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Understanding gender risk behaviour: panacea to adoption of innovations and technology for mitigating the effect of climate variability

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ABSTRACT
Innovative research aimed at mitigating the effect of climate variability on farmers output must be adopted before the desired outcome can be achieved. Adoption of any innovation, which is deeply rooted in risk behaviour and may differ according to sex and social role, has been reported low. We used both pooled and disaggregated data to investigate gender risk behaviour to a Stress Tolerant Maize variety, an innovation aimed at mitigating the effect of climate variability in Africa. Using randomized data from 360 household sampled across derived Savannah zone of Nigeria, we investigated the socio-economic characteristics of men and women farmers, the differences in men and women risk behaviour and the determinants of these risk behaviours from a gender perspective. The result showed that gender is an important factor to be considered by policy if farmers are to take the risk in adoption of innovation. Further, for women farmers to take risk and adopt any innovation, the innovation must meet their labour demand while for men farmers the innovation must have effect on the area of land available to farmers. We therefore recommend that aside from other issues that affect adoption of innovation, the issue of risk behaviour of farmers should be captured in policy aiming at fostering innovation adoption and specifically, men and women risk behaviour should be given due attention

Keywords: Climate variability mitigation, Gender, Innovation and Technology, Risk behaviour, STMA

RÉSUMÉ
Des recherches innovantes visant à atténuer l'effet de la variabilité climatique sur la production des agriculteurs doivent être adoptées avant que le résultat souhaité puisse être atteint. L'adoption de toute innovation, qui est profondément enracinée dans le comportement à risque et peut différer selon le sexe et le rôle social, a été signalée comme faible. Nous avons utilisé des données regroupées et désagrégées pour étudier le comportement à risque lié au genre d'une variété de maïs tolérant au stress, une innovation visant à atténuer l'effet de la variabilité climatique en Afrique. À l'aide de données randomisées provenant de 360 ménages échantillonnés dans la zone de savane dérivée du Nigéria, nous avons étudié les caractéristiques socio-économiques des agriculteurs et des agricultrices, les différences entre les comportements à risque des hommes et des femmes et les déterminants de ces comportements à risque dans une perspective de genre. Le résultat a montré que le genre est un facteur important à prendre en compte par la politique si les agriculteurs doivent prendre le risque d'adopter l'innovation. En outre, pour que les agricultrices prennent des risques

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et adoptent toute innovation, l'innovation doit répondre à leur demande de main-d'œuvre, tandis que pour les agriculteurs, l'innovation doit avoir un effet sur la superficie des terres disponibles pour les agriculteurs. Nous recommandons donc qu'outre d'autres questions qui affectent l'adoption de l'innovation, la question du comportement à risque des agriculteurs soit prise en compte dans la politique visant à favoriser l'adoption de l'innovation et, plus particulièrement, le comportement à risque des hommes et des femmes reçoive l'attention voulue.

Mots-clés: Atténuation de la variabilité climatique, Genre, Innovation et technologie, Comportement à risque, STMA

INTRODUCTION

The general consensus in literature indicate that climate variability will impact agriculture (Rosegrant *et al*., 2014; Zilberman *et al.,* 2018). Agricultural sector is also one of the greatest contributors to climate variability through emissions of greenhouse gases. Most climate modelling literature indicates that the current agricultural practices in most developing countries is inadequate for reducing household vulnerabilities (Rosegrant *et al.,* 2014). Sub-Sahara Africa will be among the worst hit regions of the world where food security is already problematic and populations are vulnerable to shocks (Asadi-Zarch *et al.,* 2014; Touma *et al.,* 2015). In agreement with the finding of de Jong *et al*. (2016), innovation and technologies hold core place in mitigating the effect of climate variability. Understanding the role of innovation in minimizing the impacts of climate variability is a not a new concept. In fact, there has been quite a number of studies examining the progress and success of Government programs established to facilitate the development and diffusion of climate mitigation technologies (Dhar and Marpaung, 2015; Haselip *et al.,* 2015). Literature indicates that climate variability will have differentiated effects on actors (Pearse, 2016). Literature also suggests that the effect of climate variability will vary across gender and women will be more vulnerable (Beuchelt and Badstue, 2013). These findings suggest that there is need to ensure that innovation and technologies aimed at combating household vulnerabilities are gender-sensitive. This sensitivity must include the risk behaviour of men and women to adoption of innovations. The report of Bee *et al*. (2013) emphasised that policy makers who are developing and implementing adaptation policies and strategies need to consider gender relations and their effects in order to fully explore the role of innovation and technologies in mitigation.

In Nigeria, agricultural productions are largely weather-sensitive and hence, vulnerable (Dinar *et al.,* 2006). The evidence of climate variability in Nigeria has been reported in literature. For example Brown (2006) reported that the Sudan Sahel region of Nigeria has suffered a 3—4% decrease per decade in rainfall since the beginning of the 19th century. The report of Onyekuru and Marchant (2014) also suggested that the southern part of Nigeria had experienced increased amount of irregular rainfall while the north experienced dryer weather. To mitigate the effect of climate variability on farmers, there is need to explore how innovation contribute to adaptation of farming households across gender. Stress Tolerant Maize varieties represent a major innovation aimed at combating the effect of climate variability in Nigeria. The Stress Tolerant Maize for Africa (STMA) project is aimed at addressing these challenges by developing improved multiple Stress Tolerant varieties that effectively address emerging and future climate variability challenges. However, Long *et al*. (2016) reported that socioeconomic barriers, such as gender roles and responsibility hinder technology adoption.

Literature on investigation of climate variability across gender categories in Nigeria (Arimi, 2014; Amusa *et al.,* 2015) did not investigate the gendered effect of climate variability on risk behaviour to agricultural technology and innovation. Using the case of adoption of Stress Tolerant Maize variety, we explored the risk behaviour of men and women farmers. This was done to contribute to discussions on the role of innovation and technologies in adaptation by probing the intrinsic linkage between farmers risk behaviour to adoption of innovations aimed at combating the effect of climate change from a gender perspective. We further explored the factors that influence each gender behaviour on the adoption of innovation and technology in Nigeria. We hypothesised that examination of gender specific differences in behavioural response to adoption of innovation and technologies aimed at mitigating the effect of climate change would improve understanding of the underlying issues, and hence contribute to efforts to reduce gender-blindness in policy formulation.

Conceptual Framework

We premised the concept of this research on the innovation-growth cycle which is not a new concept in economics. It started with the work of Solow (1956). Since then, many studies and works have provided support and empirical evidence of this concept (Freeman, 2002; Bayarqelik and Taiel, 2012; Bektas *et al.*, 2015). Sunding and Zilberman (2001), categorized innovation and technologies depending on their impact on inputs and outputs (capital saving, labour saving, quality improving, and risk reducing innovations). They could also be categoriesed according to their form, i.e., technological, managerial, and institutional innovations. Technological innovations can also be embodied in new machinery (mechanical), biological (STMA seeds), and chemical (fertilizers) innovations. Managerial innovations are not embodied in physical capital, but rather are described by better practices while institutional innovations may include new organizational forms like cooperation between every actor which cut across gender roles and responsibility. The goal of economic growth through innovation according to Freeman (2002) is to ensure no serious damage is done to the environment. In the field of agriculture, the link between improved technology, gender, agricultural production, its impact on the environment is inseparably linked with feedback running in all directions. Most agricultural actors innovation and technologies have direct or indirect climate linkages. Lybbert and Sumner (2012) reported that most new technologies change the way farmers use farm inputs, often in ways that alter the impact of weather on production, and of production on carbon emissions. Lybbert and Sumner (2012) also reported that the nucleus of innovation as a mitigation and adaptation tool to the impact of climate change in agriculture is to ensure greater productivity, using fewer resources, under unpredictable production conditions, and net reductions in agricultural contribution to climate change.

According to the World Bank (2009), increasing agricultural productivity and subsequently economic development requires technological advances in crop yields. In contrast to developed counties, which have seen dramatic yield gains in the past century through investments in agricultural innovation and operate close to the technological frontier, much of developing countries agriculture is far from this frontier. Thus, the greatest latent productivity potential resides in developing countries, especially in SubSaharan Africa, which has cereal yields that are half or less of the rest of the world. In these places, profitable adaptation and farmer adoption of suitable varieties and crops could spark substantial yield gains (World Bank, 2009). In addition to increasing productivity generally, several new varieties and traits offer men and women farmers greater flexibility in adapting to climate change, including traits that confer tolerance to drought, stress, and early maturation in order to shorten the growing season and reduce farmers' exposure to risk of extreme weather events (Karaba *et al.,* 2007). The Stress Tolerant Maize Variety (STMA) which our research focused on represented one of the emerging technologies aimed at improving the productivity of farming households with little or known contribution to climate change. STMA varieties were developed by the International Institute of Tropical Agriculture (IITA) in partnership with CIMMYT with the aim of enhancing the production and use of 54,000 MT of multiple Stress Tolerant Maize seed in Nigeria and in seven other target countries in Sub-Sahara Africa (ITA, 2017).

Theoretical Framework. The theoretical background of this research is built on the theory of household risk choice. According to Singh *et al*. (1986), it is often difficult to predict the effect of agricultural policies because of the complex behavioural pattern and characteristics of individual farming household in rural economies. This complexity is heightened by gender norms, roles and responsibilities. Agricultural household models are designed to capture and understand these relationships that exist between household behaviour and policy stimuli in a theoretically consistent fashion (Taylor and Adelman, 2003). We built on the theoretical explanations of farm household behaviour which assume that farming households have an objective function to maximize profit with a given set of constraints (Dillion, 1971). By agreeing with the work of Taylor and Adelman (2003) and Mendola (2007), we viewed the farming household as a unit whose behaviour maximized utility through consumption of all available commodities (home produced goods, market purchased goods and leisure) subject to many constraints which included climate change. We viewed the risk behaviour of men and women farmers to a new technology as a decision problem that exists when men and women farmers have more than one choice available to them. In such decision problems, as implied under theory of farm household, the choices of men and women farmer is an important issue to consider in policy. Following the works of Udry (1996), this study relaxed the tenets of the unitary model by considering the intra-household decision dynamics. According to Duflo and Udry (2004), there are other members of the household who make separate decisions on plots management but the study focused on the men and women of selected households who were plot managers since they had management access. Our study assumed that these plot managers operated based on a safety-first framework-using behavioural rule and their expected utility. They primarily endured survival by avoiding any risk that may lead income to fall below a certain minimum threshold (subsistence level), and then make choice from available alternatives based on their expected utility. Thus, when faced with a choice between two alternative (modern technologies versus traditional), in the face of climate variability, we expect men and women plot managers to be risk taking and adopt the new one only if it is the safest option and the utility expected from its use exceeds that of the traditional technology. Our work sought to understand the actions of men and women with respect to this theoretical proposition since such decision may vary as a result of social role, access to resources and other institutional characteristics.

Mathematically, considering that each man and woman farmer who manages a given plot under this study has two alternative outcomes, STMA varieties denoted by “I” and other traditional maize varieties “T”, the probability (Pr) that either of them is chosen can be given by:

$$Pr(IT)=Pr\ (U_{DN}=Max(U_D,\ U_N)) \qquad (1)$$

Hence, the probability of each case being selected depends on the maximum utility (U) derived. Therefore, the probability that each household will choose STMA varieties can be given by:

$$Pr(1 > 0) = Pr(U_D > (U_N) \qquad (2)$$

The utility that each men and women plot manager derives from either of the choices (IT) subject to farm internal and external factors can be given as:

$U_D = f(h, i, nh) + \mathcal{E}$ (3)

where, U represents utility, h, represent the components of the household (which include income, food security, etc.) i represent the individual characteristics of men and women (including assets, social connections etc.) and nh non-household-specific characteristics respectively influencing risk decision to improve varieties or not; I and T are notations as indicated earlier, and € is the error term. Defining Equation (2) in terms of equation (3) above we have,

$Pr(l > O) = Pr[(\varpi lf(h, i, nh) + \mathcal{E}l > \varpi Tf(h, i, nh) + ET)]$ (4)

$= Pr[(\mathcal{E}l - \mathcal{E}T) > (\acute{\omega}T — \acute{\omega}I)(h, i, nh))]$ (5)

$= Pr[v > f(\beta X)] = F(X\beta)$ (6)

where, o is weight associated with each choice, v = ($\mathcal{E}$1- $\mathcal{E}$T), β = (ώT-ώI), X includes h, i, nh and F(Xβ) refers to cumulative distribution function which assumes a cumulative normal distribution when the error term is normal. Similar pattern of choice based on expected utility framework can be applied to categorical dependent variable with more than two choices. The decision maker opts for an alternative that can maximize his/her expected utility over all other possible specified choices. The approach will group the risk behaviour of men and women accordingly as risk averse, risk neutral, and risk loving (Ayinde *et al*., 2012)

MATERIALS AND METHODS

Study area and sampling. We used gender-disaggregated surveyed data from 360 households in the Guinea Savanna Region of Nigeria. The region surveyed occupied the North Western part of Nigeria that is prone to drought and other climatic stress. The region is also a major hub where the Stress Tolerant Maize variety technology had been grown by farmers. To better understand the risk behaviour of men and women farmers, the sampling was equally drawn across gender randomly from four groups of communities; the experimental communities, near-neighbour non-experimental communities, nonneigbour non-experimental communities and experimental communities. We combined the use of Focus Group Discussion (FGD), literature and household survey to ensure that variables which were necessary to understanding the risk behaviour of farmers were captured. The FGD were used to identify the community perception regarding changes in climatic patterns and how they responded to these events in terms of farm management practices. From each community, 360 households were randomly drawn which represented the total sample for this study. Data collected were analysed using Descriptive statistics, risk elicitation procedure using the safety-first criteria and linear regression were used to examine the determinants of risk behaviour.

Definition of Variables

Age: The age of the plot manager who was also the major decision maker for the farm.

Cost of Labour (CL): Amount paid for labour usage (in Naira - Nigerian currency).

Income from other activities (10): Income from other activities other than from farming (in Naira).

Seed cost (SC): Cost of STMA seeds (in Naira)

Farm size (FS): The total size of farm available for maize farming (ha).

Household size (HS): This measures the total number of members of the household (number).

Estimated annual income (EAI): This capture the total income of the respondent for a year.

Drought effect (DE): This variable is captured by asking the farmers if they perceived that drought had affected their farm in the last cropping season.

Gender: The sex of the plot manager and decision maker.

Analytical modelling. We used the safety-first criterion in line with the works of Moscardi and de Janvry (1977), Olarinde *et al*. (2007) and Ayinde *et al*. (2012) to assess the risk behaviour of farmers. According to Olarinde *et.al*. (2007) and Ayinde *et al*. (2012), that investors have some disaster level in their minds and try to optimize or minimize the disaster level. The safety-first criterion is used to assess farmer's management ability to mobilize his/her productive resources and choosing among technological options which depends on the security of generating returns large enough to cover subsistence needs. This risk behavioural tool has been used in a number of studies (Dillion and Scandizzo,1978; Lichenstein *et al*., 1982; Lindley, 1985; Fackler, 1991; Van Lenthe, 1993).

We modelled that farmers will make decisions to take the risk of adopting STMA varieties if it satisfies the condition of greater output and efficient use of the most important input in the production cycle. Therefore, we formulated a model based on input-output relationship to understand the most significant input that probably determine the major risk decision of farmers (Equation 7). The result was used to construct a risk behaviour of farmers using equation (8)

$$Y = f(X_1, X_2, X_3, X_4, U) \quad (7)$$

Where Y = output (kg); X_1 = Quantity of STMA seed planted (kg); X_2 = Quantity of labour (man/day);

X_3 = Quantity of pesticide (litre); X_4 = Farm size (ha); U = Error term Then,

$$K(s)=1/\theta[1 -(PiXi/ Pyf1Uy)] \quad (8)$$
$$\theta = \delta y/\mu x$$

Where ƍy is standard deviation, μy is the mean ofthe risk situation, θ is the coefficient of variation Fl which represents elasticity of production of the ith output, KS is the risk aversion parameter estimated by percentage. K(s) provides a measure of risk aversion that would be derived for each farmer from the knowledge of production function, the coefficient of variation of yield, product and factor prices and observed levels of factor use. The risk aversion parameters K(s) was used to classify farmers into three distinct behavioural groups;

Risk preferring -low risk - $(0 < K(s) < 0.4)$
Risk neutral - intermediate risk - $(0.4 < K(s) < 1.2)$

Risk aversion - high risk - $(1 .2 < K(s) < 2.0)$

Regression model. Ordinary Least square regression function was used to determine the socioeconomic characteristics that are responsible for farmers' risk behaviour to STMA variety. We first modelled the determinants by pooling the data together and included sex as a variable into the equation to investigate if the sex variable influenced risk behaviour. After which we disaggregated the data to see the unique determinants of risk behaviour according to gender.

The function for pooled data is given as:

$$f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, X_9, U) \quad (9)$$

Where Y= Estimated risk parameter (KS), X_1 = Age, X_2 = Gender, X_3= Income from other activities, X_4 = Seed cost, X_5 = Farm size (ha), X_6= Household size, X_7 =Estimated annual income, X_8 = Drought Effect on Farm (Dummy), X9= Cost of labour, U= Error term.
The function for disaggregated data is given as:

$$Y= f (X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, X_9, U) \quad (10)$$

Where Y= Estimated risk parameter (KS), X_1 = Age, X_2 = Cost of labour, X_3= Income from other activities, X_4= Seed cost, X_5= Farm size (ha), X_6= Household size, X_7= Estimated annual income, X_8= Drought Effect on Farm (Dummy), U= Error term.

RESULTS AND DISCUSSION

Gender disaggregated socioeconomic characteristics of farmers. The result showed that majority of the men and women farmers (58.59% and 57.50% , respectitvely) were at the productive stage of their life. For the male respondents, 85.56% were married while 17% of the female respondents were married with male average household size as nine (9) and female household six (6). This indicate that these farmers had responsibilities and people to feed. This is expected to influence their risk behaviour to STMA innovation. Majority of the farmers had farm size of less than 5 ha (88.33% for male, 98.89% for female). Even though the majority of the farmers had less than 5 ha of land, the result showed that women were more in this category compared to men who owned large parcels of land. Access to resources such as input is considered a major factor in production decision making. As a result, we expected that farm size would influence the risk behaviour of farmers. The result of the analysis showed that for the female headed household, labour used for production was mostly hired while family labour represented the major labour usage by male-headed households.

Gender-disaggregated risk behaviour of farmers. We used the production function estimation to model the behaviour of farmers (Table 2) on the assumtion that farmers would consider adopting an innovation if it satisfied the most important production conditions. For the women farmers, Quantity of seed and labour represented the most significant inputs in the production process. These result mirrored the socioeconomic characteristics of farmers where women used more of hired labour for the production process. The implication of these are that women spend more on labour as compared to other production inputs. Therefore, the result showed that if the innovation would not be labour intensive, the women farmers would likely adopt the STMA innovation. We used the result to Model farmers risk behaviour, after the modelling, we generated an index to categorize men and women farmers based on their risk behaviour. The results showed that majority of the male-headed farming households were risk takers (55.89%) while majority of the female farmers were risk neutral (82.5%). The implication of these is that any policy that will put adoption of innovation (especially the STMA variety) must uniquely consider the differences in the risk behaviour of men and women farmers in order to formulate a holistic policy. The women farmers have little access to resources and therefore, it is not uncommon for them to want to play safe. The men on the other hand have more access to productive resources, making it easier for them to take considering they may have ample assets to hedge against the influence of risk

Factors affecting risk behaviour. We pooled the data together to investigate the determinants of risk behaviour. The result in Table 4 show that gender was one of the significant variables that influenced risk behaviour of famers in adoption of agricultural innovation, as similarly reported by Ayinde *et al*. (2012). We therefore disaggregated the data to see the specific determinants of gender risk behavibur (Table 5)

Gender disaggregated determinants of risk behaviour. The gender disaggregated factors that determine risk behaviour of farmers is presented in Table 5. The result revealed that income from other activities are central to the decision of men and women farmers to adopt new innovation. Business diversification has been identified in Literature as one of the tools to mitigate against climate risk. Male farmers who have other sources of income have the likelihood of increasing adoption by 11.021% while women farmers in this same category have the likelihood of increasing their possibility to take risk and adopt new innovation by 19.52%.

Table 1. Gender disaggregated socioeconomic characteristics of farmers

	Male		Female	
Variable	Frequency	Percentage	Frequency	Percentage
Age S 30	25	6.94	52	14.44
31 - 50	212	58.89	207	57.50
51 -70	123	34.17	101	28.06
Total				
Marital status	360	100	360	100
Single	31	8.61	11	3.06
Married	308	85.56	303	84.17
Divorced		0.00	12	3.33
Widowed	21	5.83	34	9.44
Total				
Household size	360	100	360	100
1 -6	119	33.05	212	58.89
7- 12	203	56.39	142	39.44
13	38	10.56	6	1.67
Total	360	100	360	100
Farm size (ha)				
5	318	88.33	356	98.89
6- 10	40	11.11	4	1.11
11 - 15	2	0.56	0	0
Total	360	100	360	100
Family labour	216	60.00	62	17.22
Hired labour	78	21.67	285	79.17
Family and hired labour	66	18.33	13	3.61
Total	360	100	360	100
50000	22	6.11	119	33.06
50,001 - 250,000	123	34.17	203	56.39
250,001 - 500,000	194	53.89	23	6.39
500,000	21	5.83	15	4.16
Total	360	100	360	100

Table 2. Result of the Disaggregated Production Function

	Male Respondents				Female Respondents			
.	.B	Std Error	t	Sig	B	Std Error	t	Sig
(constant)	2.403	2.836	0.801	0.002	1.204	1.801	0.244	0.214
Quantity STMA seed		0.0897	46.502	0.000		0.312	22.140	0.021
Labour	0.765	0.580	3.216	0.408		2.121	23.10	0.000
Quantity of pesticide	2.127	0.618	1.853	0.863	0.245	0.339	0.710	0.127
Farm size (ha)		0.261	0.512	0.040	0.031	2.120	8.221	0.091

$R^2 = 0.695$ *** - significant at 1% ** - significant at 5%

Table 3. Disaggregated risk behavioural categorization

	men		women	
Risk Behavioural Grouping	Frequency	Percentage	Frequency	Percentage
Risk Loving 0<K(s)<0.4	212	55.89	40	11.11
Risk Neutral 0.4<K(s)<1.2	114	31.67	297	82.5
Risk Averse 1.2<K(s)<2.0	34	9.44	23	6.39
Total	360	100	360	100

Table 4. Disaggregated Determinants of Risk Behaviour

Dependent Variable affecting (Risk Behaviour)	POOLED		
Variables	B	Std Error	Sig.
(constant)	35.104	86.223	0.993
Age	3.672	2.456	0.418
Gender	11.879***	7.139	0.000
Income from other activities	18.101 ***	62.534	0.005
Seed cost	22.13	34.213	0.645
Farm size (ha)	6.201**	12.102	0.037
Household size	20.342**	45.103	0.021
Estimated annual income	20.723	60.123	0.435
Perceived Effect of Drought (Dummy)	14.008***	46.285	0.006
Cost of labour	30.634**	46.287	0.049

*** Significant at 1%, *Significant at 5%

Table 5. Disaggregated Determinants of Risk Behaviour

Dependent Variable (Risk Behaviour)	Men			Women		
Variables	B	Std Error	Sig.	B	Std Error	Sig.
(constant)	23.001	45.129	0.911	29.101	62.113	0.672
Age	0.227	0.155	0.174	0.34	0.223	0.261
Cost of labour	23.1 10	36.13	0.134	-25.172	28.219	0.019
Income from other activities	14.210	28.201	0.002	19.521	39.413	0.000
Seed cost	4.120* *	22.121	0.342	13.118	24.121	0.231
Farm size (ha)	23.019	16.823	0.041	0.271	1.231	0.256
Household size	0.795**	13.092	0.002	20.023**	32.043	0.015
Estimated annual income	23.019	89.218	0.238	12.034	56.198	0.125
Perceived Effect of Drought (Dummy)	0.795**	3.141	0.026	0.831	2.351	0.014

Specifically, for the women, labour represent one of the core needs before taking risk to adopt STMA variety. This suggest that there is a difference in women concern and needs in the innovation adoption process. If the innovation will not offset the labour burden of women, the possibility of adopting the innovation will be low. In this study increase in labour cost reduced the decision to take risk to adopt STMA innovation by 25.13%. For the men, increase in farm size increased the possibility of taking risk. Farm land represents a major asset. Farmers in the study area had more than one wife and the socioeconomic result showed that household labour was readily available to them to use. Therefore, the higher the farm size, the more willing the male farmer's decision to take risk in adopting STMA innovation.

Increase in Household size. Household size was another significant variable that influenced risk behaviour where, for the male, an increase in the household member by one increased the possibility to taking risk to adopt STMA innovation by 1.06%. This may be as a result of having more hands to use for labour. For the women too, an increase in the number of household members increased the possibility of taking risk in adoption of STMA innovation by 20.02%. However, it must be stressed that the household member in consideration here must not be dependent but rather someone that can contribute to the production process.

Drought is one of the major climatic factors that influence farmers decision to take the risk associated with innovation aiming at mitigating the effect of climate change. Both men and women farmers results showed that increase in drought increased the possibility of farmers to take risk to adopt innovation associated with it by 79% incidence and 83. I %, respectively, for males and females. The characteristics of innovation therefore matters to both men and women. If the innovation can solve other challenges that confront farmers, the possibilities of taking the risk associated with adopting it will increase for both men and women farmers.

CONCLUSION

Mitigating the effect of climate variability using innovation and technologies is a feasible means of mitigation for farming households. In this research, we used gender-disaggregated data to investigate whether gender was an important variable to consider in risk behaviour to adoption of innovation aimed at mitigating the effect of climate variability. We used the STMA variety as the case study of innovation. The result showed that gender was an important variable that influence risk behaviour. We further disaggregated the data to see the unique factors that affect each gender risk behaviour. The empirical result presented in this article showed that if farmers are to take the risk of adopting the STMA variety, there will be need to capture gender needs in policy. Apart from considering significant variables such as characteristics of innovation, droughts, income from other sources and household size, policy makers must ensure that the innovation meets the labour need of women who have little or no access to productive resources such as labour as compared to their male counterpart. For the men, increase in land ownership will increase the possibility of taking risk.

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STATEMENT OF NO CONFLICT OF INTEREST

The authors declare that there is no conflict of interest in this paper.

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