UNIVERSITY OF ILORIN

THE TWO HUNDRED AND FIFTY-FIRST (251ST)
INAUGURAL LECTURE

"THE RISK OF NOT TAKING RISK IN AGRICULTURAL INNOVATION AND GENDER INCLUSIVITY"

By

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Members of my Nuclear and Extended Families,
Distinguished Invited Guests,
Students of the Faculty of Agriculture,
Great Students of the University of Ilorin,
Gentlemen of the Press,
Distinguished Ladies and Gentlemen.

Preamble

Thine, O Lord, is the greatness and the power and the glory, and the victory and the majesty because thy loving kindness is better than life, my lips shall praise thee (I Chronicles 29:11a; Psalm 63:3). I give thanks and adoration to the only Faithful and Covenant-Keeping God who not only redeemed me but also justifies me. All glory to Him for giving me the privilege to survive cancer and the opportunity to present this inaugural lecture.

The inaugural lecture of today is the 251st edition in the annals of the University of Ilorin. It is also the 17th in the Faculty of Agriculture, 3rd in the Department of Agricultural Economics and Farm Management, and the 1st in the year, 2024. The 158th Inaugural Lecture of this university, ”Let the Small-scale Farmer be in Good Standing”, delivered by Professor Olubunmi

Abayomi Omotesho, one of my fathers and mentors, on the 28th May, 2015 was the first in the Department of Agricultural Economics and Farm Management, and the second was the 244th Inaugural Lecture, "Making Ends Meet with Food Security." It was recently delivered by Professor Azeez Muhammad-Lawal, one of my friends and colleague, on 3rd November, 2023.

Vice-Chancellor, sir, permit me to start my inaugural lecture with the story of a great man, who gave birth to me and who knowingly or unknowingly avoided the penalty of not taking risk. My father, Rtd. WO II Samuel Duntoye Moriyonu, was born over eight decades ago when the culture and expected norms of men were to have at least a male protege. He faced this deviation from the expected norms and took the risk of caring for and nurturing only female children during a period when most people were not happy with him on this "risk-taking" venture. My father not only took the risk but also managed the risk by developing an excellent spirit of success in all his female children of which I am the 3rd. He taught us to do our best in all we do without allowing gender to affect our success. He taught us (as a soldier who he was) that we must aspire to be the best, strong, and resilience. This spirit served as impetus for me in the pursuit of my academic career and I was the best-graduating student in the Faculty of Agriculture in 1999. My undergraduate project entitled; "Investment Patterns among Rural Women in Kwara State" was supervised by Professor E.T. O. Oyatoye who incubated a resilience spirit in me.

Although I had some challenges during the write-up of my project, Prof. O. Oluwashola (my Uncle Ayanda 's friend and former staff of the Department) took me to Prof. O. A. Omotesho who not only provided solutions to the challenges I had but also encouraged me to put in my best so I could turn out a standard project.

This encouraged me to pursue my postgraduate studies under Prof. Omotesho's supervision, with a focus on Risk Management in my M. Sc. (2000-2004) and Ph.D. (2004-2008) Degrees. I proceeded further to Tshwane University of Technology, South Africa, for a Post-doctoral Fellowship where I studied the Economics of Innovation in agricultural productivity

under the supervision of Prof. Mammo Muchie (2010–2012) and was later crowned with Fulbright Visiting Senior Research at Ohio State University, United States of America, where I focused on the use of index insurance as a risk management tool in building resilience among male and female small-scale farmers in Nigeria under the mentorship of Prof. Mario Miranda (2018-2019).

I started my journey in the academic world in 2002 as a Graduate Assistant and rose through all cadres to the post of Professorship in 2019.

Mr. Vice-Chancellor, all these nurtures, trainings, and research efforts inform my choice of today's title: "**The Risk of not taking Risk in Agricultural Innovation and Gender Inclusivity.**"

Introduction

Vice-Chancellor, sir, I am recently fascinated by this quotation from Facebook Co-Founder and CEO Mark Zuckerberg, ***"The biggest risk is not taking any risk. In a world that's changing quickly, the only strategy that is guaranteed to fail is not taking risks".*** These brief remarks encapsulate the basic reality of taking chances in life, which also informs the choice of this inaugural lecture. We live in a world that thrives on risk-taking. Risk is inevitable in life, not to mention Agriculture, a system that is highly subject to risk and uncertainty. Risk is an important aspect of farming. Given that 70% of Nigerians live in rural areas, Agriculture can potentially play a significant role in a nation's economic and human development. However, Agriculture is a risky business, particularly for small-scale farmers who frequently face uncertainties and risks (**Ayinde**, Omotesho, and Adewumi, 2004; and Polycarp and Jirgi, 2018).

Risk can be defined as an event with a known probability of outcome, which includes both potential benefits and loss (Hardaker, Lien Anderson and Huirne, 2015), whereas uncertainties can be defined as an event with an unknown probability of outcome. The two are often used interchangeably (**Ayinde**, 2008a). Risk is the potential for unfavorable outcomes resulting from uncertainty and incomplete information while

making decisions (**Ayinde**, Bessler and Oni, 2017). It is a fundamental element in various fields, especially Agriculture. Today, I will be discussing these risk hazards as related to agriculture.

Types of Agricultural Risk

There are five general types of risk. These are: Production risk, Market risk, Financial risk, Institutional risk, and Human risk (Drollette, 2009).

Production Risk

This type of risk arises from factors that affect the quantity and quality of the agricultural output. It represents the variability and potential negative consequences associated with the physical output of agricultural activities. It arises from factors that can affect the quantity and quality of crops, livestock, and other agricultural products, including adverse climatic conditions, pest and disease infestations, and soil-related challenges (Lusk and Coble, 2005; **Ayinde,** Ajewole, Ogunlade and Adewumi**,** 2010; and **Ayinde**, Muchie and Olatunji, 2011). Of these, drought is the most devastating and costly challenge to crop production because most farmers in Africa practice rain-fed agriculture (**Ayinde** *et al.,* 2016a).

Market Risk

Market risk, often referred to as price risk, is intrinsically linked to production risk, creating a complex dynamic that significantly affects agricultural producers. Market risk can influence production, income, industry, growth, and unemployment (**Ayinde,** Adewumi, Nmadu, Olatunji and Egbugo, 2014; and **Ayinde,** Ojo, Ajibade and Oyeniyi, 2015). The study conducted by **Ayinde,** Adenuga, Omotesho and Babatunde (2013) revealed that prices of crops, price variation, seasons, and location influence consumer preference for cowpea variety. However, this is not the case for livestock, such as quails. **Ayinde** *et al.,* (2015) also showed that the preference for quail is influenced largely by the awareness of its benefit and not its market price and variation. Thus, market risk can influence agricultural growth. At other times, we established that unemployment rates have a significant influence on agricultural

growth (**Ayinde,** 2008b; and **Ayinde,** Aina and Babarinde**,** 2017). Thus, agricultural stakeholders must effectively manage market risk on both the input and output sides (**Ayinde,** Muchie, Adewumi and Abaniyan, 2012**)**.

Financial Risk

This type of risk is also known as investment risk. It relates to the exposure of farmers to potential financial losses or difficulties resulting from uncertainties in income, expenses, and market conditions. Farmers may struggle to meet their financial obligations, especially during periods of low income or unexpected expenses. Production and marketing risk also contribute to financial risk, relating directly to cash flows and the ability to secure and repay loans necessary for operation (Drollette, 2009; and **Ayinde**, Bello and Ajewole, 2016b).

Institutional Risk

This type of risk is sometimes referred to as Legal risk. Institutional risks result from changes in government policies, regulations, and trade agreements that can impact the agricultural sector. Agricultural policies have impact on prices of major staple crops (**Ayinde** *et al.*, 2016f). Most of the key objectives of several policies and program targeted at improving smallholder household productivity, welfare and building their resilience towards natural and economic shocks are yet to achieve the desired state of transformation due to issues related to regulatory changes, weak institution, poor monitoring and evaluation. These are evident from case study of fertilizer subsidy in Nigeria (**Ayinde** *et al.*, 2019a; **Ayinde** *et al.*, 2020; and Olaoye and **Ayinde** *et al.*, 2020).

Human Risk

This type of risk is also known as personal risk. There are substantial risks involved in any type of business that involves people, conflicts and deaths.

It has been established in the literature that agricultural production takes place under a variety of high-level risks and uncertainties. These risks subject farm households' production to risks and influence the skepticism of farmers in the way they make their decisions and their ultimate risk behaviour. Not

surprisingly, these reasons also made many researchers conclude that farmers exhibit a high level of aversion to risk while making production decisions (Mendola, 2007). However, some of my researches proved that not many farmers are risk-averse (**Ayinde**, Omotesho, and Adewumi, 2010; **Ayinde,** Muchie, Adenuga, Jesudun, Olagunju and Adewumi, 2012; and **Ayinde,** 2017). Now, let me proceed to my contributions to knowledge in research.

My Contributions to Knowledge in Agriculture, Innovation and Gender

Vice-Chancellor, sir, the effect of risk on agricultural production and growth is a multifaceted concern, deeply intertwined with various challenges faced by the agricultural sector. I have delved into research that centers on agricultural risk and its effects, risk behaviour of farmers, gender inclusivity, as well as risk management strategies, and adoption of agricultural innovation and technologies, within my twenty-two (22) years of career at the University. My years of research have yielded some interesting findings that I need to share now.

Effect of Risk on Agricultural Production and Growth

Climatic fluctuation is putting Nigeria‘s agriculture system under serious threat and stress. Our studies, **Ayinde** (2011) and **Ayinde**, Muchie and Olatunji (2011), conducted on the impact of climate change and agricultural productivity in Nigeria showed much lower growth rate in the 1996–2000 sub-period. Changes in rainfall pattern either positively or negatively affected agricultural production; and although annual temperature was observed to be stationary at its level. Furthermore, our results revealed that heavy rainfall in the previous year could lead to erosion and leaching, which makes nutrients unavailable for the current cropping season thus decreasing agricultural productivity (**Ayinde** *et al*, 2010**).** However, the Augmented Dickey-Fuller test for unit root revealed that agricultural productivity was not stationary in response to the trend in the pattern of annual rainfall but became stationary after the differencing (Table 1).

Table 1: Results of the Stationary Test

Variables	Level	1st Differe-nce	2nd Differe-nce	Unit Root	Decision
Agric. Output	-0.99	-4.80*	-7.76*	I (1)	Non-stationary
Temperature	-5.21*	-7.50*	-8.65*	I (0)	Stationary
Rain	-3.02	-4.98	-8.06	I (1)	Non-stationary

Criticalvalueat1% = -3.7667
Source: Ayinde *et al.,* 2010

There is an increasing concern about the vulnerability of farmers to the effects of climate change; and age, sex, education, and household size had significant impacts on the farmers ' perception of effect of climate change on social, biological and ecosystem functions. We further concluded that rural farmers correctly perceived the changes in the climate (Falaki, Akangbe and **Ayinde,** 2013).

Ayinde *et al.,* (2018) conducted a study that analysed maize farmers 'vulnerability' to climate risk. The majority of the farmers agreed that the climate is changing (Table 2). The study showed that they were vulnerable and lacked the necessary capacity to mitigate the effects of climate change.

Table2: Perception on Trends in Change in Climatic Elements

Climate Elements	**Increasing (%)**	**Decreasing (%)**	**No Changes (%)**
Rainfall	1	76	23
Temperature	50	34.5	24.5
Climate Elements	**Predictable (%)**	**Unpredictable (%)**	**No Idea (%)**
Rainfall Predictability	98	2	0
Climate Elements	**Too Late (%)**	**Too Early (%)**	**No Changes (%)**
Arrival of Rain	78.5	11	10
Climate Elements	**Yes (%)**	**No (%)**	
Late Cessation of Rai	67.3	32.7	
Changes in Rainfall Amount	81.9%	10.1%	

Source: Ayinde *et al.,* (2018)

Nigeria is among the African countries that have engaged in agricultural liberalisation since 1986 in the hope that reforms

emphasising price incentives will encourage producers to respond (**Ayinde**, Bessler and Oni, 2017). However, the reforms seem to have introduced greater uncertainty into the market given the increasing rates of price volatility. This volatility makes it difficult for farmers to predict and manage price risks effectively.

Ayinde, Bessler and Oni (2017)'s research work modeled supply responses in Nigerian Rice production. We found that rice producers were more responsive not only to price and non-price factors but also to price risk and exchange rate. It is, therefore, imperative to reduce price risk by increasing producers' responses to supply by bridging the gap in production. **Ayinde,** Aina, Ayinde and Lukman (2016c) analysed the pattern of rice price variation (as risk) over a period of 42 years in Nigeria. The study indicated that appropriate tax collection measures for producers should be implemented to curtail farmers from exploiting the masses by making excessive gains.

Mr. Vice-Chancellor, despite commendable efforts directed towards enhancing agricultural production and growth in Nigeria, the persistent issue of price volatility in food markets is yet to be addressed. This volatility not only impacts the affordability of food but also exerts a significant influence on the overall agricultural sector. Therefore, initiatives that tackle the challenge will help us understand the dynamics within food markets, including a comprehensive insight into their functioning and drivers.

Ajibade, **Ayinde** and Abdoulaye (2019) assessed the point of price discovery and the markets that significantly influence the price of maize in Nigeria. The study indicated that maize prices are primarily determined by major food markets in deficit production zones. Most of these markets responded to short-term price shocks within themselves, initially showing independence but eventually becoming interdependent in the long run. This suggests that the markets have a significant informational influence on each other.

Ayinde, Aina and Ayinde (2019) examined the various factors that contribute to the variations in maize prices in

Nigeria. The study revealed that inflation, population, agricultural budget, and yearly production quantity determine maize prices and highlighted the need for a resilient and strong institutional development plan to ensure continuous maize production and investment in its value chain to boost food security.

Ajibade and **Ayinde** *et al.,* (2018) investigated the determinants of maize prices in Nigeria using an error correction approach and time-series data spanning 46 years (1970-2015). The study revealed that maize prices in Nigeria responded negatively to Gross Domestic Product (GDP) and positively to the annual money supply, official exchange rate, and insurgency in the long run. In the short run, maize price was positively influenced by export quantity, insurgency, and trade liberalisation, whereas production had a negative influence on the price of maize.

Agricultural commodity prices have been influenced by inflation. While moderate inflation might lead to higher prices for crops and livestock, rapid or excessive inflation can create speculative bubbles and price volatility in commodity markets. Olatunji, Omotesho, **Ayinde** and Adewumi (2010) examined the factors driving inflation in Nigeria using time-series data. The study highlighted the importance of regulating imports to prevent price inflation due to shifts in consumer preferences. It recommended the inevitability of discouraging exclusive reliance on the export of domestic petroleum products while emphasizing the importance of promoting domestic consumption. In another study, Olatunji, Omotesho and **Ayinde** *et al.,* (2012) delved deeper into the impact of inflation on agricultural investment by conducting a comprehensive analysis of Nigerian agricultural production and inflation rates over a span of 36 years. Our findings highlighted significant variations in the trends of inflation rates and agricultural output, shedding light on the intricate dynamics of these variables. This understanding of economic factors and their effects on agriculture is crucial when examining farmers' behaviour and decision-making processes in the complex agricultural landscape.

Risk Behaviour

The risk behaviour of farmers refers to the attitudes, decisions, and actions they take in response to various types of risks in agriculture. Studies on farmers' risk behaviour have identified three categories which are (risk averse, risk taker and risk neutral) based on their risk- taking behaviour. Farmers in the risk-taking category are those open to riskier business options while risk-averse are those who try to avoid taking risks. Risk Neutral are farmers who lie between the risk-averse and risk-taking positions (**Ayinde**, Omotesho and Adewumi 2010, Khan, 2015; and **Ayinde**, Bello and Ajewole, 2016b). Therefore, understanding these levels of risk behaviour are essential for policymakers, researchers, and agricultural organizations to design effective risk management programmes and provide support that meets the diverse needs of farmers. **Ayinde**, Omotesho and Adewumi (2010) examined the risk behaviour of small-scale farming households in Kwara State. The study highlighted the different risk situations faced by farming households and identified their subjective risk perceptions. The results indicated that farming households in the study area exhibited risk-taking, risk-neutral, and risk-averse behaviours and that there is significant association between the risk attitude of the famers and their zones (X^2=20.43, p-value=0.0023) as shown in Figure 1.

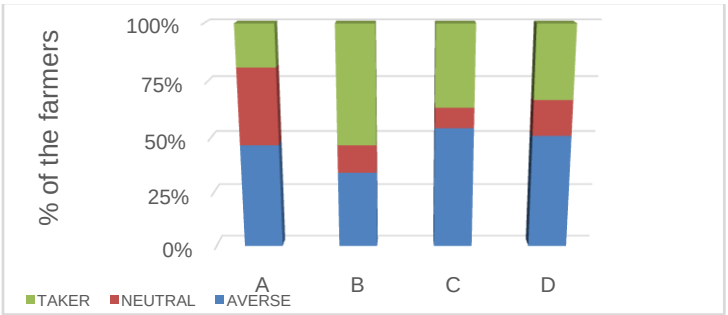


Figure 1: Small Scale farmers and their Risk Attitude in the Four Zones of Kwara State, Nigeria
Source: Ayinde, Omotesho and Adewumi (2010)

In a study conducted to elicit the risk attitude of smallholder male and female farmers in Kwara State, **Ayinde** *et al.*, (2012) found that about 72% of male maize farmers and 40% of their female counterparts are risk takers. On average, about 28.3% of the male and 60% of the female were indifferent to risk, implying that most female farmers in maize production are indifferent to risk-taking and may decide whether to adopt an innovation or not. This may be because of the way the female farmers viewed themselves. They must believe in themselves when making decisions. Interestingly, none of the producers was risk-averse.

Furthermore, **Ayinde** (2017) conducted a study in Oyo State to investigate the risks involved in the adoption of Vitamin A cassava variety. I found that 88% of cassava farmers are risk-neutral and only 16% are risk-takers (Figure 2):

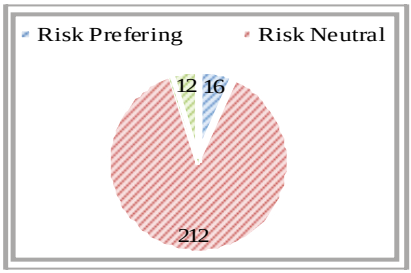


Figure 2: Farmers' Risk Attitude to the Production of Vitamin A Cassava in Oyo State, Nigeria
Source: Ayinde (2017)

The study further revealed that the predominant sources of risk are animal invasion and price fluctuation and that the significant determinants of risk behaviour among farmers were age, income from other activities, and estimated annual income (Table 3).

Relating the influence of socio-economic factors on small-scale farmers'risk behaviour, we found positive relationships between the risk coefficient of farming households in the Kwara State and their access to extension services, disposable income, amount of capital, and membership in a cooperative society.

Table 3: Factors affecting farmers' attitude towards risk-taking.

Variables	B	Std Error	T	Sig.
Constant	2.277	0.549	4.144	0.000
Age	-0.009**	0.172	-0.074	0.041
Cost of labor	-0.113	0.000	-0.623	0.535
Income from other activities	-0.026*	0.000	-0.142	0.087
Primary occupation	0.035	0.154	0.304	0.762
Farm size (ha)	-0.046	0.032	-0.396	0.693
Household size	-0.052	0.058	-0.415	0.679
Estimated annual income	0.113**	0.000	1.026	0.007

**-significantat 5%,*-significantat10%; R^2=0.73, Adjusted R^2 = 0.68
Source: Ayinde (2017)

However, there was a negative relationship between the risk coefficient of the households and their household size, off-farm income, proportion of cropped land, membership in a cooperative society, and risk aversion.

The study recommended that programmes and policies for small-scale farmers should incorporate their risk behaviour and its relationship with their socio-characteristics (**Ayinde**, 2008c; and **Ayinde**, *et al.,* 2012). In Osun State, Adewumi and **Ayinde** *et al.,* (2012) found that age and poverty levels were major determinants of the risk attitudes of rural women investors. Another study conducted in Sokoto State revealed that farmers' age, farm size, and access to extension services significantly influenced their risk attitudes (**Ayinde** and Obalola, 2017). The situation in Oyo state was not different as **Ayinde** (2017) found out that age, income from other activities, and estimated annual income are determinants of cassava farmers' risk attitudes.

Risk Management

Vice Chancellor, sir, given the changing structure of the agricultural industry, managing risk has become enormously important to the success of agricultural operations. I hereby provide my contributions along this aspect as follows:

1. **Access to Information**

Information is an essential ingredient in planning and this may be regarded as the first step to manage risk. Access to information is, therefore, the foremost strategy to manage risk. Training and education are key important factors that help to minimise risk (Obalola and **Ayinde,** 2018). If the farmers are educated and trained, it could go a long way in improving their awareness level and sharpening their perception and knowledge about risk management. **Ayinde** *et al.,* (2014) evaluated consumer awareness of risk associated with moringa consumption in the Ilorin metropolis as well as determined factors that influenced their decision to consume moringa products. The study recommended that more efforts should be made by moringa processors to improve hygiene during the processing of moringa leaves into powder to enhance consumer food safety.

2. Assessment and Analysis of Risk

The assessment and analysis of farmers 'perceptions and their response to risk is crucial in risk management because it can describe the decision-making behaviour of farmers when facing uncertain situations. **Ayinde**, Omotesho and Ayinde (2005) in our study of designing and developing farm plans used a safety-first programming technique to pin out that for effective decisions in improving the efficiency of agricultural production, farm planning models should incorporate risk. The lack of a clear understanding and assessment of risk and their attitudes towards risks remains an important factor inhibiting increased agricultural productivity in Nigeria (**Ayinde**, Bello and Ajewole, 2016b). Therefore, assessing, analysing, and revealing the risk and model of small-scale agricultural entrepreneurs is a requisite for effective planning in risk management, agricultural innovation, and production.

Ayinde, Omotesho and Adewumi (2004) used Tauer's Target-Minimisation of Total Absolute Deviations (Target-MOTAD) model to investigate enterprise choice problems involving crop production. The study revealed a positive trade-off between the risk and returns of farmers and indicated that policies should aim to increase farm income and reduce

variability in returns (risk). In the model, the farmer was assumed to evaluate risk on the basis of safety-first criterion; that is, the farmer minimised the probability of his farm output falling below his subsistence requirements. This safety-first criterion was introduced as a risk constraint into a linear programming model of a representative farming household. The decision criterion used measures risk as mean absolute deviations from an expectation.

Mathematically, the model used was stated as:

$MaxE(Z) = \sum_{j=1}^{n} c_j x_j$ (1)

Subject to:

$\sum_i \sum_j a_{ij} x_j \leq b_i$ (2)

$i = 1, \ldots, mj, j = 1, \ldots, n$

$T - Y_r^+ - Y_r^- \leq 0$ (3)

or

$Y_r^+ - Y_r^- > T$ (4)

$\sum P_r Y_r^- = \alpha$ (5)

$\alpha = (M \to 0) and X, Y > 0$

Where $E(Z)$ is the expected returns as gross margin of the plan or solution to the plan in c_j and c_j expected returns of activity j (activity as crop enterprise), x_j is the level of activity j and a_{ij} is the technical requirement of activity j for resource i (the resources include land, labor, and capital), b_i is the level of resource i and food requirement as another constraint, the target level (T) of returns in naira was derived from mean absolute deviation and c_{rj} is the returns of activity j for the state of nature or observation $r(N)$,Y^+ is the deviation above expected returns and), and Y^- is the deviation below expected returns. The probability that state of nature or observation$r$ occurred is p_r and α is a constant parameterised from M to 0. There are two steps in the computational procedure of the model. First, a conventional linear programming maximization problem was formulated and solved to determine the maximum return without risk constraint. This gave the highest point on the efficiency frontier. Second, the element of risk was formulated as a matrix of gross margin deviations from expected returns.

To analyse the expected returns, **Ayinde,** Omotesho and Adewumi (2004) maximized the expected income under risk. The model solved for the various expected returns along the efficiency frontier. The E-A efficient frontier was derived by parametrically varying the pre-specified level of the constant (α) to the maximum total absolute deviation of returns. In the study, risk was measured by the statistics of Mean Absolute Deviation (MAD), and Standard Deviation (SD). The MAD was then transformed into an estimate of standard deviation using the formula given in Equation 6. Standard deviation measured the dispersion or variability of expected income. The Target-MOTAD model minimised the mean absolute deviation for any given expected gross margins. Essentially, this minimised the standard deviation of returns to the farm measured by the estimator. To minimise risk while achieving optimal returns, the model selected enterprise combinations that were least risky (as measured by variance in annual returns). Therefore, an estimate of each activity's level of risk or risk associated with a particular farm plan (enterprise combination) was derived by calculating the standard deviation for that activity or farm plan.

$$\text{Standard Deviation} = D\left(\frac{\pi x S}{2(S-1\_}\right)^{1/2} \quad (6)$$

Where S is number of states of nature.

Furthermore, **Ayinde**, Omotesho and Ayinde (2005) determined the set and level of production activities that optimize household production under risk and found out that the Target-MOTAD programming plan guarantees returns large enough to cover the subsistence needs of the small-scale farmers (See Figures 3 and 4).

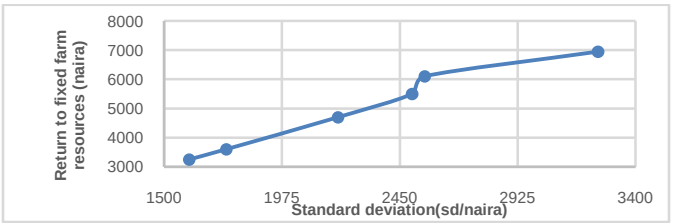


Figure 3: Trade-off between return and risk
Source: Ayinde, Omotesho and Ayinde (2005)

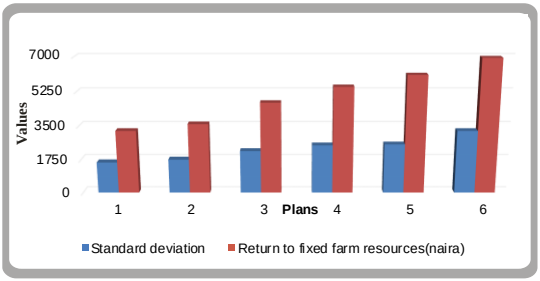


Figure 4: Comparison of trade-off between returns and risk
Source: Ayinde, Omotesho and Ayinde (2005)

Furthermore, **Ayinde** *et al.*, (2016e) built on this approach and conducted a sensitivity and uncertainty analysis on small-land scale farmers in Nigeria. The result revealed standard plans for Nigeria's small-scale agriculture system. The sensitivity analysis revealed that there is a positive relationship between capital and returns, and a negative relationship between risk level and returns in small-scale agriculture systems.

In a more recent study, Aina and **Ayinde** *et al.*, (2023) investigated the option of choosing Index-Based Livestock Insurance (IBLI) to mitigate the adverse effects associated with climate change in Nigeria by modeling a livestock farmer (an economic agent) who allocates her income w_{t+1} among consumption c_t and livestock-related investment I_t. It was assumed that this related investment provides additional income in accordance with a production function with declining marginal returns and unpredictable productivity shocks $\varepsilon_{i,t,}$ that capture weather variability, either in terms of rainfall or temperature change. Agents were assumed to be rational and maximise the expected discounted utility. We assumed a von Neumann–Morgenstern utility function that includes the risk attitudes and certainty equivalence of the representative livestock farmer. Therefore, the representative farmer maximises the expected present discounted utility of consumption denoted $E_t \sum_{j=0}^{\infty} \beta^j u(c_t+j)$, where utility is a function of consumption c and is given as $u(c_t) = \frac{c^{1-\Phi}}{1-\Phi}$. In

addition, we posited that agents have a constant relative risk aversion utility where Φ denotes the coefficient of relative risk aversion.

Consequently, the agent's optimisation baseline problem was expressed as follows:

$$V\left(W_t, \in_{i,t}\right) = max\ u\left(W_t - I_t\right) + \beta EV\left(W_{t+1}\right) \quad (7)$$

Subject to

$$c_t = W_t - I_t \quad (8)$$

$$W_{t+1} = Q_i \in_{i,t} I_t^{\alpha} a_i^{1-\alpha} \eta_{t+1} \quad (9)$$

The total weather shock that the livestock farmer cannot predict at the time investment decisions are made was represented by the weather variation η_{t+1}. Q_i is the individual-specific time-variant productivity coefficient, which represents the assets owned by the agent. However, it is important to note that the idiosyncratic terms Q_i and $\varepsilon_{i,t}$ are both log-normally distributed with mean and variance σ^2_Q and σ^2_ε, respectively. It was assumed that livestock farmers could not adjust the assets with which they were endowed. For instance, assets can be the amount of land detained. The first-order condition for the optimal capital level was calculated by matching the marginal utility of consumption on a particular day with the anticipated discounted marginal utility of consumption on the day after. The expression is given in Equation (10).

$$u^1\left(c_t\right) = \beta E_t\left[u^1\left(c_{t+1}\right)\alpha Q_i \in_{i,t} I_t^{\alpha} a_i^{1-\alpha} \eta_{t+1}\right] \quad (10)$$

To better understand the role of IBLI, the baseline framework was expanded, and it was assumed that livestock farmers can buy ι_{t+1} unit(s) of insurance to protect against weather variability, which affects livestock growth and security. Each unit of purchased insurance pays $(1 - \eta_{t+1})$ to offset any bad weather shocks. The optimisation problem thus becomes:

$$V\left(W_t, \in_{i,t}\right) = \max_{I_t, i_t \geq 0}\left[u\left(W_t - I_t\right) + \beta E_t V\left(W_{t+1}\right)\right] \quad (11)$$

Subject to

$$c_t = w_t - I_t \tag{12}$$

$$w_{t+1} = Q_i \in_{i,t} I_t^{\alpha} a_i^{1-\alpha} \eta_{t+1} + l_t\left(1 - \eta_{t+1}\right) - l_{t+1} P_t \in_{i,t} \tag{13}$$

where the term P_t is the actuarially fair price for one unit of weather insurance and was defined as: $P_t = \int_0^1 (1-\eta) f(\eta)\, d\eta$. P_t appears in the transition equation rather than in the budget constraint since it was assumed that agents have credit to pay for the insurance premium and that they can observe their productivity level before insurance purchasing.

Following the Bellman principle, the optimisation problem was rewritten under full insurance as follows:

$$V\left(w_t, \in_{i,t}\right) = \max_{I_t, i_t \geq 0} \left[u\left(w_t - I_t\right) + \beta E_t V\left(w_{t+1}\right) \right] \tag{14}$$

Subject to

$$c_t = w_t - I_t \tag{15}$$

$$w_{t+1} = Q_i \in_{i,t} I_t^{\alpha} a_i^{1-\alpha} \left(\eta_{t+1} + \underbrace{\left(1 - \eta_{t+1}\right) P_t \in_{i,t}}_{\text{weather insurance component}} \right) \tag{16}$$

3. Financial Risk Management

The availability of credit is expected to increase the purchasing power of the farmer to have in their possession items that would improve and enhance their productivity. **Ayinde**, Omotesho and Ayinde (2005) further showed that increased capital expands the efficiency of risk-return limitations confronting farmers. As a result, the scarcity of capital available to these farmers serves as a major bottleneck in their efforts to enhance productivity and resilience in the face of unpredictable market fluctuations and environmental variables. A substantial part of this limited access to financial resources can be attributed to the lack of agricultural credit opportunities and efficient insurance products for small-scale farmers. **Ayinde** (2008a)

reported that inadequate capital or poor access to capital is the riskiest variable affecting farm operations and this was reaffirmed by **Ayinde** and Obalola **(**2017). In addition, Obalola and **Ayinde (**2018) studied risk and its management strategies among smallholder onion farmers in Sokoto State, Nigeria and reported cash contribution as a management strategy that ranked third in managing risk in the study area.

Furthermore, given the lack of efficient and innovative insurance products for farmers in Nigeria; Aina and **Ayinde** *et al.,* (2023) investigated the choice of Index-Based Livestock Insurance (IBLI) as an innovative financial option to mitigate the deleterious effects associated with climate change risk in Nigeria. In the study, we provided the foundation for policymakers to design targeted strategies that could help pastoralists build resilience, decrease vulnerability, and increase income and livestock growth in Nigeria.

4. Diversification

Ayinde, Omotesho and Adewumi (2008) showed the importance of diversification (investment in more than one portfolio) as an important risk management strategy for agricultural enterprises. Obalola and **Ayinde** (2018) revealed that investing on off-farms is the most important strategy in managing risk among smallholder onion farmers in Sokoto State, Nigeria. **Ayinde** *et al.,* (2023) examined the gender-based analysis of risk management strategies and improved technology adoption among small-scale maize farmers in Kwara State, Nigeria. The study revealed that early planting practiced by 79.86% of men and 73.12% of women, was the most common risk management strategy among farmers followed by diversification, the use of improved varieties, and bush fallow. This implies that farmers are making conscious efforts to adapt to climate change. In the study, we recommended that policies towards empowering extension agents in sensitizing farmers to risk management strategies, especially the adoption of improved crop varieties and diversification into other agricultural-related activities, should be made to improve farmers' livelihoods.

5. Government Support and policies

Strong governance can help enhance an institutional resilience and ability to adapt to changing government (political shift in government). **Ayinde** *et al.,* (2019a) reported in their study that the situation of governance in Nigeria is poor since all the indicators examined are negative. Most of the indicators fluctuate except the government effectiveness which is a bit relatively stable but still negative. Indicators including the political stability, violence, terrorism and adherence to the rule of law in Nigeria are worse. The implication of this situation cannot be separated from the poor implementation of policy and economic programmes in Nigeria which invariably have negative impact on farmers output and rural income. Olaoye and **Ayinde** *et al.,* (2021) pointed out that the association between institutional risk and governance is intertwined. Effective governance practices can help mitigate risks and enhance an institutional overall resilience, while poor governance can increase vulnerability to various risks.

6. Innovation and Technology Adoption

Innovation is the cornerstone of agricultural progress. Thus, we must continually adapt to emerging technologies, sustainable farming methods, and improved access to information. Increasing agricultural productivity through innovation and improved technology is vital to the process of agricultural and structural transformation (Gollin *et al.,* 2021). Technology continues to have a huge potential for improving incomes in the poorest places on our planet (Gollin et al., 2021). **Ayinde** and Muchie (2011) concluded in a study that adapting to climate change risk is multi-dimensional and can be done through technological innovation by improving natural resources. We also recommended in another study (**Ayinde** *et al.,* 2012) that information and knowledge on new technology and innovation should be made available to the farmers. Furthermore, **Ayinde** *et. al.,* (2019b) in another study on analysis of innovation and decision making emphasised that innovation usage should be a priority in the agricultural innovation process especially in Nigeria and Africa as a whole.

Agricultural Innovation and Technology Adoption

Vice-Chancellor, sir, my research explored the transformative power of precision agriculture, genetic advancements, and efficient supply chain management. Despite these challenges, **Ayinde** and Muchie (2010) highlighted that there is a growing field of research on innovation systems and economic development, in general. I firmly believe that embracing innovation in agriculture is principal to unlocking its full potential in Nigeria. Thus, **Ayinde**, Muchie and Babalola (2015) studied the dynamics of the Innovation system and Agricultural productivity. We opined that innovation in the African agricultural sector has been dominated by the narrow approach of employing technology transfer and adoption theory. We, therefore, advocated for a multi-layered innovative behaviour and socioeconomic heterogeneity approach to encourage and boost African agricultural economy productivity. **Ayinde** *et al*., (2019b) also noted that transformation lies in using innovation to improve agricultural products and services delivered by actors in the production process.

1. Innovation in Oil Palm

Oil palm can produce more vegetable oil per unit of land than any other crop (Qaim *et al.*, 2020). Given its enormous yield per hectare and high productivity cycle, **Ayinde** *et al*., (2012) showed that oil palm is a stabilising crop for global food security, especially in developing countries. This study showed the coexistence of emerging and traditional technologies in oil palm production, with modern technology users achieving higher yields, while farmer age and education level were the primary determinants of innovation acceptance.

2. Innovation in Cassava

The success of any agricultural innovation depends on farmers' adoption. **Ayinde** *et al.,* (2017b) in their study of the system of innovation among Cassava farmers in Oyo State revealed that agricultural innovation has tremendous potential to improve the welfare of rural farmers. The study also indicated that access to media, contact with extension agents, and access to vitamin A bio-fortified cassava stem, amongst others, are the determinants of adoption of vitamin A bio-fortified cassava

variety. However, many new technologies that seem profitable in demonstration plots are yet to be widely adopted.

3. Innovation in Cowpea

Economically, cowpea serves as a vital cash crop, especially for smallholder farmers. In the face of climate change, Cowpea's adaptability and drought tolerance make it a dependable crop even in regions with erratic rainfall. Given that consumers are faced with many options as to which variety of cowpea to purchase because of the availability of a wide range of varieties from which to make a choice, **Ayinde** *et al.,* (2013) examined consumer preferences for cowpea, pattern of cowpea price over time, and the factors responsible for variation in the price of cowpea. The study revealed consumers' preference for medium size, reddish colour, very sweet taste, and a shelf life of not less than a month. It further showed that the most preferred cowpea variety by consumers is the variety (honey beans) due to its sweetness and that the price of both red and white varieties falls in October-November and rises around May-June.

4. Innovation in Maize Production

Maize can be bred to be more tolerant to abiotic stress. Genetically Modified (GM) technology has led to the discovery of certain genes that control certain operations in the plant, allowing it to perform even under drought or heat stress. Although maize constitutes an important source of calories and plays a crucial role in Nigerians' livelihoods, its productivity still remains below its potential, resulting in food insecurity and poverty within agricultural households. To address these challenges, the Drought Tolerant Maize for Africa (DTMA) and later Stress Tolerant Maize for Africa (STMA) projects funded by Melinda and Bill Gates and coordinated by scientists at Maize Improvement Programme of the International Institute of Tropical Agriculture (IITA), Ibadan in conjunction with International Maize and Wheat Improvement Center (CIMMYT), Mexico, has released over 160 improved maize varieties between 2007 and now. These varieties with the capacity to tolerate/resist stress factors militating against maize productivity (drought, striga, low-N) are presently being

cultivated by farmers in the savanna and rainforest ecologies of Nigeria. These projects have been replaced with, a new project "Accelerating Genetic Gains in Maize and Wheat for Improved Livelihoods" (AGG) Project since 2020. The aim is to explore strategies to enhance maize productivity in twelve Sub-Sahara African countries; Nigeria, Benin, Ghana, Ethiopia, Kenya, Malawi, Mali, Uganda, South Africa, Tanzania, Zambia, and Zimbabwe. These countries which constitute about 72% of the total maize area in sub-Saharan Africa cover more than 26 million households, or well over 176 million people whose livelihoods depend to a large extent on maize-based agricultural production (**Ayinde** *et al.*, 2019c).

Between 2008 and 2022, I have collaborated closely with scientists at both centers (IITA and CIMMYT) in promoting the adoption of innovative and improved maize technologies among resource-limited farmers. As the Economists on the Faculty Maize Team (formerly led by Prof. G. Olaoye, and now Dr. F. Bankole,) in the Faculty of Agriculture, University of Ilorin, my research activities have focused on formulating socio-economic policies that are compatible with the promotion and adoption of innovative maize varieties such as stress tolerant maize varieties. We were able to establish that the higher yield of agricultural produce is greatly linked to the adoption of improved agricultural innovations by farmers, and that the higher the relative advantage of technology, the faster the rate of its adoption by the farmers, especially if the result of such technology is visible to the farmers (**Ayinde** *et al.*, 2013; **Ayinde,** 2017**; Ayinde** *et al.*, 2017a; and **Ayinde** *et al.*, 2017b). Suffice to say that the maize team has won several awards on best Technology Promotion team (2007, 2008 and 2016) and the best Breeding Team (2008, 2009 and 2017). Apart from winning laurels, the team recently released and registered two Stress Tolerant Maize Varieties namely ILOMAZ 1 and 2 **(**Picture 1a &b). With the help of the USAID/Feed the Future Advancing Local Leadership, Innovation, and Networks (ALL-IN) grant received, I was instrumental to providing training and access to the stress-tolerant maize varieties for over 3,000 small and medium scale farmers (male and female) in three (3) agro-

ecological zones (namely Guinea Savanna, Derived Savanna and Rainforest zones) of Nigeria to facilitate the adoption of stress-tolerant maize varieties (Picture 2a-d).

Picture 1a: Ilomaz 1 **Picture 1b:** Ilomaz 2

Picture 2a: Training of farmers at Kwara State

Picture 2b: Training of farmers at Niger State

Picture 2c: Farmer's ST Maize Farm.

Picture 2d: Female farmers accessing STM seed.

Furthermore, **Ayinde** *et al.*, (2017a) carried out a study to understand the factors shaping the adoption of Quality Protein Maize (QPM) in Nigeria and observed that QPM adoption was significantly influenced by household age, years of schooling, household size, farmland, tenancy attribute, farm size, and quantity of QPM harvested in the previous agricultural season.

QPM varieties are specialised maize developed to address the nutritional deficiencies associated with traditional maize varieties. It was designed to enhance the nutritional value of maize-based diets, thereby combat malnutrition, and improve food security, particularly in areas where maize consumption is prevalent. The study therefore recommended further intensification of information dissemination regarding the adoption of QPM in the study area.

Innovation in Access to Credit

My work has also examined the constraints faced by farmers in securing credit for crop production. Credit is a vital factor in agricultural production and, in many cases, is a limiting factor in small-scale agriculture. Access to credit facilities is a direct solution for increasing investment in agriculture in the country. Adequate links between farmers and social groups play a pivotal role in the adoption of innovations and underscore the significance of addressing these social dynamics. **Ayinde** *et al.*, (2017c) revealed that Nigeria's lingering nutritional backwardness is not only due to low-income earning and population pressure but also to inadequate capital (information on loans) to keep their farming activities running smoothly. Initiatives that support credit access such as the Village Alive Development Initiative (VADI) could increase the productivity of participating farming households by 315.55 Kg/ha, hence such should be encouraged and sustained among farming households in Nigeria.

In a study by **Ayinde** *et al.*, (2018) which focused on examining social networks and innovation dissemination among farmers in Kwara State, Nigeria, through Social Network Analysis (SNA) and Quadratic Assignment Procedure (Qap) correlation, it was noted that the non-adoption of innovative technologies to mitigate agricultural risk is often attributed to the lack of effective social groups linking farmers to researchers. Furthermore, it was established that farmers who were members of social groups demonstrated a greater propensity to adopt innovations at an accelerated rate than non-members. The findings further showed the absence of a correlation between farmers' choice behaviour and their social network behaviour,

which suggests that farmers tend to exhibit different behaviours under varying conditions especially when it comes to the adoption of innovations. However, our results showed that when farmers became part of a social group, their decision-making processes and adoption behaviour diverged from their choices when they were not part of such groups. In other words, social networks increase the potential influence of farmers in shaping their decisions regarding innovation adoption. The study, therefore, recommended that farmers should be actively encouraged to join social groups as a proactive measure to enhance innovation adoption, improve their risk management, and promote inclusivity within the agricultural landscape.

In our study on Farmers' Willingness To Pay (WTP) for the Stress Tolerant Maize innovative seed, **Ayinde** *et al.,* (2019c) further reported that the adoption of improved maize varieties combined with better management techniques can minimise losses from maize yield by about 40%, and that it is also capable of contributing to increased maize production and productivity such that farmers can overcome the challenges of maize production and improve their livelihood. As revealed by the "contingent valuation method and Heckman's two-step model", farm income, years of experience in farming, membership of the social group, and price of other maize seeds were factors that influenced farmers' willingness to pay for the purchase of Stress Tolerant Maize (STM) varieties. The study further revealed that access to credit influences the payment level for farm farmers who are willing to pay for the STM innovative variety.

Gender and Inclusivity in Agricultural Risk Management

Mr. Vice-Chancellor, it is a known fact that there is gender difference in agricultural activities as well as the risk attitudes of men and women. Gender has been defined as "the arrangement of roles, responsibilities, and relations between men and women of different social groups, ages, and educational and marital status (Rao *et. al*., 2019 and Phiri *et. al.,* 2022). Both perceptions of risks and actual vulnerabilities are shaped by these roles, responsibilities, and relations, and hence may vary across place, time, and social position/location" (Rao *et al.,* 2019). In most countries, men are considered to have direct and clear roles in

agricultural operations. Compared to other parts of the world, the high rate of female participation in certain African countries (such as Nigeria) can be attributed to women's traditional involvement in subsistence agriculture and production (**Ayinde**, Aletan and Ajewole, 2017 and Asamu *et al.,* 2020). Although rural women are responsible for up to 60–80 percent of food production in developing countries, they are often underestimated and overlooked in terms of technological innovation, policies, and strategies (**Ayinde** *et al.,* 2023). They also contribute to household subsistence and well-being.

A key hindrance to agricultural advancement is the wide gender gap in agricultural productivity (Awotona *et al.,* 2022). Gender inequalities exist in accessing resources, such as land, credit, agricultural inputs, innovation and technology, education, and extension services. Men and women have unequal access to and control over key productive resources (Amare, Abebe, Mohamed, Latifou, Dioukou, **Ayinde**, Tsedeke and Abdoulaye, 2020). This inequitable access to productive resources partly stems from the general perception that women's contributions are negligible in mainstream agricultural policies and research agendas. The rationale behind considering gender as critical factor in agricultural research is related to agricultural productivity, food security, nutrition, poverty reduction, and empowerment. In all of these cases, women play a critical but often less recognised role and face greater constraints than men. Women are powerful agents of change and continue to make significant contributions to sustainable development despite existing structural and socio-cultural barriers (Markham, 2013). Gender-predefined roles in rural and urban areas, along with socio-cultural constraints, make children, women, and young people especially vulnerable to agricultural risks (**Ayinde** *et al.,* 2023). To respond effectively to the impacts of shocks in agriculture, there is a need to design interventions that address the needs of the respective gender groups. All these necessitate the inclusion of gender in agricultural research so that the system can identify ways to address the problems and contribute to productivity, by ensuring gender equity in the adoption of

technology and innovation for the improvement of the livelihood of the household.

Vice-Chancellor, sir, over the years, my research has been committed to unraveling the barriers that limit the participation of marginalized and vulnerable communities in the agricultural sector. I have worked extensively on initiatives that support policies and practices that empower women, smallholder farmers, and rural communities, fostering a more equitable agricultural landscape. Through a gender lens for innovation adoption, **Ayinde** *et al.,* (2013) revealed that varietal preferences of male and female farmers differed, with male farmers favoring large cobs, full grains, large seeds, and multiple cobs, whereas female farmers preferred yellow seeds, nutrient-fortified seeds (for example QPM varieties), and large cobs with full grains. It is important to engage both male and female farmers in the varietal selection process to improve the adoption of improved maize technologies, especially considering the food security concerns of female farmers who play a vital role in improving household food security.

Two separate studies that analysed the profitability of an on-farm trial of drought-tolerant (DT) Maize varieties in Kwara State, Nigeria using a gendered innovation approach, **Ayinde** *et al., (*2016d) and **Ayinde** *et al.,* (2018), found that female farmers ranked the DT maize varieties as the best at most locations. The profitability of the maize varieties also differed according to location, with DT maize varieties having the highest profit at all locations. The study recommended that female farmers should be encouraged through increased access to agricultural inputs and innovations. Furthermore, efforts should be made to involve female farmers in the varietal selection process to facilitate the adoption of improved maize varieties. This is expected to meet the needs of the female farmer, and their preferences are incorporated into the development of agricultural innovations

With the support of the West African Agricultural Productivity Project (WAAPP) won by our research team in 2013, old and young farmers in seven (7) “adopted villages” were empowered through the dissemination and use of improved technology and supportive engagement for purposes of creating

jobs and poverty alleviation. The seven adopted villages in Kwara State are Lajiki, Jimba-Oja, Ballah, Omupo, Arandun, Efue, and Amodu. To be inclusive of youth, poultry and fishery productions were established in adopted secondary schools in three communities - Omupo, Jimba-Oja, and Ballah (Picture 3) while the Agricultural Research Outreach Centre (AROC), fully equipped with viewing equipment and relevant books, was established in secondary schools at Omupo and Ballah.

Picture 3: Pictures from an adopted secondary school at Omupo, Kwara State.

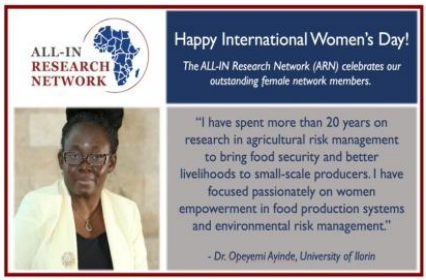
The importance of rice in food security and enhancement of the Nigerian economy cannot be overemphasized. Although rice is produced in Nigeria, its production at a sustainable level has been a challenge due to many factors such as land size, seed quantity, agrochemicals, labor, gender, extension access, and off-farm income. The actors involved in the production process include women who face formidable obstacles. Ajewole and **Ayinde** *et al.,* (2015) analysed agricultural innovation and constraints faced by male and female rice farming households in Nigeria. The study recommended the use of innovation tools, availability of subsidies, and gender considerations in the decision-making process. Similarly, **Ayinde** *et al.,* (2018) recommended that programmes and policies that encourage female farmers' involvement in the development and testing of agricultural innovations should be implemented across the country to ensure food security and enhance agricultural productivity.

Amare, Abebe, Mohamed, Latifou, Dioukou, **Ayinde**, Tsedeke and Abdoulaye (2020) examined the sex-disaggregated data recorded in multi-year participatory on-farm trials of maize in three selected West African countries (Benin, Nigeria, and Mali). The study employed farmers' responses to varietal and trait or other characteristic preference selections and used the

results of the analyses to identify specific gender-preferred characteristics with implications for future breeding of maize varieties appropriate for both male and female farmers. Our results indicated that progress has been made by the maize breeding project in considering the range of traits valued by both men and women farmers and further identified those that should be considered for gender-focused product pipeline development in the future. We concluded the study by empasising the need for adjustment in breeding to be gender sensitive.

Mr. Vice-Chancellor, an aspect of my research has focused on promoting the use of new technologies among poor rural women involved in food production systems. The most obvious and immediate significance of this has been the deployment of innovative seeds of climate-smart maize varieties that are resistant to climate risk (Drought, low-N, *striga*, etc.) to stabilise the incomes of smallholder farmers. This is evident in my several publications cited by many Agricultural Economists, at home and abroad. Of relevance are my recently published papers in journals and presentations in conferences where I contributed to the innovative maize seed variety to combat climate risk. These include and not limited to "Economic Analysis of On-farm Trial of Drought Tolerant Maize in Kwara State Nigeria: A Gender Approach" (2016), "Estimating Farmers' Willingness to Pay for Stress Tolerant Maize (STMA) in Nigeria: A Heckman Model Approach"(2019), "Addressing Gendered Varietal and Trait Preferences in West African Maize" (2020), "Adoption of Stress Tolerant Maize Varieties in Nigeria: Does Gender Matter?"(2021) and "Gender-based Analysis of Risk Management and Improved Technology Adoption among Small-scale Maize Farmers in Kwara State"(2023).

Moreover, over one thousand women farmers have been trained in the adoption of "Stress-Tolerant Maize Varieties Technology" with many provided with access to credit. Consequently, in recognition of my efforts at promoting the cause of women farmers, I was celebrated as one of the outstanding female network members on 2022 International Women's Day by the ALL-IN Research Network based at the University of California, Davies, United States of America (Picture 4).



Picture 4: Celebrating Prof. Opeyemi E. Ayinde on 2022 International Women's Day

My Contribution to the Academic Communities

Vice-Chancellor, sir, in addition to my contributions in research, I have also served this University in various capacities. These are: Level Adviser (2008 -2010), Head of Department (2017–2018), Member, of Convocation and Ceremonials Committee (2015–2018), Faculty Representative on Committee for Scholarships, Prizes and Award (2016–2019), Member, Evaluation Committee on Research Exhibition (2015–2019),Faculty Representative on Centre for International Study (CIE) 2014–2019), Managing Editor, International Journal of Moringa Nutraceutical Research (2014–2019), Managing Editor, Agrosearch Journal (2013–2019), Departmental Postgraduate Coordinator (2013–2019), Faculty Representative to Committee on Secretary to Farm Development and Implementation Committee (2014–2019), Member, University of Ilorin Admission Screening Committee, (2014), Departmental Representative, Anthropology and Cultural Studies Programme Committee (2013), Member, University of Ilorin Multidisciplinary Research Team (2013), Secretary, Faculty of Agriculture Ethical Review Committee (2013), Departmental Representative on the Development of Courseware for Blended Learning Training (2013), Faculty of Agriculture Representative on Timetable and Room Usages Committee (2008–2012), Departmental Examination Officer (2008–2012) and Departmental Farm Practical Training Coordinator (2004 – 2008).

I have taught undergraduate and postgraduate courses and successfully supervised 10 Ph.D. theses, 32 M.Sc.

dissertations, and numerous undergraduate final-year projects. Many of my postgraduate students' dissertations were with the grants from International Institute for Tropical Agriculture (IITA), Africa Rice, Arise Fellowship (through the Intra-Africa academic mobility scheme of the European Union), the Robert Bosch Stiftung Lindau Meeting on Economic Science Support. And have also won various travel grants and visiting fellowships within and outside Nigeria.

I have served as an External Examiner to various higher institutions in the field of agriculture and innovation studies in Nigeria, Rwanda, the Republic of Benin, and South Africa. I have also served as an External Assessor for the promotion of colleagues to the professorial cadre in universities in Nigeria. I have not only contributed to men and women small-scale farmers but I have also mentored young generation of researchers in Nigeria, South Africa, Kenya, Rwanda, United States of America through mentorship programmes organised by the Applied and Agricultural Economists Association, United States of America, International Association of Agricultural Economists, Africa Association of Agricultural Economist, Africa Network for Economics of Learning, Innovation and Competence systems (AFRICALICS) and Global Network for Economics of Learning, Innovation and Competence systems (GLOBELICS)

I am privileged to be the current Vice-President of the African Agricultural Economists Association and served as the first female West African Representative to the Board of AFRICALICS. Furthermore, I am the General Secretary of the Nigeria Network for Economics of Learning, Innovation and Competence Systems (NIGERIALICS). I initiated and conceptualised the network and the University of Ilorin served as the secretariat office of the network. I led the network to organise the first African Ph.D. academy at the University of Lagos sponsored by AFRICALICS. I am a Fellow of the African Science Leadership Program (ASLP) and Nigeria Young Academy (NYA).

I have also had the privilege to be engaged as a consultant to some of the World Bank Supervision Mission to Nigeria, the

Africa Rice Programme, the United Nations Development Programme (UNDP) on Rice Supply Chain Development in Nigeria, and the International Institute for Tropical Agriculture.

Mr. Vice-Chancellor, out of a passion for the protection of nature to mitigate risk and for grassroots empowerment, male and female inclusion, and young, and old inclusion, Save Sahara Network (SSN), a non-profit organisation, was born on 5th May, 2017, by Prof. F. D. Babalola, myself and three other professionals. The organisation carries out capacity-building training and creates forums for scientific interactions and discussions on current environmental issues for empowerment and sustainable development. The organisation has planted about 2,000 trees in the Compound of more than twenty (20) schools. More than 1,000 tree seedlings were freely distributed to teachers and students and new wells dug for eight schools. Furthermore, the organisation introduces efficient cook stoves to rural communities to reduce indoor air pollution, reduce causes of sickness and death especially among women and children, and ultimately mitigate the risk of climate change.

Finally, I have won several research grants and awards namely the Uma Lele Mentorship Grant, USA, Joint Award from West Africa Agricultural Productivity Programme, Institution Based Research Fund (IBRF) Tetfund Grant, West Africa Agricultural Productivity Programme (WAAPP-Nigeria), USAID/Feed the Future Advancing Local Leadership, Innovation and Networks (ALL-IN). I am the principal investigator of the U.S. Agency for International Development project titled ”Building Resilience among West African Women Smallholders by Promoting Greater Access to Insurance, Financing, and Advanced Agricultural Technologies”(2021-2024) https://basis.ucdavis.edu/project/linking-financial-and-agricultural-innovations-women-farmers-resilience-nigeria. I am also co-principal investigator, with Prof B. A. Raji as the Principal Investigator, of the National Research Fund (NRF)/Tetfund project titled “Development of Soil Health Dataset for Upscaling Specialty Fertilizer/Soil Management in Kwara and Niger States for Enhanced Staple Crops Production” (2023- 2025).

Conclusions

Vice-Chancellor, sir, permit me to conclude the story I started with the great man; S. D. Moriyonu, who managed the risk of having all his female children well. He does not only have great rewards and investment accomplished by presently having male and female as children and grandchildren, but also have innovativeness and gender inclusiveness with long life being experienced by him and his wife. You cannot take my mother from my father for whatever reason. I recalled telling my mother to visit the USA and she said she could not leave her husband.

Through my years of research, I have established that agricultural risks and shocks affect men and women differently, primarily because of gender-differentiated roles and responsibilities. Women are more vulnerable to shocks owing to disparities in economic opportunities and access to productive resources because they are typically less educated, poorer, and excluded from household, community, and political decision-making processes that directly affect lives. This has made most of the female farmers risk-averse and unwilling to make informed decisions that can help build their resilience against shocks and promote economic growth. My research will continue to promote the positive disposition of females, especially small-scale farmers to risk management strategies.

Mr. Vice-Chancellor and all the people present, physically and virtually here today, risk is everywhere. Life is full of risk and is of much concern to all fields. Hence, **the risk of not taking risk** is such a great penalty that can lead to missed opportunities, unproductivity, and lack of growth. While it is important to be cautious and considerate when taking risks, avoiding them entirely can hinder progress, innovation adoption, growth, and fulfillment. I encourage the idea of calculated risk-taking to achieve a balance between security and reward through risk management. Eventually, the reward of effective risk management can result in innovation, increased productivity, increased income, resilience, and gender inclusivity.

Recommendations

Mr. Vice-Chancellor, to improve agricultural risk management, foster the dissemination and adoption of innovation, and drive substantial growth in Nigeria's agricultural sector while empowering its farmers, it is imperative to consider the following strategic recommendations:

1. **Promotion of Financial Innovation and Access to Credit for Small-scale Farmers:** The first key recommendation is to promote financial innovation and enhance access to agricultural credit for small-scale farmers. This includes creating financial products tailored towards the specific needs of farmers, particularly those who rely on personal savings. By increasing access to credit and introducing innovative financial solutions, such as index-based insurance, farmers can better manage financial risks and invest in their operations, which can ultimately lead to increased agricultural productivity and resilience to market fluctuations.
2. **Provision of Information and Training:** To mitigate risks effectively, it is essential to enhance farmers' access to information and provide training and education programmes. This recommendation emphasises the importance of awareness and understanding of various risks in agriculture. By equipping farmers with knowledge and information, they can make more informed decisions and implement strategies to manage risks. Training programmes can empower farmers to adopt best practices and innovative technologies, ultimately enhancing their risk management capabilities.
3. **Diversification of Income Sources**: Diversification of income sources and crops is another crucial risk

management strategy. Encouraging farmers to diversify their agricultural and non-agricultural investments can reduce the impact of individual risk factors.

4. **Strengthening of Social Networks:** it is important to recognize the importance of social networks and groups in facilitating the adoption of agricultural innovations. Efforts should be made to establish and support social groups that connect farmers with researchers, as this can enhance the dissemination of crucial information and accelerate innovation adoption.
5. **Gender-Inclusive Agricultural Research:** Promoting gender-inclusive agricultural research to ensure equitable access to resources and technology is imperative. Recognising the distinct roles and preferences of male and female farmers and involving both genders in the selection and development of agricultural innovations is crucial to attaining the goals of self-sufficiency in crop production. Efforts should be made to empower women in agriculture, improve their access to resources, and engage them in decision-making processes.
6. **Enhancing Risk Awareness**: There is a need to promote awareness among farmers about the risks associated with climate change, especially the effects of climatic parameters like rainfall and temperature on agricultural productivity.
7. **Encouraging Adoption of Climate-resilient Crop Varieties:** Encouraging the adoption of climate-resilient crop varieties, such as stress (drought, striga, low-N, etc.) tolerant varieties, to stabilise farmers' incomes, especially in regions prone to climate-related risks is a necessity which can significantly contribute to food security and poverty reduction.

8. **Promotion of Environmentally-friendly Technologies:** Mitigating the impacts of climate fluctuations requires encouraging the adoption of environmentally and agriculturally sensitive technologies and innovations. This will help maintain a steady supply of agricultural produce and contribute to increased and sustained agricultural productivity.
9. **Inflation Mitigation through Agricultural Surplus Management:** To maintain low inflation rates and stabilise the country's economy, it is crucial to implement a comprehensive policy that addresses agricultural surplus management. The government, private institutions, and farmers' associations should collaborate to encourage farmers during times of surplus to absorb excess agricultural output and ensure its distribution to the appropriate sectors, thereby curbing inflation.
10. **Effective Governance:** Effective governance and government support play a vital role in risk management. Government policies should focus on creating a conducive environment for risk awareness and management, which includes governance systems that promote transparency, accountability, and resilience within the agricultural sector.

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Cece Winnanas (Goodness of God)
I love you, Lord
For your mercy never fails me
All my days
I've been held in your hands
From the moment I wake up
Until I lay my hands
Oh, I will sing of the goodness of God

'Cause all my life
You have been faithful
And all my life
You been so, so good
With every breath I am able
Oh, I will sing of the
goodness of God.

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References

Adewumi, M.O., **Ayinde**, O.E., Olatunji, G.B., & Ajayi, F.F. (2012). Effect of poverty on risk attitude of rural women investors in Osun State, Nigeria. *Journal of Agriculture and Social Research* 12(1), 19-25. http://www.ajol.info /index.php/jasr/article/view/81677

Aina I.V., **Ayinde**, O. E., Thiam D.R.,& Miranda, M. (2023). Risk adaptation through livestock insurance in West Africa: evidence from a pilot program in Nigeria. Forthcoming in *Climate and Development.*

Ajewole, O. O., **Ayinde, O. E.,** Ojehomon, V. E. T., Agboh-Noameshie, R., & Diagne, A. (2015). Gender analysis of agricultural innovation and decision making among rice farming house hold in Nigeria. *Journal of Agricultural Informatics* 6(2), 72-82. https://sites.google.com /a/ubt.edu.al/rssb/ajas_2013_file/13092ope.xml?attredirects=0

Ajibade, T. B., **Ayinde**, O.E., Abdoulaye, T., & Ayinde, K. (2018). Modelling the price of maize and its determinants in Nigeria: error correction model approach, *Albanian Journal of Agricultural Science*. 17(4), 235-242. https://www.researchgate.net/publication/330938378_ Modelling_the_price_of_Maize_and_its_Determinants_in _ Nigeria_Error_Correction_Model_Approach.

Ajibade T. B., **Ayinde O. E.,** & Abdoulaye T. (2019): Discovery of Maize Price and Food Crop Market Dynamics in Nigeria. *Review of Agricultural and Applied Economics (RAAE)*, 22 (1): 51-64 http://dx.doi.org/10.22004/ag.econ. 285930

Amare T., Abebe M., Mohamed N. B., Latifou I., Dioukou S., **Ayinde O. E.**, Abate T., & Abdoulaye T. (2020). Addressing gendered varietal and trait preferences in West African maize. *World Development Perspectives* 20:100268. https://doi.org/10.1016/j.wdp.2020.100268.

Asamu, F. F., Odagwe, M. C., Rasak, B., Arisukwu, O., Igbolekwu, C., & Oyeyipo, E. (2020). Gender issues and women's participation in agricultural production in Warri South Local Government area of Delta State, Nigeria. IOP

Conference Series: *Earth and Environmental Science*, 445 012049.

Awotona, T. O., Oladimeji, Y. U., & Damisa, M. A. (2022). Analysis of gender dynamic in cassava production for resources empowerment among farmers in Oyo State, Nigeria. *Agrosearch* 21 (1&2), 32 – 45.

Ayinde, O. E. (2008a). Analysis of Risk Management Behaviours of Small-Scale Crop Producers in Kwara State, Nigeria (Unpublished doctoral dissertation). University of Ilorin, Ilorin, Nigeria.

Ayinde, O. E. (2008b). Empirical analysis of agricultural growth and unemployment in Nigeria. *African Journal of Agricultural Research* 3(7), 20-25.https://doi.org/10.5897/AJAR.9000282.

Ayinde, O.E. (2008c). Effect of socio-economic factors on risk behaviour of farming households: an empirical evidence of small-scale crop producers in Kwara State, Nigeria. *Agricultural Journal* 2(4),447-453. https://ascidatabase.com/ascidetail.php?doi=aj.2008.447.453&kw=households

Ayinde, O. E. (2011). Effect of climate variability on agricultural production in guinea savannah region of Nigeria. *Ela Journal of African Studies* 29, 15-27.

Ayinde, O. E.; Muchie, M., & Olatunji, G. B. (2011) "Effect of Climate Change on Agricultural Productivity in Nigeria: A Co-integration Model Approach" *Journal of Human Ecology* 189-194 https://doi.org/10.1080/09709274.2011.11906406

Ayinde, O. E. (2017).Risk analysis in innovation system: A case study of production of Vitamin A cassava variety among farmers in Oyo State, Nigeria. *Journal of Agricultural Faculty of Gaziosmanpasa University (JAFAG)* 34(3), 263-270. https://api.semanticscholar.org/CorpusID:33646446

Ayinde, **O. E.**, Abdoulaye, T., Ambali, O. Y., & Akinsola, G. O. (2017a). Determinants of the adoption of quality protein

maize among farming households in Niger State, Nigeria. *Annals of Science and Technology* 2(1), 8-12.https://doi.org/10.2478/ast-2018-0002

Ayinde, **O. E.,** Abdoulaye, T., Olaoye, G., & Oloyede, O. A. (2018). Evaluation of women's on-farm trial of drought tolerant maize in southern guinea savannah of agro-ecological zone of Nigeria. Shimeles, A., Verdier Chouchane, A., Boly, A. (eds) Building a Resilient and Sustainable Agriculture in Sub-Saharan Africa, 81–95. Palgrave Macmillan, Cham.

Ayinde, **O. E.**, Abdoulaye, T., Muchie, M., & Ajewole, O. O. (2019b). Analysis of agricultural innovation and decision making among maize farming household in Nigeria: A gender approach in innovation. Oloruntoba, S., Muchie, M. (eds) Innovation, Regional Integration, and Development in Africa. Advances in African Economic, Social and Political Development, 267–281. Springer, Cham.https://econpapers.repec.org/RePEc:spr:aaechp:978-3-319-92180-8_18

Ayinde, **O. E.**, Abdoulaye, T., Takim F. O., Oloyede, A. O., & Bankole F. A. (2016d). Economic analysis of on-farm trial of drought tolerant maize in Kwara State Nigeria: A gender approach. *Trakia Journal of Sciences* 14(3) 287-293.Published by Trakia University, Bulgaria. Available online athttps://www.researchgate.net/publication/309213902_Economic_analy sis_of_on farm_trial_of_drought_tolerant_maize_in_Kwara_State_Nigeria_A_gender_approach

Ayinde, **O. E.**, Adenuga, A. H., Omotesho, K. F., & Babatunde, A. (2013). Consumer preference for cowpea in Kwara State, Nigeria: Global approaches to extension practices. *Journal of Agriculture Extension* 8(1), 1-9.

Ayinde, **O. E.**, Adewumi, M. O., Ajewole, O. O., & Ologunde, O. O. (2017b). Determinants of Adoption of Vitamin a Bio-fortified Cassava Variety among Farmers in Nigeria. *Croatian Journal of Food Science and Technology* 9(1),

74-49.http://www.ptfos.unios.hr/novicjfst/wp-content/uploads/2017/06/10-rad-Ayinde.pdf

Ayinde, O. E., Adejumo, A. O., Oloyede, A. O., Ibrahim, H. K., & Ayinde, A. F. O. (2017c). Impact of village alive development initiative on farming households productivity in Kwara State: A comparative analysis. *Nigerian Journal of Agricultural Economics* 7(1), 33-44.http://dx.doi.org/10.22004/ag.econ.268443

Ayinde, O. E., Adewumi, M. O., Nmadu, J. N., Olatunji, G. B., & Egbugo, K. (2014). Review of marketing board policy: Comparative analysis cocoa of pricing eras in Nigeria. *Nigeria Journal of Agricultural Economics* 4(1), 80-92.

Ayinde, O. E., Aina I. V. & Ayinde, K. (2019). Analysis of determinants of maize price variations in Nigeria (1978 - 2014). *Croatian Journal of Food Science and Technology* 11(2), 237-244.

Ayinde, O. E., Aina, I. V., Ayinde, K., & Lukman A. F. (2016c). Drivers of rice price variation in Nigeria (1970-2011). A two-stage iterative ridge regression approach. *Journal of Agricultural Sciences* 61(1), 79-92.http://joas.agrif.bg.ac.rs/sites/joas.agrif.bg.ac.rs/files/article/pdf/440-8._761._ayinde_et_al._final.pdf

Ayinde, O. E., Aina, I. V., Ayinde, K., & Lukman A. F. (2016c). Drivers of rice price variation in Nigeria (1970-2011). A two-stage iterative ridge regression approach. *Journal of Agricultural Sciences* 61(1), 79-92. http://joas.agrif.bg.ac.rs/sites/joas.agrif.bg.ac.rs/files/article/pdf/440-8._761._ayinde_et_al._final.pdf

Ayinde, O. E., Aina, I. V., & Babarinde S. O. (2017). Effect of agricultural growth on unemployment and poverty in Nigeria (1980 -2012): A co-integration approach. *Tropical Agriculture* (Trinidad) 94, 4. https://journals.sta.uwi.edu/ta/index.asp?action=viewPastAbstract&articleId=6540&issueId=724

Ayinde O. E., Aina I. V., Omotesho, K. F., & Jesudun O. M. (2016a). Social network and innovation dissemination

among farmers in Kwara State, Nigeria. *Journal of Agricultural Research and Development*15(2), 20-30. http://dx.doi.org/10.4314/jard.v15i2.3

Ayinde, O. E., Bello, K. A., & Ajewole, O. O. (2016b). Evaluation of risk attitude of rice farmers in Kwara State, Nigeria. *Al-Hikmah Journal of Pure & Applied Sciences* 3, 1-5.

Ayinde, O. E., Ajewole, O. O., Adeyemi, U. O., & Salami, M. F. (2018). Vulnerability analysis of maize farmers to climate risk in Kwara State, Nigeria. *Agrosearch* 18(1), 25-39. https://www.ajol.info/index.php/agrosh/article/view/176100

Ayinde, O. E., Ajewole, O. O., Ogunlade, I., & Adewumi, M.O. (2010). Empirical analysis of agricultural production and climate change: A case study of Nigeria. *Journal of Sustainable Development in Africa* 12(6), 275 - 283.

Ayinde, O. E., Ajibade, T., Ojo, V., Ajibade, E. T., & Oyeniyi M. V. (2015). Determinants of quail eggs consumption in Kwara State Nigeria. *International Journal of Agricultural Economics, Management and Development* 5, 1-22.

Ayinde, O. E., Aletan, O. J., & Ajewole, O. O. (2017). Gender analysis of resources use and efficiency in rice production in Kogi State, Nigeria. Annual NAAE Conference, October 16 -19, Abeokuta, Nigeria. Nigerian Association of Agricultural Economists.

Ayinde, **O. E.,** Ayinde, K., Omotesho, O. A., & Muhammad-Lawal, A. (2016e). Sensitivity and uncertainty analysis: applications to small-land scale agriculture systems in Kwara State, Nigeria. *Journal of Science, Technology, and Mathematics Education* 12(1), 87-98. https://docplayer.net/140713461-Sensitivity-and-uncertainty-analysis-applications-to-small-land-scale-agriculture-systems-in-nigeria.html

Ayinde, **O. E.**, Ayinde, K., Ilori, T. E.,& Babatunde, R. O. (2016f). Impact of government agricultural policies on the major staple food prices in Nigeria (1966-2011). *Sarhad*

Journal of Agriculture 31(3), 191-198. http://dx.doi.org /10. 17582/ journal.sja/2015/31.3.191.198

Ayinde, **O. E.,** Bessler, D. A., & Oni, F. E. (2017). Analysis of supply response and price risk on rice production in Nigeria. *Journal of Agribusiness and Rural Development*, 43(1), 17–24. dx.doi.org/10.17306/J.JARD.2017.00279.

Ayinde, O.E., Daramola, O.C., Adenuga, A.H.,& Abdoulaye, T. (2019). Estimating Farmers' Willingness to Pay for Stress Tolerant Maize (STM) in Nigeria: A Heck-man Model Approach. *Pertanika Journal of Social Sciences and Humanities*, 27(2): 1159-1174. http://www.pertanika.upm.edu.my/pjssh/browse/regular-issue?article=JSSH-2541-2017

Ayinde, **O. E.**, & Muchie, M. (2010). Book Review - Handbook on innovation system and developing countries: Building domestics capabilities in a global setting. *Africa Journal of Science, Technology Innovation and Development* 2(3), 248-252.

Ayinde, O. E., & Muchie, M. (2011): Book Review. *Africa Journal of Science, Technology Innovation and Development.* 4 (3); 248-252

Ayinde, **O. E.,** Muchie, M., Adenuga, A.H., Jesudun, M.O., Olagunju, F.I. & Adewumi, M.O. (2012). Food security and emerging innovations in oil palm production in Osun State, Nigeria. *Pakistan Journal of Nutrition* 11, 1009-1013. https://scialert.net/abstract/?doi=pjn.2012.1009.1013

Ayinde, O.E., Muchie, M., Adewumi, M. O., & Abaniyan, E.O. (2012): Risk analysis of gender in innovation system: A case study of production of downy mildew maize resistant variety in Kwara State, Nigeria. *Obeche Journal* 30(1), 459-465. http://www.ungs.edu.ar/globelics/wp-content/uploads/2011/12/ID-211-Ayinde-Muchie-Abaniyan-Innovation-economic-development-and-inequality-from-a-systemic-a.pdf

Ayinde, O. E., Muchie M. & Babalola, F. D. (2015). Systems of innovation and agricultural productivity in african economies. *Journal of Agricultural Research and Development*14(2), 1-10. http://dx.doi.org/10.4314/jard.v14i2.1 https://www.ajol.info/index.php/jard/article/view/140729

Ayinde, O. E. & Obalola T. O. (2017). Effect of socioeconomics characteristics and income status on onion farmers risk attitude in Sokoto state, Nigeria. *Agriculture Tropical et Sub-tropical* 50(3), 141-146. https://doi.org/10.1515/ats-2017-0015

Ayinde, O. E., Olaoye, I. J., Bolaji, M., & Oloyede, A. O. (2019a). Politics in fertilizer subsidy implementation and governance structure towards agricultural and economic development in Nigeria: a review. Invited paper presented at the 6th African Conference of Agricultural Economists, September 23-26, 2019, Abuja, Nigeria. https://EconPapers.repec.org/RePEc:ags:aaae19:295946

Ayinde, O. E., Olaoye, I. J., Mammo M.,& Oloyede, A. O. (2020). Agricultural and economic development in Nigeria: Politics of fertilizer subsidy implementation and governance structure. *Innovation for Sustainable Integrated Development in Africa* 14, 299-319.

Ayinde, O. E., Olarewaju, A. O., Chimeze V., Omotesho, K. F., Ogunlade I., & Olaoye G. (2023). Gender-Based Analysis of Risk Management and Improved Technology Adoption among Small-Scale Maize Farmers in Kwara State. *Agrosearch* 22 (1), 70-84. https://www.ajol.info/index.php/agrosh/article/view/256189

Ayinde, O.E., Omotesho, O. A., & Adewumi, M.O. (2004). Trade-off between Expected Returns and Risk among Farming Household in Kwara State. *AMSE Journal* 25(4), 31-42.

Ayinde, O. E., Omotesho, A.O.,& Adewunmi, M.O. (2008). Risk attitudes and management strategies of small-scale crop producers in Kwara State, Nigeria: A ranking approach.

African Journal of Business Management (2)12, 217-221. https://api.semanticscholar.org/CorpusID: 154607367

Ayinde, **O.E**., Omotesho, O.A.,& Adewumi, M.O. (2010). Analysis of risk behaviour of small-scale farming households in Kwara State, Nigeria. *International Journal of Agricultural and Rural Development* 1(4), 142-150.

Ayinde, O. E., Omotesho, O. A., & Ayinde, K. (2005). Farm planning under risk and uncertainty. *Center Point* (13)1, 10-22.

Belay, F., & Jimma, A. O. (2016). Gender role in agricultural activities in Ethiopia: country review. *Journal of Culture, Society and Development* 22, 1–7.

Doss, C. R. (2018). Women and agricultural productivity: Reframing the Issues. *Development Policy Review* 36(1), 35-50.

Drollette, S.A. (2009). Understanding agricultural risk. Department of Applied Economics, Utah State University.

Falaki, A. A., Akangbe, J. A., & **Ayinde, O. E.** (2013). Analysis of climate change and rural farmers' perception in North Central Nigeria. *Journal of Human Ecology* 43(2), 133-140. https://doi.org/10.1080/09709274.2013.11906619

Girdzuite, L. (2012). Risks in agriculture and opportunities of their integrated evaluation. *Procedia, Social and Behavioural Sciences* 62, 783 – 790.

Gollin, D., Hansen, C. W., & Wingender, A. (2021). Two blades of grass: The impact of the green revolution. *Journal of Political Economy* 129(8), 2344–84.

Habtezion, S. (2016). Overview of linkages between gender and climate Change. Training module. United Nations Development Programme. New York, NY: UNDP. https://www.undp.org/content/dam/undp/library/gender/Gender%20and%20Environment/UNDP%20Linkages%20Gender%20and%20CC%20Policy%20Brief%201-WEB.pdf

Halter A. N., & Dean G. W. (1971). Decisions under uncertainty with research applications (1st ed.). South-Western Press.

Hardaker, J. B., Huirne, R. B. M., Anderson, J. R., & Lien, G. (2004). Coping with risk in agriculture. CABI.

Hardaker, J. B., Lien, G., Anderson, J. R., & Huirne, R. (2015). Coping with risk in agriculture: Applied decision analysis (3rd ed.). CABI.

Kahan, D. (2015). Managing risk in farming. Food and Agriculture Organization of the United Nations.

Ladanyi, M. (2003). Risk methods and their applications in agriculture. *Applied Ecology and Environmental Research* 6(1), 147-164.

Lusk, J. L., & Coble, K. H. (2005). Risk perceptions, risk preference, and acceptance of risky food. *American Journal of Agricultural Economics*, 87(2), 393-405.

Markham, S. (2013). Women as agents of change: Having voice in society and influencing policy. Women's Voice, Agency and Participation Research Series 2013, 5. World Bank.

Mendola, M. (2007). Agricultural technology adoption and poverty reduction: A propensity-score matching analysis for rural Bangladesh. *Food Policy* 32(3), 372-393.

Nwaobiala, C. U., Alozie, E. N. & Anusiem, C. N. (2019). Gender differentials in farmers' involvement of cassava production activities in Abia State, Nigeria. *Agrosearch*, 19(1), 72-86.

Obalola, T. O. & **Ayinde, O. E.** (2018). Risk and risk management strategies of small-holder onion farmers in Sokoto State Nigeria. *Acta Agriculturae Slovenica* 111(3), 559-566.

Olaoye I. J., **Ayinde O. E**., Adewumi M. O., Alani E. A., & Babatunde R. O. (2020). Fertilizer policy, governance, and agricultural transformation in Nigeria: A review of political economy from historical perspectives. In the Palgrave Handbook of African Political Economy, Palgrave Handbooks, S. O. Oloruntoba, T. Falola (eds.). Springer.

Olaoye, I. J., **Ayinde, O. E.**, Ajewole, O. O., & Adebisi, L. O. (2021). The role of research and development (R&D)

expenditure and governance on economic growth in selected African countries. *African Journal of Science, Technology, Innovation and Development*, 13(6) 663-670.

Olatunji, G.B., Omotesho, O.A., **Ayinde**, **O. E.**, & Adewumi, M.O. (2012). Empirical Analysis of Agricultural Production and Inflation Rate in Nigeria (1970-2006). *Agrosearch* 12(1), 21-30. https://www.ajol.info/index.php/agrosh/article/view/79914

Olatunji, G. B., Omotesho, O. A. **Ayinde, O. E., &** Ayinde, K. (2010). Determinants of inflation in Nigeria: A co-integration approach, 2010 AAAE Third Conference/AEASA 48th Conference, September 19-23, 2010, Cape Town, South Africa 96162, African Association of Agricultural Economists (AAAE).

Phiri, A. T., Toure, H. M. A. C., Kipkogei, O., Traore, R., Afokpe P. M. K., & Lamore, A. A. (2022). A review of gender inclusivity in agriculture and natural resources management under the changing climate in sub-Saharan Africa. *Cogent Social Sciences* 8, 1.

Polycarp, I. M., & Jirgi, A. J. (2018). Dealing with risks and uncertainties in agriculture: Implication for Central Bank of Nigeria interventions. *CBN Bullion* 42(3), 49-68.

Qaim, M. Sibhatu, K. T. Siregar, H., & Ingo Grass (2020). Environmental, economic, and social consequences of the oil palm boom. *Annual Review of Resource Economics* 12(1), 321-344

Rao, N., Lawson, E. T., Raditloaneng, W. N., Solomon, D., & Angula, M. N. (2019). Gendered vulnerabilities to climate change: Insights from the semi-arid regions of Africa and Asia. *Climate and Development* 11(1), 14–26. https://doi.org/10.1080/17565529.2017.1372266