraneous shocks. Y= AFC default rate;  ~~$\beta_0$  = Constant =~~ ~~constant~~  $\beta_1 - \beta_3$  = ~~Regression Coefficients~~ regression coefficients;  $\varepsilon$  = ~~Error~~ error term;  $X_1$  = ~~Agroclimatic~~ agroclimatic extremes;  $X_2$  = market volatility; and  $X_3$  = biological hazards.

## RESULTS AND DISCUSSION

### 4.5 The Effect of Extraneous Shocks on ~~the~~ AFC Loan Default Rate

#### 4.5.1 Agroclimatic Extremes

The loan repayment distribution on the basis of agroclimatic ~~imply data implies~~ that 31.7% of borrowers experienced favourable conditions, while 68.3% were victims of bad weather. This means that ~~the~~ majority of borrowers in the area of study experienced ~~bad more severe~~ weather than ~~did~~ their minority counterparts who were not affected by harsh weather conditions. ~~Further~~ Furthermore, the repayment performance ~~indicates data indicate~~ that 54% ~~of the~~ default rate was registered due to ~~extremities in extreme~~ weather. There was high loan repayment performance in

~~favour~~~~favour~~~~favor~~ of borrowers who were not affected by bad weather and who registered a paltry with an 8% default rate (Table 3).

Table 3: Loan ~~Repayment Status and Distribution Based on Agroclimatic Extremes~~repayment status and distribution based on agroclimatic extremes

Agroclimatic extremes	Loan status		Borrowers' distribution
	Compliance	Default	
Favourable climatic conditions	88 (92%)	7 (8%)	95 (31.7%)
Unfavourable conditions	151 (74%)	54 (26%)	205 (68.3%)
Total/ <del>+</del> Percent	239 (79.7%)	61 (20.3%)	300 (100%)

Pearson chi-square =14.4260; df=1; P-value = 0.000<0.05

The findings of this study established that there ~~existed~~was a significant association between agroclimatic extremes and loan repayment performance at the 5% level ~~of~~significance (~~P~~(P value = 0.000<0.05). The implication is that shocks associated with agroclimatic extremes ~~influenced~~influence the loan repayment performance ~~by~~of AFC borrowers. Bad weather exacerbates default ~~problem~~problems among ~~the~~ farming communities. ~~The likely reason is mainly~~This is likely due to yield stress caused by crop failure. Since the occurrence is an unforeseen event, there is a possibility of adjusting to absorb more costs ~~so~~as avoid project collapse. Production and market risks result ~~to~~in financial risk, which is associated with obtaining loan funds and investing them in the implementation of agricultural ~~project~~projects.

The findings of this study agree with those of Komarek [21], who reported that agroclimatic extremes ~~contributes~~contribute to multiple risks ~~which hamper~~that hamper production, marketing and ~~the finance~~financial availability, thus increasing the probability of default in agribusiness loans. Hess [19] noted that loan repayment is a financial obligation that is inseparable from financial risks such as ~~non-compliance~~noncompliance in remitting loan repayments. Kibrom [20] reported that adverse weather conditions represented significant risks for agricultural sectors and geographic regions. These challenges cause default in loans disbursed for project execution [7].

~~Further~~Furthermore, this study ~~observed~~revealed that credit players need to understand how critical ~~the~~ agroclimatic extremes ~~were~~are in production and ~~market~~markets and their spillover effect in causing loan default. These extremes measure the extent of bad weather that ~~is disruptive~~to~~disrupts~~ farming across ~~the~~ value chains by imposing yield stress. With knowledge of agroclimatic extremes, the lender should be alert ~~by~~to having a ready solution on how borrowers will be assisted to ~~get over the matter~~overcome this problem. These findings ~~are in~~con~~conurrence~~concur with ~~to~~ those of Egbeadamah [12], who suggested that stakeholder interventions could be directed at improving farm households ~~so~~as to improve their adaptive capacity. The role of institutions such as the AFC (the lender) is to craft mechanisms ~~which~~that will offer supportive intervention to ~~the~~ borrowers so that their mission of empowering borrowing farmers will be attained, even within the presence of agroclimatic extremes.

Borrowers should cooperate with lenders in such events and reason together on how to ~~get out of~~escape the debt ~~trap~~traps that ~~has~~have been created by these shocks [18].

They should work in the best interest by avoiding moral hazard, which ~~brings can~~ cause strategic default [16]. It is imperative for borrowers to bear in mind that a good relationship with their lenders even in the face of shocks is the way forward to solving the problem amicably [14]. For government-~~sponsored-sponsor~~ loans ~~likesuch as~~ AFC loans, the government should also intervene by mediating ~~in~~ amicable solutions between the borrower and the lender. This finding is compatible ~~to~~ with the observation ~~byof~~ Marney [13], who observed that a good relationship between credit players is important even in the face of exogenous shocks. As such, loans may ~~be~~ eventually ~~recovered~~ recover, albeit late [10]. In the study area, it was noted that natural hazards did not ~~make~~ cause borrowers to take advantage of and default if they had the capacity, but only those of limited capability failed to deliver their loan remittances.

#### 4.5.2 Market Volatility

The findings on the repayment distribution based on market volatility show that 57.7% of the borrowers admitted that market conditions were conducive, while 42.3% experienced market failures. This may mean that more borrowers did not suffer ~~unfavourableunfavour~~ favorable conditions ~~as comparedthan~~ fewer who experienced market volatility. The reason is perhaps their production in diversified portfolio streams and engagement in the essential services sector during ~~the~~ periods of extraneous shocks. ~~Further, Furthermore, the~~ results on loan repayment performance status showed that in instances of market failure, there ~~is~~ was 37% default, while a paltry 8% default was recorded when the market conditions ~~are favourablewere~~ favou favorable (Table 4).

Table 4: Loan Repayment Status and Respondents' ~~Based on~~ Market Volatility

Market volatility	Loan status		Respondents' distribution
	Compliance	Default	
Favourable market conditions	159 (92%)	14 (8%)	173 (57.7%)
Market failure indicators	80 (63%)	47 (37%)	127 (42.3%)
Total/ <del>+</del> Percent	239 (79.7%)	61 (20.3%)	300 (100%)

Pearson chi-square =37.8008; df=1; P-value = 0.000<0.05

The findings of this study ~~established the existence of~~ revealed a significant association between market volatility and loan repayment performance at the 5% level ~~of significance-(p p~~ p-value = 0.000<0.05). This implies that market volatility influenced the loan repayment performance ~~byof~~ AFC borrowers such that default escalated with instances of market ~~failures~~ failure. Volatile markets resulted in unrealistic margins ~~whiehthat~~ were insufficient to service the borrowed loans, thus lateness in servicing borrowed loans. Borrowers suggested that supportive intervention from lenders would be forthcoming in solving the problem of market failure. For instance, the disbursement timeliness of adequate loans would enable borrowers to implement their projects within their stipulated timings ~~so as~~ to take advantage of optimum market opportunities.

These findings are in conformance ~~to~~ with those of Abakah [33], who noted that fluctuations in market volatility posed the risk of exposure to both borrowers and lenders. Putra [32] observed that price volatility made it ~~hard~~ difficult for farmers to reap sufficient income from sales, thus causing default in farming loans. Market

volatility constitutes both price volatility and lack of a market, which affected affect the revenue ~~cashflows of the borrower~~ cash flows of borrowers, thus hindering loan repayment [31]. Market volatility is a systemic risk-threatening aspect of borrower operations, and it can be mitigated by lender's slender intervention [29]. Low prices for several agricultural products add to the financial stress that some borrowers are experiencing [28].

The findings of this research emphasized the importance for of credit actors who handle agribusiness loan ~~portfolio~~ portfolios to understand how critical the volatility dynamics in the market are in influencing market failure. Lenders should then offer supportive interventions to borrowers who are affected by this nature of shocks shock. One of the supportive interventions they can recommend is the disbursement timeliness of adequate loans, which will enable borrowers to implement their projects within their stipulated timings so as to take advantage of optimum market opportunities [30]. This is consistent with the observation by of Mieg [8], who concluded that market volatility is a systemic risk-threatening borrower operations operation. However, Barko [29] argued that ~~it this~~ can be mitigated by lender's slender intervention. Rai [28] reported that low prices for several agricultural products add to the financial stress that some borrowers are experiencing.

This study ~~found~~ revealed the necessity need for the government players to understand their role in controlling brokers in the free market economy so as to ~~ent~~ reduce transaction costs, which can create distortions. Besides In addition, the government need needs to play its a role in regulating the market players who may act unethically to create unhealthy competition; craft farmer-friendly policies to counter macroeconomic shocks such as inflation; and offer supportive intervention in infrastructure and logistics that address market inefficiencies. These findings agree with those of Castro [60] that the government should support in risk mitigation. Lastly, Finally, the government can increase investment in research so as to provide updated agriculture agricultural data on the prices of commodities at various market centres and leverage on technology to disseminate the information ubiquitously. These observations are congruent with those of Chen [34], who agreed that in the face of market volatility, government intervention was called for so as to reduce broker-driven markets where sellers suffered suffer due to broker's broker price gouging.

#### 4.5.3 Biological Hazards

This study ~~showed~~ revealed that 31.3% of the respondents were not affected by biological hazards, while 68.7% experienced the effect of biological hazards. This means that more borrowers in the area experienced biohazards. In the presence of biological hazards, 33% default was recorded, but in the absence of biohazards, 14% defaulted (Table 5).

Table 5: Loan ~~Servieing~~ Serving Status and Respondents' Based on Biological Hazards

Biological hazards	Loan status	Respondents'
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	Compliance	Default	distribution
Absence of biohazards	173 (86%)	28 (14%)	201 (31.3%)
Presence of biohazards	66 (67%)	33 (33%)	99 (68.7%)
Total/Percent	239 (79.7%)	61 (20.3%)	300 (100%)

Pearson chi-square = 7.5530; df=1; P-value = 0.000<0.05

This study ~~found that there exist~~revealed a significant association between biological hazards and loan repayment performance at the 5% level ~~of significance~~-(P P-value = 0.000<0.05). Biohazards increased the number of instances of loan default, probably because they affected the prices of some commodities and ~~also~~reduced the number of consumers, resulting in massive losses and the closure of some enterprises. This created ~~a lot of many~~ struggles in the repayment of loans. These findings agreed with those of Hess [19], who observed that crop failure and livestock diseases negatively affected loan repayment ~~negatively~~ because they affected the total income generated from agriculture. The FAO [35] reported that the health of plants and invasive pests were the drivers of biodiversity loss, which eventually exacerbated default in loan repayment. In addition, Ochuba [37] identified, pests, diseases and other calamities ~~which that~~ affected the yield of crops as ~~trigger~~triggers for loan default. ~~Lastly~~Finally, Noor [61] reported that the pandemic outbreak increased the default rate ~~in for~~ agricultural loans.

The findings from this study ~~informs~~indicate that there is a need to equip farming communities with knowledge of biological hazards. This point of information will place them at a vantage point where they can predict trends and be able to handle future hazards in case they arise. Dutta [17] concurred with the findings by reporting that knowledge on biological hazards among ~~the~~ farming communities was a boon. Loan borrowers provide for future contingencies by taking out crop and livestock insurance to mitigate ~~against~~ losses ~~which that~~ may arise ~~due from~~ crop failure or ~~death of~~livestock death. This finding agrees with Million [62], who agreed that risk mitigation should be adopted to avert food insecurity. Borrowers can also try to diversify their farming activities ~~so to so as to~~ spread risk ~~in case when~~ market or environmental contingencies arise.

Based on the findings of this study, there ~~was~~is a need for lenders to respond to biological hazards by ~~giving~~providing flexible loan repayment schedules so that they can recover loan funds and at the same time maintain their ~~relationship~~relationships as they meet social objectives. Consistent ~~to with~~ this observation, Asadov [38] agreed that repayment flexibility was the solution to loan contracts when hazards hit. The government responds to social ~~erisis~~crises by playing interventionist roles. In such ~~case cases~~, the government can engage subsidies to inject ~~in borrower's into~~ borrowers' projects so that they will have money to service their obligations and repay the loan. Peck Christen [27] agreed that government ~~subsidy~~subsidies helped in resolving loan default problems caused by biohazards.

#### 4.6 Description of the Econometric Models on the Effect of the Borrower ~~Socio-economic~~Socioeconomic Profile on the AFC Loan Default Rate

##### 4.6.4 The Effect of Extraneous Shocks on the AFC Loan Default Rate.

Multiple regression analysis was ~~done~~performed to assess the moderating impact of extraneous shocks on the AFC loan default rate. The regression equation ~~formulated~~ was as follows:

$$Y = \beta_0 + \beta_{14}X_{14} + \beta_{15}X_{15} + \beta_{16}X_{16} + \varepsilon \dots\dots\dots(i)$$

The ~~Model~~model summary for the effect of extraneous shocks and the AFC loan default rate is tabulated hereunder. The ~~Adjusted~~adjusted R squared ( $R^2$ ) of the regression model ~~depicts~~shows that extraneous shocks ~~accounts~~account for 0.231 (23.1%) of the AFC loan defaults. ~~Adjusted R Square~~The adjusted R square (Adj.  $R^2$ ) of 0.231 was ~~a figure~~close to  $R^2$  (0.239),~~thus~~ indicating that the outliers were not significant. The p-value = 0.000 was less than 0.05, implying that the model had a 5% level of significance (Table 6).

Table 6: Model summary for extraneous shocks and the AFC loan default rate

Model	R	R Square	Adjusted R square	Std. error of the estimate
1	0.489 <sup>a</sup>	0.239	0.231	0.340

a. Dependent variable: AFC loan default rate

The ANOVA for extraneous shocks and the AFC loan default rate revealed that the presence of agroclimatic extremes, market volatility and biological hazards had a positive and significant effect on the AFC ~~loans~~loan default rate at 5% (Table 7).

Table 7: ANOVA for extraneous shocks and the AFC loan default rate

Model		Sum of squares	Df	Mean square	F	Sig.
	Regression	10.730	3	3.577	30.968	0.000 <sup>b</sup>
1	Residual	34.187	296	0.115		
	Total	44.917	299			

b. Predictors: (~~Constant~~constant), presence of Agroclimaticagroclimatic extremes, market volatility and biological hazards.

The coefficients for the extraneous shocks affecting the AFC loan default rate showed that agroclimatic extremes are felt in the sense that ~~it is~~they are associated with a 21.6% default rate. The findings imply that efforts by the borrowers to repay the loans when due ~~was~~were affected by adverse climatic conditions. Market volatility is associated with a 30.5% increase in the default rate, implying that the presence of market failure led to a decline in the funds available to service ~~the~~loans, thus increasing the AFC default rate. Biological hazards ~~lead~~led to a 16.9% increase in the default rate (Table 8).

Table 8: Coefficients for the effects of extraneous shocks ~~affecting on the~~ AFC loan default rate

Model	Unstandardized coefficients		Standardized coefficients	T	Sig.	
	B	Std. Error	Beta			
	Constant	0.151	0.042		1.017	0.001
	Climate extremes	0.216	0.042	0.261	5.134	0.000
	Market volatility	0.305	0.040	0.391	7.676	0.000
	Biological hazards	0.169	0.042	0.208	4.093	0.000

The equation for the extraneous shocks is as follows:

$$Y = 0.15 + 0.216 X_{12} + 0.305 X_{13} + 0.169X_{14}.....(i)$$

The findings imply that extraneous shocks negatively impacted the agribusiness activities, which are meant to be the source of revenue to service the loans, thereby increasing the probability of default by the borrowers. The study therefore established that extraneous shocks can predict the AFC loan default rate. These findings are consistent with those of He [22], who reported that adverse shocks affected the quality of loan portfolios and made borrowers vulnerable by reducing their revenue streams, thereby increasing the likelihood that they would plunge into loan repayment difficulties. Irungu [63] observed that extraneous shocks introduced untold risks to farming communities, which affected production and marketing, thereby causing loan servicing challenges for agribusiness borrowers.

## 5.2 CONCLUSION

Extraneous shocks are a harbinger for risks which can affect lending cycles. Both lenders and borrowers need to provide for contingencies and be alert so as to cope with attendant vagaries when they eventually hit. The study found that these shocks are the sources of production, marketing and financial risks which hinder the repayment of agricultural loans. As such, they would be able to proceed with their operations even during the periods of extraneous shocks. Agroclimatic extremes and biological hazards are associated with environmental and natural hazards that occur unexpectedly, thus causing production risks. Market volatility presents market dynamics associated with the volatility of prices and price mechanisms which introduce market failure. It characterizes distortions linked to market risks, which are a great constraint to marketing efficiency. Both borrowers and lenders should take precautionary measures during loan cycles so as to absorb risks emanating from shocks. As such, they would be able to proceed with their operations even during the periods of extraneous shocks. Notably, climate change is a contemporary reality which needs to be factored in planning and accounted for in budgeting. The study recommends the need for credit players to take precautionary measures and be alert so as to absorb risks emanating from shocks when they eventually hit; additionally, credit players need to collaborate in pursuit of bespoke insurance schemes which can suitably cover farmer projects.

## REFERENCES

1. Ho, D., Kuwornu, J. & Tsusaka, T. (2022). Factors influencing smallholder rice farmers' vulnerability to climate change and variability in the Mekong Delta Region of Vietnam. *The European Journal of Development Research*, 34(1), 272-302.
2. Weina, Z. & Tan, R. (2020). What is an external shock? The Straits Times. Retrieved from: <https://www.straitstimes.com/business/invest/what-is-an-externalshock>.
3. Tesfay, G. (2009). *Econometric analyses of microfinance credit group formation, contractual risks and welfare impacts in northern Ethiopia*. Wageningen University and Research.

4. Lainé, M. (2023). How to reconcile actual climate change mitigation with prosperity? A proposal. *Ecological Economics*, 204, 107679.
5. Islam, E. & Singh, M. (2022). Information on Hot Stuff: Do Lenders Pay Attention to Climate Risk? Available at SSRN 3971621.
6. Zhou, Q., Chen, X. & Li, S. (2018). Innovative financial approach for agricultural sustainability: A case study of Alibaba. *Sustainability*, 10(3), 891.
7. Desbrousses, R. & Meguid, M. (2023). On the analysis and design of reinforced railway embankments in cold climate: a review. In *Canadian Society of Civil Engineering Annual Conference* (pp. 307-318). Springer, Singapore.
8. Mieg, H. (2022). Volatility as a transmitter of systemic risk: Is there a structural risk in finance? *Risk Analysis*, 42(9), 1952-1964.
9. Ume, S., Ezeano, C. & Obiekwe, N. (2018). Analysis of determinant factors to loan repayment among broiler farmers in Enugu State, Nigeria. *International Journal of Environmental & Agriculture Research*, 4(6), 1-11.
10. Headey, D. (2011). Rethinking the global food crisis: The role of trade shocks. *Food Policy*, 36(2), 136-146.
11. Mirón, I., Linares, C. & Díaz, J. (2023). The influence of climate change on food production and food safety. *Environmental Research*, 216, 114674.
12. Egbeadumah, O., Aboshi, A., Bulus, G. & Zarewa, N. (2023). Agricultural Risk Management and Production Efficiency among Peasant Farmers in Taraba State, North Eastern Nigeria. *Journal of Land and Rural Studies*, 11(1), 69-82.
13. Marney, R., & Stubbs, T. (2021). *Corporate Debt Restructuring in Emerging Markets: A Practical Post-Pandemic Guide*. Springer Nature.
14. Pelka, N., Musshoff, O. & Weber, R. (2015). Does weather matter? How rainfall affects credit risk in agricultural microfinance. *Agricultural Finance Review*, 75(2), 194-212.
15. Bilén, C., El Chami, D., Mereu, V., Trabucco, A., Marras, S. & Spano, D. (2023). A Systematic Review on the Impacts of Climate Change on Coffee Agrosystems. *Plants*, 12(1), 102.
16. Breeden, J. (2022). Impacts of Drought on Loan Repayment.
17. Dutta, P., Bhattacharyya, A. & Kumari, A. (2023). Innovative Integrated Pest Management Paradigm for Sustainable Crop Production with Special Reference to North East India. In *Integrated Pest Management in Diverse Cropping Systems* (pp. 61-90). Apple Academic Press.
18. Kanwal, V., Sirohi, S. & Chand, P. (2022). Risk perception, impact, and management by farmer households in Rajasthan (India). *Environmental Hazards*, 1-17.
19. Hess, U., Richter, K., & Stoppa, A. (2002). Weather risk management for agriculture and agri-business in developing countries. *Climate Risk and the Weather Market, Financial Risk Management with Weather Hedges*. London: Risk Books.
20. Kibrom, T. (2010). *Determinants of successful loan repayment performance of private borrowers in Development Bank of Ethiopia North Region* (Doctoral dissertation, Mekelle University).
21. Komarek, A., De Pinto, A. & Smith, V. (2020). A review of types of risks in agriculture: What we know and what we need to know. *Agricultural Systems*, 178, 102738.

22. He, W., Liu, Y., Sun, H. & Taghizadeh-Hesary, F. (2020). How does climate change affect rice yield in China? *Agriculture*, 10(10), 441.
23. Gebremedhin, K. (2010). Determinants of Successful Loan Repayment Performance of Private Borrowers in Development Bank of Ethiopia, North Region.
24. Suppan, S. (2020). Agricultural Finance for Climate Resilience. *Washington: Institute for Agriculture and Trade Policy*.
25. Mall, R., Singh, N., Patel, S., Singh, S., Arora, A., Bhatla, R ... & Srivastava, P. (2022). Climate Changes over the Indian Subcontinent: Scenarios and Impacts. In *Science, Policies and Conflicts of Climate Change* (pp. 27-52). Springer, Cham.
26. Chatzopoulos, T., Domínguez, P., Zampieri, M. & Toreti, A. (2020). Climate extremes and agricultural commodity markets: A global economic analysis of regionally simulated events, *Weather and Climate Extremes*, Volume 27, 100193, ISSN 2212-0947.
27. Peck Christen, R., Pearce, D., Acevedo, P., Brar, A., Reinsch, M., Ayee, G... & de Vletter, F. (2005). Managing risks and designing products for agricultural microfinance: Features of an emerging model.
28. Rai, A., Sidhu, K. & Sharma, P. (2022). Factors Affecting Perception of Farm Families towards Farming as an Occupation.
29. Barko, T., Cremers, M., & Renneboog, L. (2022). Shareholder engagement on environmental, social, and governance performance. *Journal of Business Ethics*, 180(2), 777-812.
30. Hryshchuk, N. (2022). Macroeconomic Vision of the Essence of Financial Resources of Enterprises in Agriculture. *Three Seas Economic Journal*, 3(1), 50-58.
31. Tripathi, P., Singh, C., Singh, R. & Deshmukh, K. (2022). A farmer-centric agricultural decision support system for market dynamics in a volatile agricultural supply chain. *Benchmarking: An International Journal*, (ahead-of-print).
32. Putra, A., Supriatna, J., Koestoer, R. & Soesilo, T. (2021). Differences in local rice price volatility, climate, and macroeconomic determinants in the Indonesian market. *Sustainability*, 13(8), 4465.
33. Abakah, E., Gil-Alana, L. A., Arthur, E. & Tiwari, A. (2022). Measuring volatility persistence in leveraged loan markets in the presence of structural breaks. *International Review of Economics & Finance*, 78, 141-152.
34. Chen, J., Liu, X., Ou, F., Lu, M., & Wang, P. (2023). Green lending and stock price crash risk: Evidence from the green credit reform in China. *Journal of International Money and Finance*, 130, 102770.
35. Food and Agriculture Organization of the United Nations (FAO). (2021). Climate change fans spread of pests and threatens plants and crops, new FAO study, <http://www.fao.org/news/story/en/item/1402920/icode/>
36. Moosa, I. (2022). The benefits and costs of fintech. In *Fintech* (pp. 81-104). Edward Elgar Publishing.
37. Ochuba, O., Inyang, N. & Osabohien, R. (2023). Coronavirus (COVID-19) Pandemic and Food Price Increase in Nigeria: Examining the Role of ICT. In *Socioeconomic Shocks and Africa's Development Agenda* (pp. 74-82). Routledge.
38. Asadov, A. I. (2022). COVID-19 and Resilience of Islamic Home Financing:

- Enhanced Musharakah Mutanaqisah (EMM) Model as an Example. In *Towards a Post-Covid Global Financial System*. Emerald Publishing Limited.
39. Peng, Y., Zhou, L., Wang, Q., Kong, R., Fu, H., Zhang, Y. & Turvey, C. (2023). Optimal Debt and Risk Balancing Behavior of Rural Households in China: Evidence from a Discrete Choice Experiment. *Emerging Markets Finance and Trade*, 59(2), 436-450.
  40. Villarreal, M. (2022). Desert Locusts: Can Mathematical Models Help to Control Them? In *Imagine Math 8* (pp. 405-417). Springer, Cham.
  41. Simple Maps. (2021). Kenya cities database, Pareto software, llc. © 2010-2021. <https://simplemaps.com/data/ke-cities>
  42. Sirisilla, S. (2023). Bridging the Gap: Overcome these 7 flaws in descriptive research design
  43. McCombes, S. (2019). How to create a research design. Retrieved from Scribbr: <https://www.scribbr.com/research-process/research-design/>.
  44. Chege, M. (2021). Credit Management Practices and Loan Default in Agricultural Finance Corporation, Kenya.
  45. Adusei, C. (2017). Determinants of Agribusiness Entities Loan Default in the Tamale Metropolis of Ghana. *European Journal of Accounting, Auditing and Finance Research Vol.5 No.3, pp.1- 20, March 2017*.
  46. Mwirigi, R. (2018). Customer Relationship Management and Satisfaction of Commercial Banks' Account Holders in Nairobi City County, Kenya (Doctoral dissertation, Kenyatta University).
  47. Mphaka, P. (2017). *Strategies for Reducing Microfinance Loan Default in Low-Income Markets* (Doctoral dissertation, Walden University).
  48. Daniel, W. & Cross, C. (2018). *Biostatistics: a foundation for analysis in the health sciences*. Wiley.
  49. Snyder, S. (2017). How to calculate margin of error. <https://bizfluent.com/how-6855127-calculate-precision-data.html>.
  50. Bhandari, P. (2021). What Is Quantitative Research? | Definition, Uses and Methods <https://www.scribbr.com/methodology/quantitative-research/>.
  51. Lancaster, G., Dodd, S. & Williamson, P. (2004). Design and analysis of pilot studies: recommendations for good practice. *J Eval Clin Pract.* 2004 May;10(2):307-12.
  52. Trochim, W. (2022). ResearchMethods Knowledge Base, hosted byConjointly <https://conjointly.com/kb/construct-validity/>
  53. Middleton, F. (2019). The four types of validity. Diakses dari [https://www.scribbr.com/methodology/types-of-validity/pada tanggal, 13](https://www.scribbr.com/methodology/types-of-validity/pada-tanggal,13).
  54. Vaske, J., Beaman, J. & Sponarski, C. (2017). Rethinking internal consistency in Cronbach's alpha. *Leisure sciences*, 39(2), 163-173.
  55. Cronbach, M. & Hedge, R. (2001). Construct validity in psychological tests. *Psychological Bulletin*, 52, 281 – 302.
  56. George, D. & Mallery, P. (2019). *IBM SPSS Statistics 25 Step by Step* (15th ed.). New York and London: Routledge. <https://doi.org/10.4324/9781351033909>.
  57. George, D., & Mallery, P. (2018). *IBM SPSS Statistics 25 Step by Step*. <https://doi.org/10.4324/9781351033909>.
  58. Hair Jr., J., Black, W., Babin, B. & Anderson, R. (2010). *Multivariate Data Analysis: A Global Perspective*. 7th Edition, Pearson Education, Upper Saddle River.

59. Walsh, M., & Wiggins, L. (2003). *Introduction to research*. Nelson Thornes.
60. Castro, C., & Garcia, K. (2014). Default risk in agricultural lending, the effects of commodity price volatility and climate. *Agricultural Finance Review*.
61. Noor, F. (2020). Effect of Covid-19 on Loan Repayment of Small Businesses in Kenya: A Case Study of Eastleigh Business Community *European Journal of Business and Strategic Management*. ISSN 2518-265X (Online) Vol.5, Issue 2, No.1. pp 1 - 14, 2020.
62. Million, S. (2012). *Factors affecting loan repayment performance of Smallholder farmers in Eastern Hararghe, Ethiopia* (Doctoral dissertation).
63. Irungu, J. W. (2013). *Relationship between Agricultural Credit Financing and Financial Performance: A Case of Small-Scale Farmers in Kiria Division in Muranga County* (Doctoral dissertation, University of Nairobi).

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