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FARMERS' PERCEPTIONS AND KEY INFLUENCING FACTORS OF MARKET RISKS IN GROUNDNUT FARMING IN MCHINJI DISTRICT, MALAWI

Gondwe SR*[1], Mangisoni JH[1], Maganga AM[1], Sissoko K[2] and K Makoko[3]

Sangwani Rebeccah Gondwe

*Corresponding author email: sangwani2009@gmail.com
ORCID: https://orcid.org/0009-0006-9824-5410

[1]Lilongwe University of Agriculture and Natural Resources, Department of Agricultural and Applied Economics, Bunda College, Lilongwe, Malawi

[2] University of Social Sciences and Management of Bamako (USSGB), Faculty of Economics and Management (FSEG), Bamako, Mali

[3]Department of Agricultural Research Services, P. O. Box 30779, Lilongwe 3, Malawi

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ABSTRACT

The groundnut value chain is highly vulnerable to market risks, including price volatility, inflation, infrastructural limitations, political instability, and technological shifts. These challenges are exacerbated by informal supply chains, which dominate groundnut trade in many regions, creating further uncertainty for farmers. Farmers' perceptions and responses to market risks have been proven undisputedly vital for understanding risk behaviors. These perceived risk patterns are highly contextual and different across systems and geographical regions. Besides, the perceived levels are incongruent and are influenced by the farmers' socioeconomic and institutional factors such as education of the household head, farm size, household income, access to credit and extension services. The knowledge of farmers' perception of market risk sources is important for the farmers, extension advisory service providers, industry stakeholders, and policymakers. The deficient information about how risk is perceived, particularly in most developing countries like Malawi, poses a big challenge for policymakers and researchers to design appropriate risk management systems at the farm level. It is in line with this view that this study investigated farmers' perceptions of market risks to which groundnut farmers are exposed and the factors that influence their perceptions of the market risk sources among 161 smallholder groundnut farmers in Mchinji District, Malawi. Using Exploratory Factor Analysis (EFA) and Panel Probit estimations, the research identifies disorganized markets, high food prices, and fluctuating output prices as the most significant and devastating market risks. Key determinants influencing farmers' risk perception include groundnut production scale, farm size, and wealth levels. Based on the results, the study highlights the urgent need for stabilizing market prices through commodity trading platforms. These could include the strengthening of the existing and establishment of new structured commodity platforms. The study also recommends the adoption of holistic risk management strategies that target farmers regardless of their farm and socioeconomic characteristics such as farm size and wealth status.

Key words: Groundnuts, market risk perceptions, Exploratory Factor Analysis (EFA), Probit, Trading platforms

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INTRODUCTION

Groundnut farming plays a crucial role in rural livelihoods and economic development in Malawi, yet its value chain remains fragile, subject to market instability, inflation fluctuations, interest rate shifts, political uncertainty, and technological advancements. A major challenge stems from sudden and unexpected drops in product prices, which leave farmers vulnerable to financial losses. Additionally, smallholder farmers struggle to meet aflatoxin regulations imposed by importing countries, limiting their access to lucrative international markets. Low domestic prices, high post-harvest losses (estimated at 30%), and an informal, unstructured supply chain further compound the problem, reducing both market efficiency and farmer profitability [1,2,3].

The informal supply chain, which dominates the groundnut trade, lacks standardization and organization. It consists of small-scale traders, assemblers, large-scale traders, processors, informal export markets, and consumers, many of whom rely on unconventional units of measurement like pails and buckets instead of standardized weights [4]. The inconsistencies in measurement leads to pricing inefficiencies and financial losses. As noted by previous studies [1,2,5], the poor pricing structure acts as a disincentive to increased groundnut production, discouraging farmers from expanding their cultivated area and reinforcing a cycle of low production and market stagnation. Since groundnut farming is highly labor-intensive, inadequate prices prevent farmers from earning sustainable profits, thereby weakening the entire value chain.

A deep understanding of farmers' perceptions of market risks is essential for multiple stakeholders. Farmers can make better risk management decisions, extension service providers can develop targeted advisory programs, policymakers can design more efficient agricultural policies, ensuring public funds are allocated effectively, and industry players can tailor their products and services (such as financial tools, fertilizers, and machinery) to better align with farmers' needs [6,7].

Risk perception plays a fundamental role in the adoption of technology, investment, and farm management decisions [8,9,10]. Risk-averse farmers (who perceive market uncertainties as highly detrimental) often underutilize critical inputs, reducing overall productivity and farm efficiency. However, there is a significant gap in research on farmers' perception of market risks in developing countries, particularly in Malawi, where such studies remain scarce [6,7,9]. This lack of information hinders the development of effective risk management strategies at the farm level [7].

In response to this challenge, this study investigates how groundnut farmers in Malawi perceive market risks and identifies key factors that influence their perceptions of risk. It addresses the following research questions (i) Do groundnut

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farmers perceive market risks as devastating? and (ii) What are the factors that influence groundnut farmers' perception of market risks? The research is primarily guided by the hypothesis that groundnut farm and farmer household characteristics significantly shape their views on market risk. By applying Exploratory Factor Analysis (EFA) and Panel Probit estimation, this study identifies market deregulation, fluctuating food prices, and unstable output prices as the key market risk sources negatively affecting farmers in Mchinji District. Furthermore, the findings suggest that production scale, farm size, and wealth levels have a significant influence on farmers' perceptions of market risks. The study contributes to the ongoing policy dialogue on agricultural risk management by highlighting the following needs:

- The stabilization of market prices through commodity trading platforms
- The promotion of holistic risk management strategies regardless of the farmers' farm and socioeconomic characteristics such as farm size and wealth status.

By addressing these issues, the study provides actionable insights that can drive policy reforms, enhance farmer resilience, and improve the overall competitiveness of the groundnut sector in Malawi.

MATERIALS AND METHODS

Study Area

Groundnuts are a staple cash crop in Malawi, cultivated predominantly as a sole crop by farmers across the country. Smallholder farmers contribute approximately 93% of total groundnut production, while estates account for the remaining 7% [11]. The central region is the heart of smallholder groundnut farming, where the crop plays a crucial role in local farming systems, contributing up to 20% of household income. Besides groundnuts, the smallholder farmers in the central region grow other crops for income such as tobacco and sugar (major cash crops at 35%), maize (major staple food and commercial crop at 25%), soybean (15%), and roots and tubers (5%) [11,12]. Between the two legume crops- groundnuts and soybean, groundnuts have received special attention in the income and nutrition diversity agenda of most African countries including Malawi, making it an important case study for the present study [11,12,13]. This study was conducted in Mchinji District, one of Malawi's leading groundnut-producing areas [11,12].

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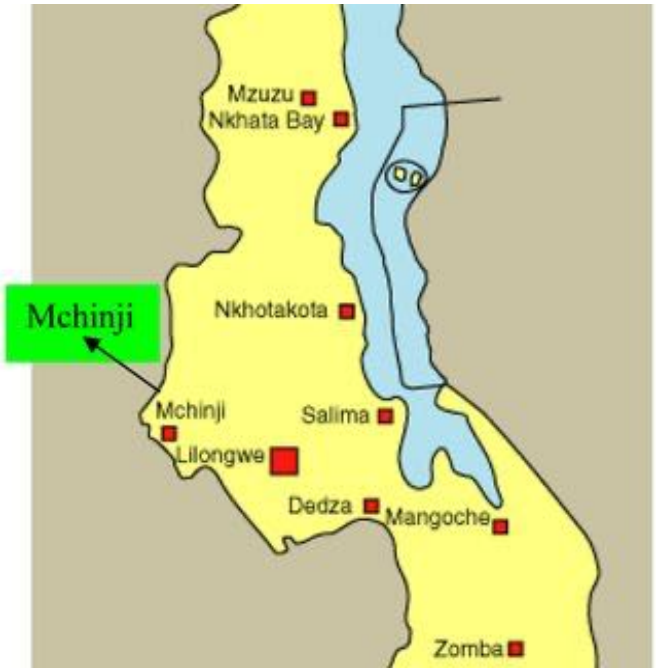

Figure 1: Study location (Mchinji District) on the Map of Malawi [14]

Sampling and Data Collection

This study was conducted in Mchinji District, one of Malawi's leading groundnut-producing areas (Ministry of Agriculture 2022). The study was based on a three-wave panel survey, covering the 2020/2021 to 2022/2023 production seasons. A structured questionnaire was administered to 161 smallholder groundnut-farming households in Mchinji District (111 male-headed households and 50 female-headed households. Besides, four Focus Group Discussions (FGDs), two from each Extension Planning Area (EPA) were conducted comprising 15 people each. The sample was drawn using a multistage sampling approach, ensuring a random and representative selection of farmers. The first stage was the purposive selection of Mchinji District due to the high levels of groundnuts that are produced. At the second stage, the Extension Planning Areas (EPAs) from Mchinji District were also purposively selected from a cluster of seven groundnut-producing EPAs in the district. At this stage, Mkanda and Chiwosya EPAs were selected owing to their relatively high levels of groundnut production compared to the other five EPAs. The third stage involved the selection of groundnut-producing farmer clubs from the selected EPAs using systematic random sampling. The farmer clubs that demonstrated commercial-and subsistence-orientation were selected. A total of eight clubs were selected. The final stage involved randomly selecting households from the farmer clubs. The names of the clubs were assigned numbers. Using tables of random numbers, 161 groundnut farmers were selected from the farmer clubs from which the data for the study was collected.

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To capture a comprehensive perspective, the study employed both quantitative and qualitative research techniques. Data collection tools included structured questionnaire, checklists, and Likert scales, complemented by Focus Group Discussions for deeper insights.

Data Analysis

Data were analyzed using the Exploratory Factor Analysis (EFA) and panel probit random effects regression analysis. The EFA was applied prior to running a panel probit regression model. Since the mean of all the 10 sources of market risk identified in the study area cannot be used as independent variables in the probit model specification, the EFA was employed to reduce and categorize these numerous sources of risk. It was also used to identify the underlying latent variables that better explain the risk perceptions of the groundnut farmers. This method generates factor scores, assessed using eigenvalues and varimax rotation, which simplifies the factor structure for better interpretation [15,16]. Additionally, the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity were used to confirm the suitability of the dataset for factor analysis. Unlike Confirmatory Factor Analysis (CFA) which is used to test an existing theory by hypothesizing an a priori model of the underlying data structure, EFA is used to generate a new theory when researchers have little knowledge about the underlying mechanisms of the target phenomena [17]. It hypothesizes that the researcher is unsure of how the variables would operate against one another, a scenario which held true for the present study.

Panel Data Regression Model Specification

Given that this study utilizes panel data collected over multiple production seasons, a panel probit random-effects regression model was applied to account for both cross-sectional and time-series variations in farmers' risk perceptions. This model effectively captures unobserved heterogeneity among farmers over time, thereby improving estimation efficiency [18,19]. The choice of the probit model was because many of the groundnut farmers reported facing several market risk sources concurrently and the number of response categories was too great to perform either a Multinomial Probit or Multinomial Logit after grouping related responses.

The panel version of the Probit Model is specified as follows:

$$Y_{it}^{*} = \alpha + \sum_{i=1}^{n}\sum_{t=1}^{3} \beta X_{it} + \mu_i + \varepsilon_{it}$$

Where:

Y_{it}^{*} is the latent (unobserved) risk perception variable for farmer i at time t. In reference to the two-quadrant risk assessment matrix for the groundnut farmers in Mchinji District (*Appendix 1*), the factor scores between 2 and 5 (low and moderate

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risk) were classified as low risk and scores between 6 and 10 (major and high impact risk) were categorized as high risk. High risk scores were coded as 1, while low risk scores were coded as 0 in the Probit specification. The observed binary outcome Y_{it} is defined as:

$$Y_{it} \begin{cases} 1, & Y_{it}^{*} > 0 \text{ (farmer perceives risk as high)} \\ 0, & \text{Otherwise} \end{cases}$$

X_{it} represents a vector of time-varying independent variables (socio-economic characteristics such as age of the household head, farm size, wealth index, production levels, and access to credit).

β is a vector of coefficients measuring the marginal effects of the independent variables on risk perception.

μ_i captures unobserved individual heterogeneity, accounting for farmer-specific characteristics that remain constant over time but influence risk perception.
ε_{it} is the idiosyncratic error term, assumed to be normally distributed with a mean of zero.

The Panel Probit Model was estimated using Maximum Likelihood Estimation (MLE), with a random-effects specification to handle unobserved heterogeneity [20]. The Maximum Likelihood Estimation approach ensures more robust inference compared to a standard cross-sectional model, as it incorporates individual and temporal variations in farmers' risk assessments [21]. By applying this panel specification, the study provides a dynamic perspective on how farmers' risk perceptions evolve, offering more precise policy insights for addressing market risks in the groundnut value chain.

RESULTS AND DISCUSSION

Socioeconomic Characteristics of Respondents

The demographic and socioeconomic attributes of the sampled households presented in Table 1 provide valuable insights into the groundnut farming landscape in Mchinji District. Gender analysis showed male dominance in groundnut farming, with 68.94% of respondents being male and 31.06% female. This suggests that men have a greater influence on risk management decisions, aligning with studies that highlight gender disparities in agricultural decision-making [22,23]. Education levels among household heads were predominantly low, with 60.87% having only primary education, 31.06% attaining secondary education, and just 1.04% reaching tertiary education.

About 96.69% of the respondents identified farming as their primary livelihood, underscoring the importance of risk management strategies in groundnut farming.

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Only 3.31% of the households engaged in other activities, such as bricklaying, off-farm businesses, and waged employment. Income distribution further highlighted the economic vulnerability of smallholder farmers, as 95.65% earned between MK 1 and MK 200, 000 per month, 2.48% earned between MK200, 001 and MK 500, 000, and just 1.86% had incomes exceeding MK 500, 000. Crucially, 55.69% of the respondents lacked access to credit, and 78.47% had no access to extension services, limiting their ability to adopt risk-mitigation strategies. On average, the respondents had 12 years of experience in groundnut farming, they were aged 43.1 and had 5.1 members per household.

Farm Size, Productivity, and Market Conditions

From Table 2, the respondents had an average of 12 years' experience in groundnut farming. The farmers in Mchinji District allocated an average of 1.9 hectares to crop production, with 0.69 hectares dedicated to groundnut cultivation, representing 36.3% of total land use. However, the reported average groundnut yield was 591.5 kg/ha, significantly below the national average of 940 kg/ha and the potential yield of 2,500 kg/ha [24]. Seasonal market prices averaged MK[1]947.87/kg, with a standard deviation of MK360.48, indicating price volatility.

Market Risk Sources in Groundnut Farming

Before conducting the Orthogonal Varimax rotation for the EFA important diagnostic tests were conducted. The Kaiser–Meyer–Olkin KMO which measures sampling adequacy for sources of risk gave an accumulative score of 0.855, indicating that the variables have 85.5% in common to warrant a factor analysis [25]. The Cronbach alpha test was run to check for the internal reliabilities of the variables. It was tolerable and gave an acceptable range of 0.809 exceeding the acceptable threshold of 0.6 [5,26]. Lastly, Bartlett's Test of Sphericity was statistically significant at $\chi^2 = 2391.48; P < 0.01$, indicating that the variables are correlated and suitable for factor analysis [25].

Table 3 presents the mean scores, standard deviations, factor loadings, and uniqueness measures derived from factor analysis on the market risks perceived by groundnut farmers in Mchinji District. A higher mean score indicates greater significance attached by farmers to a particular market risk source [26]. The analysis identified three key factors with Eigenvalues of 0.637, 0.786, and 4.126, respectively. Eigenvalues below one suggests weak correlations between variables, potentially limiting interpretability in complex contexts [25,27]. However, in this study, factor isolation and interpretation were clear, allowing meaningful classification.

[1] MK (Malawian currency at MK1,140/1USD)

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Volume 25 No. 8
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Following the factor-loading threshold of 0.5 as recommended by Howard [26], the three primary risk categories were identified as Price risks, Policy risks, and Storage (Aflatoxin) risks. Together, these three factors explained 111.6% of the total variance in risk perception, an overestimation likely due to the high variability of farm-level data compared to aggregated national data [5].

The highest-rated risk was the lack of regulated structured markets with a mean score of 3.879. Most farmers indicated selling their groundnuts to small-scale traders through informal channels. Farmers emphasized that formalized market structures could provide stable prices and predictable incomes, enhancing production planning. Despite participating in farmer-based organizations (clubs, cooperatives or associations), many groundnut farmers reported that cooperative membership did not guarantee collective marketing as such disorganized marketing was dominant in the district with a mean score of 3.878. The absence of large-scale trading platforms and the weak farmer group management structures in Mchinji District forces farmers to rely on informal markets, especially in response to urgent household needs like school fees and groceries. This aligns with studies highlighting how weak cooperative governance and inefficient management structures undermine the effectiveness of collective marketing [28,29].

With a mean score of 3.845, high food prices were rated third. Farmers reported that rising food prices indirectly affect groundnut production, as household resources are diverted to purchasing food rather than investing in farming inputs. Fourthly, with a mean score of 3.834 the farmers reported fluctuating prices as another key market risk source. Market volatility creates uncertainty for both farmers and traders, making it difficult to predict income levels. Price fluctuations send conflicting investment signals - When prices are expected to fall, farmers reduce production, whereas expected price increases may encourage overproduction. Similarly, traders may withdraw from the groundnut market in favor of more profitable crops like soybeans and tobacco [23,30]. Beyond these major risks, farmers also identified low commodity prices, lack of government price support, reduced earnings, high input costs, aflatoxin contamination, and pest/disease attacks in storage as significant market risks.

Categorization of Market Risks

The factor analysis classified market risks into three key categories, namely price, policy and storage (aflatoxin-related) risks. Price risks included reduced farm earnings, lack of government price support, price fluctuations, and high input costs. Although high food prices and government price policies are linked to policy issues, their direct impact on pricing places them in this category. Rising food costs force households to redirect farming investments towards food purchases, reducing groundnut production and household income. The policy risk category included

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market deregulation and low commodity prices. Farmers believe government intervention in price stabilization and market regulation could prevent severe price fluctuations, making this a policy-driven challenge.

Lastly, the storage/aflatoxin risk category included pest infestations, disease attacks, and aflatoxin contamination. Focus Group Discussions (FGDs) revealed that most farmers do not actively implement aflatoxin management practices. Alarmingly, 86.7% were unaware of Aflasafe, a biocontrol product designed to reduce aflatoxin levels, while 73.33% rejected Mandela Cock drying technology, a recommended post-harvest management practice. Groundnut storage remains a major susceptible factor for farmers. Many still use traditional sack storage, leaving their produce highly susceptible to pest damage and quality deterioration. These challenges directly impact on farmer incomes and food security, as crop loss reduces marketable volumes and overall profitability. Literature confirms that poor post-harvest management not only threatens individual farmers but also weakens the agricultural sector's role in combating poverty and food insecurity [31].

Determinants of Farmers' Perception of Market Risks

Key diagnostic tests were conducted to ensure the robustness and reliability of the Panel Probit model results. The Breusch-Pagan test for heteroskedasticity yielded a p-value of 0.1337, exceeding the 0.05 threshold, confirming that residual variances are constant. This validates the assumption of homoscedasticity, ensuring that the Probit model estimates are efficient and reliable [32]. To detect potential multicollinearity, the Variance Inflation Factor (VIF) was computed for each independent variable. A VIF value above 10 indicates severe multicollinearity, but in this study, all VIF values were below 5, with a mean of 1.41, indicating moderate multicollinearity, which did not pose a concern for regression analysis [33]. Furthermore, a Pearson correlation matrix (Table 4) was analyzed to validate the absence of multicollinearity. Since all the absolute correlation values were below 0.8, collinearity was deemed insignificant, confirming the suitability of the variables for inclusion in the model [33].

Table 5 presents the Probit model results for the study. The results revealed that groundnut production, farm size, and farmers' wealth index have a positive and significant relationship with farmers' perceptions of market risk sources. A higher groundnut harvest increased the likelihood of farmers perceiving market risks as devastating by 24.78 percentage points. During Focus Group Discussions (FGDs), farmers in Mchinji District associated higher yields with better market prospects, as increased production enhances collective bargaining power and reduces vulnerability to price fluctuations, but our finding revealed otherwise. A contradiction probably emerged because even farmers with high production levels faced severe market risk challenges that resulted in lower marketed volumes and reduced

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incomes. These findings challenge previous research by Sulewsk and Kłoczko-Gajewska [34], which suggested that past production losses (low production) increased risk aversion and that yield fluctuations were the primary risk factor for Polish farmers.

Regarding farm size, a one-acre increase in farm size raised the probability of perceiving market risks as devastating by 8.83 percentage points. Farmers in Mchinji District linked this to the higher financial burden associated with market risk management efforts such as crop insurance premiums and input costs which increase with land size. While Iqbal *et al.* [9] found no correlation between farm size and risk perception, Ullah *et al.* [35] highlighted the role of land ownership status in determining risk-coping strategies. In Khyber Pakhtunkhwa, Pakistan, landless tenants relied more on traditional risk-management tools, whereas owner-farmers and tenant-owners preferred formal instruments like insurance and credit reserves. Although this study does not assess ownership status, most Mchinji farmers reported owning an average of 1.9 hectares with only 0.038 hectares rented, indicating a need for greater adoption of formal risk-coping mechanisms, despite their higher costs [35].

Farmers with higher and medium wealth were 63.9% and 74.67% more likely, respectively, to perceive market risks as devastating compared to farmers with low wealth. A plausible explanation for this was the fear of financial loss, despite wealthier farmers being better positioned to absorb risks. This finding contrasts with Ullah and Shivakoti [36], who found no significant difference in risk perception across income groups in Delhi-NCR, India.

These results emphasize the need for targeted risk management strategies tailored to potential production levels, farm size, and wealth status, ensuring that both high- and low-income farmers are equipped to mitigate market risks effectively.

CONCLUSION AND RECOMMENDATIONS DEVELOPMENT

This study provides a critical analysis of market risks affecting groundnut farmers in Mchinji District, Malawi, shedding light on the most pressing challenges that threaten farmer livelihoods and the overall stability of the value chain. Using Exploratory Factor Analysis (EFA), the study identifies market deregulation, high food prices, and unstable output prices as the top three most severe market risks perceived by farmers, aligning with global research emphasizing the vulnerability of smallholder farmers to market volatility and weak institutional support [37,38]. It also reveals that groundnut production, farm size, and wealth levels significantly influence farmers' perception of market risks. Farmers with higher production levels are more likely to suffer financial loss in the face of unstable and unstructured market conditions than those with less produce. Similarly, farm size shapes risk perception in the sense that

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ISSN 1684 5374

larger farms entail additional market risk management effort that will be required to abate market risk effects. For instance, crop insurance premiums are directly proportional to farm size, putting a farmer in a position to spend more for an additional hectare of land [39]. However, the study underscores that wealth does not eliminate risk concerns; even wealthier farmers remain vulnerable to financial losses, emphasizing the need for holistic risk management approaches that incorporate financial resilience and market stability strategies. Based on the above results the following suggestions could certainly strengthen farmers' market resilience:

Stabilizing Market Prices through Commodity Trading Platforms

Price instability remains the most significant risk affecting groundnut production. The study findings reveal that farmers with higher production, though better positioned to bargain for better prices, perceived market risks as more devastating. To counteract price volatility, the study recommends revitalizing government-regulated commodity platforms such as the Agricultural Development and Marketing Corporation (ADMARC) and Warehouse Receipt Systems (for example, Agriculture Commodity Exchange and Auction Holdings Commodity Exchange). Empirical studies indicate that structured commodity markets improve price stability and reduce farmer exploitation regardless of their production capacity [40]. Furthermore, the timely release of minimum farm gate prices by the Ministry of Agriculture would empower farmers with predictable pricing structures, allowing them to make informed production and marketing decisions.

Promotion of Holistic Risk Management Strategies

The revelation that groundnut farmers with larger farm size, middle and high-income perceived market risks as devastating compared to those with lesser farm size and low-income levels, highlights the unique effect of market risk sources on the farmers regardless of their farm and wealth status. Holistic risk management approaches that combine financial resilience and market stability strategies such as crop diversification and crop insurance programs could be key in addressing the market risks inefficiencies across all wealth groups. With coordinated efforts between the government, local authorities, financial institutions, and industry stakeholders, Malawi can transform its agricultural economy, ensuring that groundnut farming remains a stable and profitable enterprise for generations to come.

STUDY LIMITATION

The study acknowledges that besides groundnut farming, the farmers were also involved in other economic crop production ventures such as tobacco, maize, soybean and sweet potato farming. The production and marketing decisions from these enterprises might have also shaped the farmers' perception of market risks in groundnut farming. However, examining the interaction of the economic behaviors of groundnuts and other crops was beyond the scope of this study.

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Author contributions

All authors participated in the study design, practical work and writing of the manuscript and approved the final manuscript.

Conflict of interest

The authors declare no conflicts of interest whether financial or personal

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Table 1: Descriptive Statistics of the Sampled Households

Variable	Frequency	Percentage
Sex		
Sex (=1 if Male)	333	68.94
Education levels		
None	34	7.04
Primary school	294	60.87
Secondary school	150	31.06
University	5	1.04
Occupation		
Farming	467	96.69
Others (Bricklaying, business, waged employment)	16	3.31
Household monthly expenditure Categories (Malawi Kwacha (currency)- MK)		
Group 1: 01-200000	462	95.65
Group 2: 200001-500000+	12	2.48
Group 3: Above 500000	9	1.86
Access to credit		
Access to credit (=1 if yes)	214	44.31
Access to extension		
Access to extension (=1 if yes)	104	21.57
	Mean	**Standard deviation**
Farming experience	12.2	9.5
Age of the household head	43.1	12.6
Household size	5.1	1.81
Observations	**483**	

Source: Survey data (2023)

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Table 2: Groundnut Production and Marketing Statistics for the Sampled Households

Description	Mean	Standard Deviation	Min	Max
Total Farm size (ha)	1.90	1.23	0.42	11.25
Groundnut farm size (ha)	0.69	0.36	0.08	2.50
Groundnut yield (Kg/ha)	591.45	615.80	15	4000
Groundnut average price (MK/Kg)	947.87	360.48	500	2500

Source: survey data (2023)

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Table 3: Varimax Rotated Factor Loadings for Groundnut Market Risk Sources in Mchinji District

Most Important Market Risk Factors								
Market risk source	**Mean**	**Standard Deviation**	**Rank**	**Price**	**Policy**	**Aflatoxin/ storage**	**Uniqueness**	**KMO**
High food prices	3.845	1.024	3	**0.806**	0.143	0.026	0.3215	0.909
Low commodity prices	3.805	1.048	5	0.209	**0.714**	0.064	0.441	0.727
High input cost	3.749	1.005	8	**0.764**	0.150	-0.009	0.3673	0.905
Large fluctuation in prices	3.834	1.027	4	**0.790**	0.144	0.010	0.349	0.927
Reduced earnings	3.793	1.023	7	**0.840**	0.154	0.008	0.254	0.891
Lack of government Price support	3.828	1.051	6	**0.821**	0.318	-0.015	0.208	0.888
Deregulated markets	3.879	0.994	1	0.354	**0.725**	-0.014	0.349	0.772
Disorganized markets	3.878	1.030	2	0.371	0.274	0.014	0.715	0.917
Aflatoxin infestation	2.257	1.095	9	0.019	0.091	**0.573**	0.659	0.499
Pest and Disease attack in storage	2.205	1.049	10	-0.009	-0.022	**0.576**	0.665	0.467
Eigenvalues				4.126	0.786	0.637		
percent of variance explained				71.84	98.21	111.63		
Cumulative percent of variance explained								
Overall KMO								0.855
Overall Cronbach's α coefficient								0.809
Number of variables considered for naming				5	2	2		

Factor loadings with absolute value >0.5 are in bold; Ranks are dependent on the mean values; $\chi^2 = 2391.48$; $P < 0.0$
Source: Authors

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SCHOLARLY, PEER REVIEWED
Volume 25 No. 8
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Table 4: Matrix of Correlations among the Independent Variables

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1. Access to insurance	1.000									
2. Access to credit	0.747	1.000								
3. Farming experience	-0.019	0.023	1.000							
4. Groundnut production	0.006	0.020	0.051	1.000						
5. Farm size	0.000	0.007	0.298	-0.073	1.000					
6. Education level of HH	-0.026	0.003	0.014	-0.020	0.022	1.000				
7. Wealth index	-0.036	-0.034	0.163	-0.088	0.494	0.212	1.000			
8. Gender	0.032	0.032	-0.152	0.028	-0.245	0.221	0.107	1.000		
9. Membership to FBO*	0.005	0.039	-0.037	-0.051	-0.029	-0.062	-0.008	0.019	1.000	
10. Access to extension	-0.031	-0.021	0.054	0.032	0.027	0.088	0.039	-0.019	0.062	1.000

*FBO: Farmer Based Organization

Source: Authors

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Table 5: Empirical Estimates of the Determinants of Farmers Perception of Market Risks

Variables	Coefficient	St. Error	P – value	Marginal effects
Credit (1 = if yes)	0.0378	0.2037	0.853	0.0150
Insurance (1 = if yes)	0.1789	0.1967	0.363	0.0711
Sex (1 = if Male)	-0.0897	0.1116	0.422	-0.0356
Experience	0.0376	0.0310	0.226	0.0149
Groundnut production (Kg)	0.6238***	0.1617	0.000	0.2478
Farm size (hectare)	0.2223***	0.0330	0.000	0.0883
Access to extension (1 = if yes)	-0.0738	0.1112	0.507	-0.0293
Organization member (1 = if yes)	0.0513	0.1110	0.644	0.0204
Education (Ref category; Primary)				
Secondary	0.0893	0.1229	0.468	0.2036
Tertiary	0.2636	0.4852	0.587	0.2304
Wealth index (Ref category: Low)				
Moderate	0.4610**	0.1814	0.011	0.6390
High	0.8105*	0.4329	0.061	0.7467

Note: *Significant at 10%, **Significant at 5% and ***Significant at 1%; Log pseudolikelihood = -351.19303, Wald (chi2) =127.92, prob>chi2 = 0.0000 N = 483; Breusch-Pagan test, p-value=0.1337; VIF mean value=1.41; Pearson correlation matrix values <0.8

Source: Authors

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Appendix

Appendix 1: Risk assessment matrix

Probability/Frequency

5	6	7	8	9	Deregulated markets/large fall in prices
4	5	6	7	Rise in food prices	9
3	Loss of employment/remittances	Reduced marketed volumes; IGA failure	High cost of inputs; Aflatoxin infestation/P&D	7	8
2	3	4	5	Non-fulfilled contracts	7
1	2	3	4	5	6
	1	**2**	**3**	**4**	**5**

Severity/Impact

Key	
	Low risk
	Moderate risk
	Major risk
	High impact risk