

**ASSESSING RISK PERCEPTION AND DETERMINANTS OF BRANDING AS A RISK MITIGATION TOOL AMONG RICE PRODUCERS IN GHANA**

**Edinam Fred Degboe**

St. Francis College of Education, Hohoe, Ghana

**Nicholas Opong Mensah,**

University of Energy and Natural Resources, Department of Agricultural Economics  
Agribusiness and Extension, Sunyani, Ghana

**Jeffery Kofi Asare**

University of Energy and Natural Resources, Department of Agricultural Economics  
Agribusiness and Extension, Sunyani, Ghana

**Tekuni Nakuja**

University of Energy and Natural Resources, Department of Agricultural Economics  
Agribusiness and Extension, Sunyani, Ghana

**Frank Osei Tutu**

University of Energy and Natural Resources, Department of Agricultural Economics  
Agribusiness and Extension, Sunyani, Ghana

---

**ABSTRACT:** *Rice is remains an important crop in Africa, which serves as food for a large percentage Africa's population and has the potential to help reduce poverty and alleviate food insecurity. Educating farmers to increase competitiveness via branding will help mitigate risk and increase farmers income. This study accesses risk perception and analyse branding as a risk mitigation tool among rice producers in the Volta Region of Ghana. The study relied on a structured question to elicit response from 395 rice producers via convenience and purposive sampling. Ordinary least square (OLS) was used to analyse effect of branding on local rice producer's risk and factor analysis was used to examine perception of risk faced by rice producers. Branding was found to decrease producers risk whiles variety in prices and type of rice produced increases producers risk. Hence the study recommends that effective branding can be used as a risk mitigation tool for rice farmers.*

**KEY WORDS:** branding, risk mitigation, risk perception, OLS regression, factor analysis

---

**INTRODUCTION**

Agriculture is the most risk sensitive venture globally (African Development Bank, 2016).The risk in agriculture is even higher in developing countries, especially in Africa due to the effects

of climate change and the sector's over dependence on rain-fed agriculture (Oppong-Kyeremeh and Bannor2018). Due to low productivity, industrialization and adverse human activities, it is not surprising that climate change has become a significant threat to the future agriculture and agribusiness. Studies reveal that, crop yield declines can be attributed to climate change, which is a major source of production risk (Adnan *et al.*, 2020), this has placed immense strain on national and global food security (Tong *et al.*, 2019; Lobell *et al.*, 2011). Apparently, rice producers who face these risk, also have to deal with competition of imported rice which has contributed to the dwindling domestic demand of local rice supplies (MoFA 2018; IFFPRI , 2020) (refer to figure 2). Agricultural risk can be classified into five forms namely: environmental, production, marketing, financial and human capital risk (Adnan *et al.*, 2020). Besides, other sources of risk in agriculture are pests and diseases, extreme weather conditions and occurrences of natural disasters (Ullah *et al.* 2015; McNeil *et al.*, 2015; Rizwan *et al.*, 2020). The incapacity of the producer to estimate input prices as well as the selling prices of agricultural goods is referred to as market risk (Harariková, 2018). Farmers are confronted with numerous risks. However majority of these hazards are unknown to smallholder farmers prior to the start of the farming season, but they are expected based on their perceptions and previous experiences (Mgale and Yunxian, 2021).

Agriculture remains the backbone of Ghana's economy via its employment and GDP contribution (Arthur *et al.*, 2011; Anang *et al.*, 2020) Nonetheless, the sector is characterized by small holder farmers that are saddled with many constraints preventing them from effectively increasing their participation in markets. These include insecure rights to land, inadequate access to quality inputs, credit access, and minimal support from extension, research services, and high cost of transaction caused by poor rural infrastructure (FAO 2012).

According to Tomlins *et al.* (2005), rice has been described as one of the essential foods in many nations in West Africa. Tomlins *et al.*, (2005) further reveals that, rice functions as an essential and accessible food for indigenous Ghanaians. Hence, if well managed, the sector has the tendency of providing employment chances particularly in the local towns, consequently easing the socio-economic pressure in the big cities. Government of Ghana has put in place various plans and policies in order to augment rice cultivation and supplies in the country (FAO, 2006).

The National Rice Development Strategy (NRDS) was announced in 2008 to increase local rice cultivation by one hundred percent so as to reduce the adverse effect imported rice possess on Ghana's economy. In spite of the government efforts to double rice cultivation in the country, buyer desire for locally produced rice still remains discouraging (Alhassan *et al.*, 2015). However it is worth noting that rice has the second per capita consumption among cereals in Ghana. Besides due to rapid increase in urban population, per capita consumption of rice is expected to rise from 24 kilograms per person to 68 kilograms per person (MOFA, 2015; Kwofie *et al.*, 2016; Ehiakpor *et al.*, 2017). Surprisingly, only 35% of locally produced rice is consumed in the country while

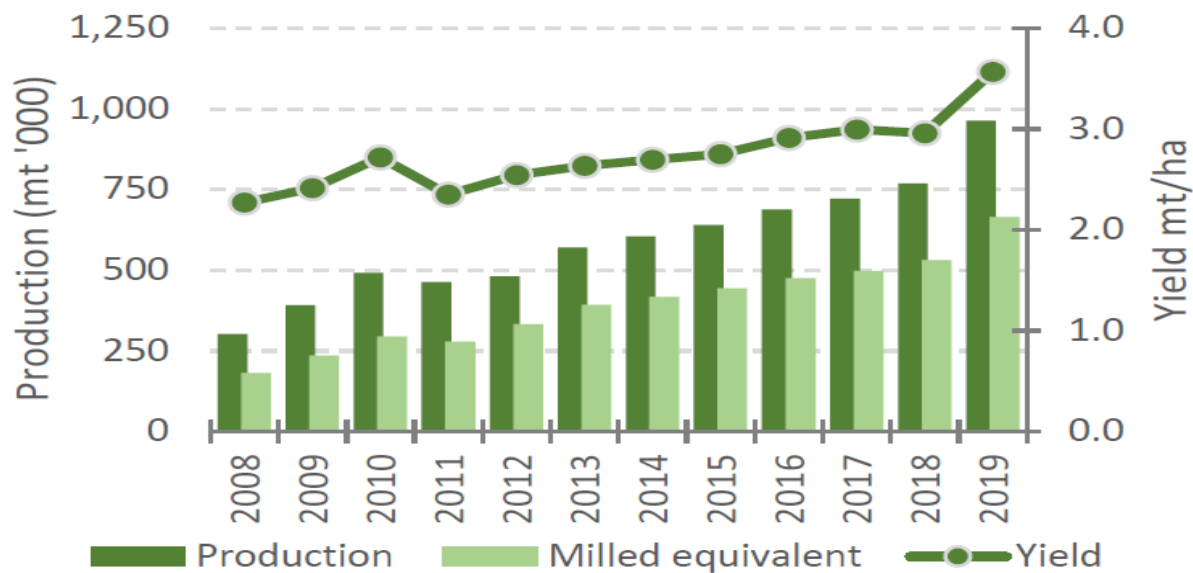
65% of the countries rice consumption is met by imported rice(Boansi and Favour 2015). This gives glaring evidence that consumers do not prefer locally produced rice. The questions arise, why is demand for local rice still low and what possible risk does farmers face when their rice is not purchased by consumers? According to Andam *et al.*, (2019) local rice sold on the market is segmented into, namely: branded and unbranded rice. Branded rice is supplied by relatively large-scale companies which are sold super markets and mini marts for very good prices. This shows that small scale farmers who produce local rice can make sales when they brand their rice. However they lack the knowledge and expertise to brand their rice. A study by Quarshie and Fraser indicates that 88% of rice farmers are unable to adopt modern technologies. This shows that the average small scale farmer might not brand his rice. Thus, it predisposes farmers to great risk of selling at low prices or eventually experiencing postharvest losses which has immense effect on their profitability. Alemu (2019) revealed that in developed countries actors in commodity value chains utilize effective branding in marketing agricultural products and strengthening competitiveness in the market. On the other hand, farmers and other important value chain actors in Africa has scant knowledge on branding tools, thus branding as an agricultural marketing tool is underutilized. Consequently branding as a risk mitigation tool has also not been utilized. Against this backdrop, it necessitates a research on branding in agriculture. Specifically study bridges the gap between rice production and rice branding as a risk mitigation tool for small scale farmers in a developing country, Ghana. The study aims to bring to light the relevance of branding to rice farmers and aid them understanding why branding can help them reduce these risk and augment sales and profit. Moreover policy makers can rely on this study to redirect tailor made policies and resources to educate farmers about branding. Several studies have investigated how farmers deal with risk (Fahad *et al.*, 2018; Ahmad *et al.*, 2019; Rizwan *et al.*, 2020; Mgale and Yunxian 2021). However to the best of author's knowledge no empirical study has examined branding as a risk mitigation tool for rice farmers. Above and beyond, this leaves a significant research gap which this study seeks to fill. To address this lacuna, the objective of this paper is in twofold: 1. To determines risk perception of rice producers, 2. To analyse the effect of determinants of branding on producers risk. Besides

## LITERATURE REVIEW

### Brief Overview of Rice Production in Ghana

*Oryza Glaberima* and *Oryza sativa* are the two main rice varieties grown in Ghana. Rain-fed, irrigated paddies, upland, lowland, deep water, and tidal wetlands are the six main habitats in which rice is grown. Formal records of certified seed production disclosed that authorized seed production over the past years has been dominated by three varieties: Jasmine 85, GR 18, and Togo Marshall (recording 91 percent of certified seed production) (Ragasa *et al.*, 2013). Rice production accounts for roughly 19 percent of total cereal production in Ghana. Between 2000 and 2010, the number of hectares used for rice production increased from 0.09 to 0.16 million hectares, with productivity ranging from 1.7 to 2.7 tons per hectare (FAOSTAT, 2017).

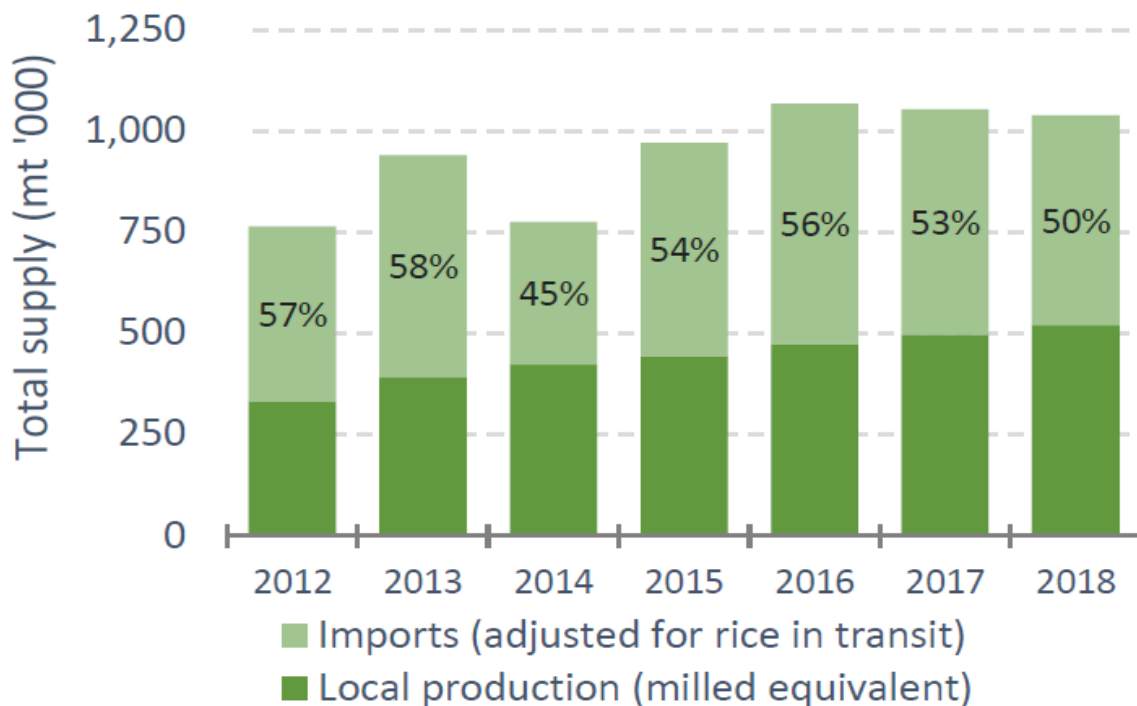
Furthermore production increased over 100% between 2007 and 2010, rising from 185,000 tons in 2007 to 491,600 tons in 2010 with a mean annual growth rate of about 15% between 2005 and 2010 despite a drop in production in 2007, from 237,000 tons in 2005 to 185,000 tons in 2007 (SRID, 2011). Consequently, production increased in 2019 to about 963,000 tons. Since then, there has been an estimated annual growth of 6.9 percent per annum in rice production across the country (IFPRI, 2020). Although there has been considerable increase in production, domestic rice supply and consumption is still low, this calls for attention and research on the contributing factors of low local rice supplies in the country. Figure 1 and 2 respectively show production of rice and yields in Ghana from 2009-2019 and Domestic rice supply in Ghana and their sources between 2012-2018



**Figure 1: Production of rice and yields in Ghana from 2009-2019**

*Source: MoFA-IFPRI Market Brief No. 2 | April 2020*

*Available at: <https://doi.org/10.2499/p15738coll2.133697>*



**Figure 2:** Domestic rice supply in Ghana and their sources 2012-2018

Source: MoFA-IFPRI Market Brief No. 2 | April 2020

Available at: <https://doi.org/10.2499/p15738coll2.133697>

### The concept of Branding

Branding is by far one of the most significant modules of marketing. It is a term used to define the name, description and design of a product that is being offered for sale. (Ikporah, 2012). Perreault and McCarthy (2002) see branding as the use of a name, term, symbol or design or a blend of these to recognize a product. In addition, it is the use of a unique name and mark on a product to distinguish it from related ones. Arens (2002) identifies branding as a basic differentiation device for all products. It comprises name, words, symbols, or designs that identify the product and its source and differentiates it from competing products. A robust brand brings value to the consumer and therefore is expected to build financial value to the company over time. Thus, the brand is an intangible financial asset for the business that controls it (Bobby *et al.*, 2019).

### Agricultural risk

Agriculture is a highly risky venture mostly due to its high dependence on rain fed production. A review of literature reveals that agriculture risk has been discussed and grouped into different types. Economic Research Service (2018) reported on production risk, which involves occurrence of droughts, flood, tornados, other weather-related risks and pest and diseases. Broll, Welzel, and

Pong Wong (2013) revealed other types in agriculture such as price and supply risk. Other studies gave insight on market and economic risks which include risks related to buying and selling an agricultural product on the market, such as market price fluctuation. Generally agricultural risk can be classified into five forms namely: environmental, production, marketing, financial and human capital risk, all other risk are embedded in these types of risk which has been outlined. (Adnan *et al.*, 2020). In this study we assess farmers risk perception of institutional risk, price and production risk and political related risk.

### **Risk mitigation**

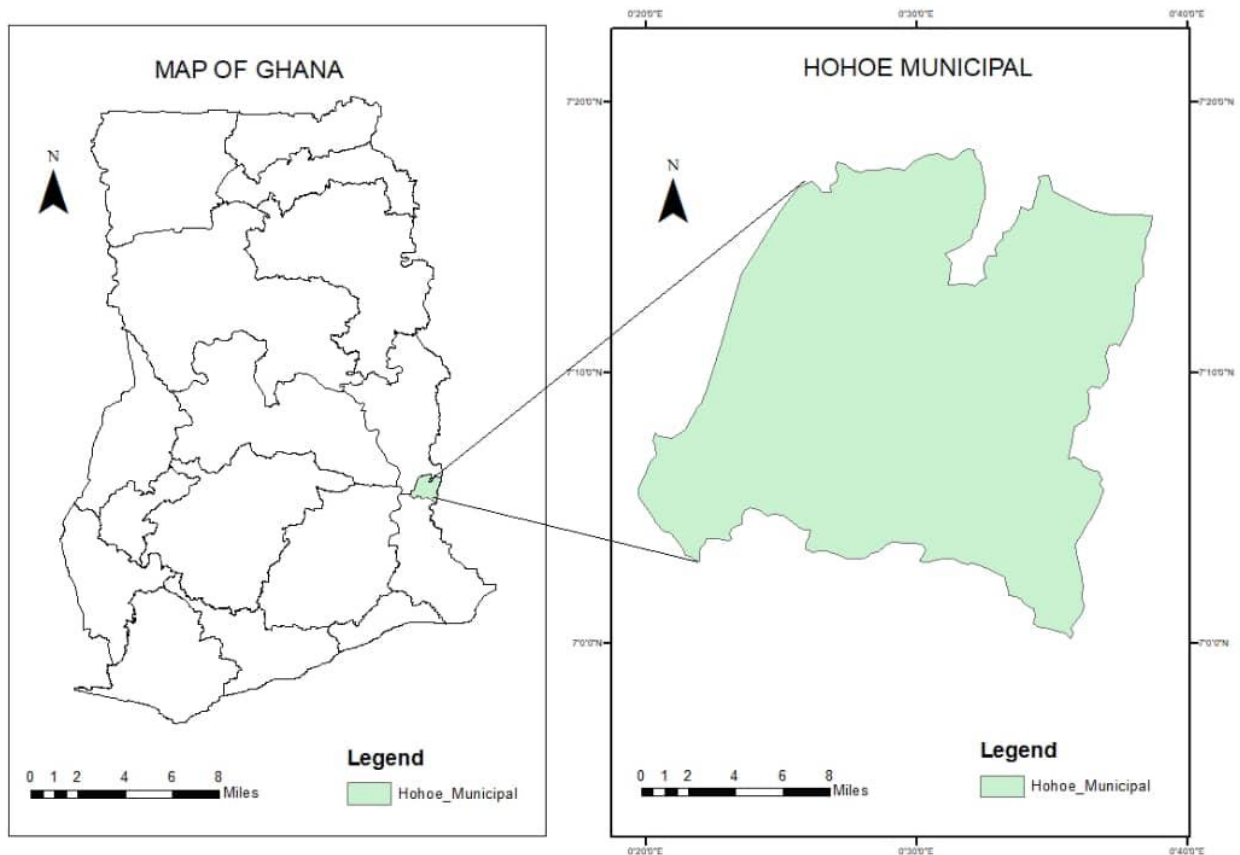
The possible deviation between expected and actual outcomes is what is known as risk.. There are several risks and uncertainties in agriculture which can be diverse. These agricultural related risks predispose farmers, especially rice producers to several challenges such lack of ready market. Hence, it is dependent on the farmers to find innovative ways to mitigate these risks. Risk management for an individual farmer entails determining the best mix of activities with unpredictable outcomes and varying amounts of expected returns (Aimin, 2010). According to Holzmann and Jorgensen (2001) risk management strategies can be classified into three. These are risk reduction (involves reducing the probability that an uncertain event that can affect the farmers welfare negatively occurs), mitigation (deals with reduction of the negative effects on this farmer's welfare once it occurs) and coping (entails dealing with the event once it has happened and usually means reducing consumption). Nonetheless, Amevenku (2019) argues that diversification should be used as a mitigation strategy. More so (Mensah *et al.*, 2017, 2021) also argue that agricultural insurance can be used as a means to mitigate and transfer risk. No study has used branding as a risk mitigation strategy. Hence this study seeks to investigate how branding can be used to mitigate risk.

## **MATERIALS AND METHODS**

### *Study area*

The study was conducted in Hohoe Municipality in the VoltaRegion of Ghana. The Hohoe municipality is one of the largest municipalities in Volta Region of Ghana. In 2014 the municipality had a population of about 187,028, 84, with majority (87%) of the population residing in rural areas. The municipality is characterized by rice farmers with most of them mainly into subsistence farming (Osei *et al.*, (2015). A high numberof the residents are involved in commodity value chain activities such as production, wholesaling, retailing and petty trading (Ghana statistical service, 2010)





**Figure 3: Map of the study area**

**Source:** Authors construct, with ArcMap

### **Sampling procedure and sample size**

The study's respondents were chosen via convenient sampling approach. This non probability sampling technique was used because respondents for the study were accessible and available (Sedgwick 2013). Volta region was purposely selected because of the intensity of local rice production in the area (Jarhet.*et al.*, 2020). In addition Hohoe, Lolobi and Akpafu were purposely selected from the Hohoe Municipality, these areas were chosen due to the high presence of rice value chain actors, especially producers (Kwarteng *et al.*, 2003). In total we conveniently selected 400 rice producers in the study area. However out of the 400 questionnaires sent on the field 5 questionnaires were not completed leaving 395 questionnaires for cleaning, coding, data entry and analysis. In reference to central limit theory a sample size greater than or equal to 30 is accurate enough for a standard normal deviation (Mensah, *et al.*, 2020), indicating that the sample size is appropriate for the statistical analysis. Responses were elicited through questionnaire

administration and focused group discussions, with key informants and experienced rice producers. Before questionnaire administration commenced, pretesting was done in order to fine tune the questionnaire for final data collection. Further reconnaissance study was made to introduce respondents to the concept of branding and risk mitigation; this gave depth of understanding to respondents, which made them further appreciate the concept of branding. A period of one month was used for data collection, commencing from 5<sup>th</sup> may 2020 to 5th June 2020. A team of data collection experts were trained to translate English to the producers' local dialect, (Ewe) so that farmers would really understand questions posed from the questionnaire. Lastly, data was coded and entered into Microsoft Excel 19 whiles Stata 15 software was used for analysing the data.

### Method of Data Analysis

Descriptive statistics presented in (frequencies and percentages) were used to analyse socio economic characteristics of producers as well as brand of rice produced and producers perception of risk. To achieve the objective of risk perception among rice producers, they were asked to rank several questions on perception which was measured via the use of a five point likert scale which ranges from (1= extremely agree, 2=agree, 3= neutral, 4= disagree and 5=extremely disagree). Rizwan *et al.*, (2020) employed a similar technique. Factor analysis was further employed to extract the main risk factors local rice producer face (See tables A1-A5 for specific details). In addition, this study used ordinary least squares regression to estimate the relationship between branding and risk of producers. The ordinary least squares (OLS) regression has been adopted by several studies (Sefcik and Thompson, 1986; Adjasi and Osei, 2007; Uadiale, 2010; Ajayi and Oke, 2012; Antwi *et al.*, 2013; Verter and Bečvářová, 2016) and was hence adopted in this study. The OLS model for risk of producers is specified as;

$$\text{RiskPro} = \beta_0 + \beta_1 \text{Brand}_i + \beta_2 \text{Varpx}_i + \beta_3 \text{Exp}_i + \beta_4 \text{Protype}_i + \beta_5 \text{Loc}_i + \beta_6 \text{Inc}_i + \beta_7 \text{Educ}_i + \varepsilon_i$$

Where;

RiskPro = producer's risk

Brand = branding of local rice

Varpx= Variety in prices of local rice

Exp= Work experience of producers

Protype= Type of local rice produced

Loc = Location

Varsold = Variety of local rice retailed

Educ = Education

Inc = Income

Age = Age

Employ = Employment Status

HHsize= Household size



$i$  = individual observation

$\beta$  = the parameters to be estimated

$\varepsilon$  = Error term

**Table 1: Description of variables used for analysis**

Variable	Description	Measurement	A prior expectation	Relevant literature
<b>Socio demographic factors</b>				
Education	Number of year spent in school	Continuous	+	Buabeng (2015)
Experience	Years of experience in rice production	Continuous	+	Rizwanet al., (2020)
Location	1= Hohoe 2=Apkafu 3=Lolobi	Categorical	-	Buabeng (2015)
Income	Income in Ghana cedis	Continuous	-/+	Buabeng (2015)
<b>Branding factors</b>				
Type of rice produced	1=Jasmine 2=Togo Marshal 3= Agra-Cri 4=Gino	Categorical	-/+	Bannor et al., (2017)
Branding	Do you brand your rice 1=Yes 0= No	Dummy	-/+	Anholt (2007) Srinivasan (2018)
Variety in prices	Are there varieties in prices with respect to rice brand? 1=Yes 0= No	Dummy	-/+	Gunawan et al.,(2019)

Source: field survey, 2020

**Table 2: Summery statistics for risk perception variables used for factor analysis**

Variable	Mean	Std. dev	Minimum	Maximum
Variability in Price	1.37	0.5056	1	3
Interest rate	1.37	0.4852	1	2
Excess rainfall	1.54	0.7577	1	4
Deficit in rainfall	1.45	0.6093	1	4
Pest and diseases	1.47	0.8221	1	5
Changes in Technology	1.31	0.5449	1	3
Competition	2.22	0.9596	1	5
Low demand for product	2.15	0.9468	1	5
Political situation	2.27	0.8391	1	4
Government laws	1.4	0.6816	1	4
Hired labour	2.14	0.8411	1	4

Source: field survey, 2020

**Table 3: Summary statistics for entire sample**

Variable	Mean	Std. dev	Minimum	Maximum
Gender	1.44	0.499	0	1
Age	32.45	12.761	25	65
Household number	4.521	3.131	1	10
Education level	7.157895	0.725	3	16
Income	31381.42	126984.6	500	10000
Religion	2.10	0.402	1	4
Marital status	1.94	0.499	1	3
Location	1.83	0.233	1	3
Branding	1.93	0.410	0	1
Variety in prices	1.76	0.718	0	1
Experience	5.231	3.626	1	15
Type rice of produced	1.81	0.321	1	2

**Source:** *field survey,2020*

## RESULTS AND DISCUSSIONS

**Table 4: Demographic and Socio-economic Characteristics of Local Rice Producers**

Variables	Frequency(N=395)	Percentage (100%)
<b>Sex</b>		
Male	220	55.8
Female	175	44.2
<b>Total</b>	<b>395</b>	<b>100</b>
<b>Age</b>		
18-30	25	6.3
31-40	187	47.4
41-50	146	36.8
51 and above	37	9.5
<b>Total</b>	<b>395</b>	<b>100</b>
<b>Household size</b>		
2-5	158	40.0
6-10	154	38.9
11-15	29	7.4
16 and above	54	13.7
<b>Total</b>	<b>395</b>	<b>100</b>
<b>Education</b>		
No basic education	79	20

Basic Education	170	43.2
First degree	112	28.4
Second degree and above	34	8.4
<b>Total</b>	<b>395</b>	<b>100</b>
<b>Income level</b>		
Low Ghs (100-1000)	146	36.8
Middle Ghs (1100-2000)	191	48.5
High Ghs (Above 2100)	58	14.7
<b>Total</b>	<b>395</b>	<b>100</b>
<b>Marital Status</b>		
Single	54	13.7
Married	308	77.9
Divorced	33	8.4
<b>Total</b>	<b>395</b>	<b>100</b>
<b>Location</b>		
Hohoe	87	22.1
Akpafu	327	60.0
Lolobi	71	17.9
<b>Total</b>	<b>395</b>	<b>100</b>
<b>Religion</b>		
Traditional	8	2.1
Christian	349	88.4
Muslim	33	8.4
Atheist	5	1.1
<b>Total</b>	<b>395</b>	<b>100</b>

*Source: Field Survey, 2020*Note: GHS 1 = \$5.78

Table 4 reveals that out of the 395 local rice producers, 220 were males and 175 were females. This constitutes 55.8 % and 44.2 % respectively. 55.8 percent clearly shows male producers are majority. This is similar to an observation made in the Volta region by Oppong-Kyeremeh and Bannor (2018), who observed that male dominate rice producers in the Volta region. With respect to age, the results showed that majority (47.4%) respondents fell within the age range of 31-40 while minority (6.3%) fell within the age range of 18-30. This infers that larger number of the respondents is made are in their economically active ages. Also, most of the respondents (40%) had a household size ranging from 2 to 5 whereas a few respondents (13.7%) had household size of above 16. The results differ from the study of Oppong-Kyeremeh and Bannor (2019) who

observed a mean household size of six, among rice producing households. Also, a greater number (43.2%) of the local rice producers had their basic education; whereas a minority (8.4%) had a second degree. This implies that majority of respondents have formal education, hence when if they are educated about branding they will understand and utilize the concept to improve their rice production business. The results correlate with (Ojo *et al.*, 2020). Most respondents (48.5%) were middle-income earners (Ghs1100-2000; \$190.46-346.30) while a small number (14.7%) were high income earners (above Ghs 2100; \$ 363.61) as shown in the table 4.0. In furtherance many of the local rice producers that were sampled lived in Akpafu and most of the local rice producers were Christians.

**Table 5:** Brand of rice produced by farmers in the study area

Brand	Frequency(N)	Percentage (%)
Jasmine	100	25.3
Togo Marshal	200	50.5
AGRA-CRI	33	8.4
Gino	62	15.8
<b>Total</b>	<b>395</b>	<b>100</b>

**Source:** Field Survey, 2020

Table 5 shows that there is a preponderance of the Togo Marshall variety over all varieties of rice produced by farmers in the Hohoe Municipality. The farmers explained that they cultivate Togo Marshall's rice because the rice variety is relatively high yielding and can withstand bad weather such as deficiency of rain and its high resistant to pests and diseases. This is followed by Jasmine rice (25.3%), AGRA-CRI 8.4 (%) and then the improved long grain rice, Gino (15.8%).

### Perception of risk faced by local rice producers

Descriptive statistics (percentages and frequencies) were used to analyse producers' perception on risk. In addition, following the studies of (Iqbala 2017; Opoku *et al.*, 2020; Mensah *et al.*, 2021) factor analysis was employed to extract the main risk factors local rice producers face (See tables A1-A5 for more specific details). Also Cronbach's alpha was computed to assess if the eleven items which were summed to create risk perception score of producers, formed a reliable scale. Specifically the Cronbach's alpha value computed was 0.88 (refer to tables A4 for more specific details). This shows that the items form a scale of reasonable internal consistency reliability. Three main factors namely (perception on price and production risk, perception on institutional risk and perception of political related risk) were extracted using the cutoff point of 0.60 for factor loadings (refer to table A3 for more specific details). Williams *et al.*, (2010) and Stevens (2002) indicated that items with factor loading of at least 0.40 are acceptable; besides other empirical studies (Opoku *et al.*, 2020; Mensah *et al.*, 2021) used 0.60 as cut-off point. Hence the use of 0.60 in this study is adequate.

**Table (6): Perception of risk faced by local rice producers**

Variable	Explanation	Extremely agree	Agree	Neutral	Disagree	Extremely disagree
<b>Perception on price and production risk</b>						
F1	Variability in prices increase risk	188(47.5)	88(22.1)	99(25.3)	12(3.2)	8(1.1)
F2	High interest rate increase risk	125(31.6)	157(38.9)	88(22.1)	21(5.3)	4(1.1)
F3	Excess rainfall increases risk	63 (15.8)	108(27.5)	129(32.6)	62(15.8)	33(8.4)
F4	Deficit in rainfall increase risk	270(68.4)	117(29.5)	4(1.1)	2(0.55)	2(0.55)
F5	Pest and diseases increase risk	262(66.3)	91(23.2)	26 (6.3)	8(2.1)	8(2.1)
<b>Perception on institutional risk</b>						
F6	Changes in Technology increase risk	259(65.3)	116(29.5)	4(1.1)	4(1.1)	12(3.2)
F7	Competition among producers increase risk	287(72.6)	92(23.2)	8(2.1)	4(1.1)	4(1.1)
F8	Low demand for product increase risk	175(44.2)	183(46.3)	17(4.2)	8(2.1)	12(3.2)
<b>Perception of political related risk</b>						
F9	Political situation (instability) increases risk	126(31.6)	71(17.9)	97(24.2)	92(23.2)	9(3.2)
F10	Government laws (policy) increases risk	79(20.0)	104(26.3)	104(26.3)	100(25.3)	8(2.1)
F11	Strict Labour laws increase risk	263(66.3)	112(28.4)	12(3.2)	4(1.1)	4(1.1)

Source: Field Survey, 2020

### **Perception on price and production risk**

Analysis of results from table (6) indicates 188 rice producers extremely agreed to the risk perception “Variability in prices increase risk price increase risk” while only 8 rice producers indicated extremely disagree to the said statement. This suggests that majority of the respondents are in agreement. If the price of rice varies, it poses a great risk to local rice producers, because the rice varieties they produce are usually processed with traditional methods and are less desired. It corresponds to a study by Chaudhary *et al.*, (2015) who found price risks as one of main sources of risk for farmers in Northern Ghana. Results revealed that 157 farmers (38.9%) agreed to the perception of high interest rate posing a great risk to farmers while only 4 rice producers (1.1%) of the respondents extremely disagreed. High interest rate connotes high payment of loans or credit by farmers, which can reduce their profit and restrain them from producing at competitive price, hence posing a negative risk on rice producers. Similarly, Hardaker (2004) noted that financial risk occurs when there are unexpected changes or increase in the interest rate on loans. He further revealed that farmers may face risk of inaccessibility of loans or high interest rates. Also results from table shows that 129 rice producers were neutral about the question. “Excess rainfall increase risk” whereas 33 rice producers disagreed. A plausible reason is that, rice production thrives in waterlogged conditions, and in Africa especially Ghana where rice production is rain fed (Oppong-Kyeremeh and Bannor 2018), farmers are uncertain if excess rainfall poses a risk to rice production, when rice needs higher amounts of rainfall to thrive. Nonetheless, a few farmers were of the view that excess rainfall can be a risk to rice production. This is in contrast with an observation made by Mahmood *et al.* (2012) who specified that increase in rainfall pattern has negative impact on rice productivity. Furthermore, (270) of the producers indicated deficit in rainfall is a risk to their rice production venture while (2) farmers extremely disagreed. Deficit in rainfall can be detrimental to rice producers because; generally every plant

requires some amount of water to be able to grow well, however rice needs water in higher amounts because it thrives on relatively high amount of water, hence if there is deficit in rainfall, rice may not be able to survive. In Ghana where rice production is mostly rainfed, deficit in rainfall easily affects production. The results match with the findings of (Subash and Gangwar, 2014), which is in agreement with this perception. With the statement “Pest and diseases increase risk,” 262 farmers extremely agreed, but 8 farmers disagreed. The results correlate with the study of (Choudhary *et al.*, 2015). Similarly Kouame and Komenan (2012) ranked this type of risk among the top two sources of risk in agriculture.

### ***Perception on institutional risk***

With respect to institutional risk faced by rice farmers, analysis from table (6) indicates that 259 rice producers (65.3%) indicated they extremely agree to the perception “changes in technology increases risk” whereas 4 farmers were neutral. In contrast Several studies (Yu *et al.*, 2011; Barrett, 2007; Diao and Hazell, 2004) have shown that agricultural technology adoption does not only reduce the level of poverty but also benefits farmers in terms of generating output market for crop producers. However, in developing countries, it is very difficult to get access to improved technology due to the unavailability of funds for peasant rice producers. This poses a challenge to the local farmers as they are unable to compete with the imported rice brands given the technological changes. Moreover, a colossal number (287) of farmers extremely agreed to the statement “Competition among producers increase risk” while four (4) farmers extremely disagreed. Producers of local rice are often faced with strong competitive forces especially from their affluent peers and commercial farmers who are financially capable to invest and use new methods to process rice. Thus, the local rice producers who are relatively small scale and financially constrained become fragile to compete. Equally Bannor 2017 maintained that commercial farmers are making efforts to produce aromatic rice that can meet the standard of imported rice (Bannor *et al.*, 2017). This will eventually increase competition among local producers and small holder rice farmers who are financially constrained (Salami *et al.*, 2010). The results reveals that 46.3 percent of the farmers agreed low demand for products increases risk while only 2.1 percent disagreed. Likewise Tannng, (2006) noted that, demand for products is likely to vary amongst consumers due to economic related issues and difference in preference. This may be attributed to failure on the part of the producer to communicate with customers making demand for the product more unstable, thus reduction in demand can increase risk (Tang, 2006).

### ***Perception of political related risk***

Table (6) reveals that (31.6%) of rice producers selected “extremely agree” to the statement “Political situation (instability) increases risk” while just a few (3.2%) disagreed. Moreover 104 of the respondents representing 2.3% to agree to the statement “Government laws (policy) increases risk” whereas 8 respondents representing 2.1 percent extremely disagreed. The results are in tandem with a report by Economic Research Service, (2018a, para. 6). Their report revealed



that government law/policy and political related risk includes unexpected changes in laws and agricultural policies, such as environmental regulation. This type of risk can result from “uncertainties emanating from government actions, such as tax laws, regulations for use of chemicals, rules guiding animal waste disposal, and payment of income support. Lastly 263 producers extremely agreed to hire labour risk while 4 farmers disagree and 4 farmers extremely disagree. Increase in labour cost increases cost of production, this increases farmers risk of maximizing profit against budget constraints.

**Table 7:** *The Effect of Branding on Producers risk in the Local Rice Industry in Hohoe Municipality*

Variable	Risk
<i>Socio demographic factors</i>	
Experience	0.08 -0.0932
Income	-0.1388 -0.155
Education	-0.0786 -0.1983
Location	0.0323 -0.1823
<i>Branding variables</i>	
Branding	-0.7988*** -0.207
Variety in prices	0.5946* -0.3427
Type rice of produced	0.2110** -0.0984
_cons	1.8632** -0.7571
R <sup>2</sup>	0.3977
N	59
Standard errors in parentheses * $p < 0.10$ , ** $p < 0.05$ , *** $p < 0.01$	

Source: Field Survey, 2020

---

From Table (7) the coefficient of branding is negative and statistically significant at 1%, this implies that branding of local rice reduces the perceived risk of farmers. This is indicative as many producers do not brand their harvested rice, thereby predisposing them to several risks such as risk of low sales and low prices. With regards to this finding, farmers were of the view that branding help reduce risk. Farmer one, an experienced rice farmer opined that” *nowadays consumers are relatively younger and prefer well packaged aromatic rice. This makes branding a core element in marketing and if only we can brand our locally produced rice we will make desirable sales*”

Similarly farmer two was of the view that “*Modern day buyers are very selective when it comes to rice brands, usually people who buy rice prefer attractive and convenient packaging. For this reason, I think that if we are able to package our rice to the standards required by these buyers, we will increase sales drastically*”. Market research reveals that locally produced rice are categorized into two types, branded and unbranded. The branded rice are usually produced by commercial farmers in larger quantities, which contains are the characteristics preferred by consumers, but are sold for higher prices in supermarkets, malls and through well-organized distribution channels (Andam *et al.*, 2019), on the other hand unbranded local rice which dominates the market are processed using traditional methods (Ayeduvor 2018). Similar to the results, Anholt (2007) emphasized that producers who do not advance a competitive brand will find it tough to win their shares of the world’s consumer market . Also Fournier and Srinivasan (2018) argue that a powerful brand entices new buyers, retain present customers and also helps lessen risk by reassuring broader stock ownership and reducing variability and volatility in future cash flows of producers. Variation in prices also has a positive and significant relationship with producers’ risk. This shows that price variation increases local rice producers’ risk. A possible reason might be that there are different types of rice on the market which commands different prices. More so, it is worth noting that the brands that command relatively higher prices are well branded rice compared to those that are locally produced which are not adequately branded. Hence, local rice producers face the risk of being affected by price variation, since their rice will not receive higher prices in the market. Farmers indicated that, “consumers are willing to pay good prices for well branded rice on the market, but when it comes to locally produced rice consumers are reluctant to pay, although local rice has goodtaste , they spend time wash and remove particles from the rice , which waste their time when cooking. Thus preference for well polished, branded and package rice is becomes a good choice, because it saves them extra time of cooking.” As a result of this consumers would prefer other brands than locally produced brands this makes price of both products vary. Likewise Gunawan *et al.*, (2019) revealed that, the seasonality and perishability nature of agricultural products has significant effects on their price. Furthermore, the type of local rice produced also has a positive relationship with producer’s risk. This implies that, if local producers produce the rice variety which is desired by the retailers and consumers it reduces their risk of purchase, whereas the production of less desired varieties increases risks of low sales or low prices. Farmers indicated that “The type of rice we produce is

aromatic but our traditional ways of processing is seriously affecting us, however we do not have adequate financial capacity to invest into new technology and machinery. Although branding is good our financial constraints usually hinder us, hence we are forced to reduce our prices. Equally Bannor *et al.*, (2017) noted that, due to consumers increasing demand of aromatic rice, efforts are continuously being made by commercial rice producers in Ghana to produce aromatic rice that can meet the standard of imported rice. Nevertheless, income, education, experience and location have no significant relationship with producers' risk. This contradicts the finding of Buabeng (2015) who found education, location and income to have a positive impact on producer's risk.

## CONCLUSIONS

The study examines determinants of branding as a risk mitigation tool among rice producers in the Hohoe municipality of Volta region of Ghana. Majority of rice producers attained at least basic education. The study revealed that a larger number a little above half, (50.5%) of rice producers produced Togo Marshal Rice due to its disease resistance and high yielding nature. Moreover, responses emanating from the study with respect to responses of risk perception show that rice farmers are aware of risks they face and they have adequate knowledge on risk perception. The study found that branding has a major effect on production of local rice in the Hohoe municipality. Thus, it helps to reduce the risk involved in the production of local rice whereas variety in prices and type of rice produced increases producers risk.

## Recommendations

The negative perception on risk is suggestive that insurance companies should strengthen measures to educate rice producers about agricultural insurance to enable them adopt it so they can transfer the numerous risks they face. The study further recommends that farmers should be sensitised and educated about branding this will help them gain competitive advantage in the market. Also, since they are aware of various risks they should adopt insurance packages such as flexa insurance and business interruption insurance to minimize their risks. In addition producers of local rice should embrace improvement in packaging and branding of their produce to help them in mitigating most of the risks they face. The study also recommends that producers should adopt vigorous advertisement of the rice they produce.

## Acknowledgement

Authors are grateful to rice farmers in Hohoe municipality of Volta Region, for dedicating their time and availing their selves for questionnaire administration. Also great thanks to Mr Kofi Gyawu Sarfo of Aberdeen University and Mr Asomah Shadrack of University of Energy and Natural Resources for proofreading and critical review of the paper. Your comments shaped and improved the paper immensely.

---

**References**

- Adnan, K. M., Ying, L., Ayoub, Z., Sarker, S. A., Menhas, R., Chen, F., & Yu, M. M. (2020). Risk management strategies to cope catastrophic risks in agriculture: the case of contract farming, diversification and precautionary savings. *Agriculture*, 10(8), 351.
- Adu-Kwarteng, E., Ellis, W. O., Oduro, I., & Manful, J. T. (2003). Rice grain quality: a comparison of local varieties with new varieties under study in Ghana. *Food Control*, 14(7), 507-514.
- African Development Bank (AfDB). (2016). Feed Africa: Strategy for Agricultural Transformation in Africa, 2016–2025.
- Ahmad, D., Afzal, M., & Rauf, A. (2019). Analysis of wheat farmers' risk perceptions and attitudes: evidence from Punjab, Pakistan. *Natural Hazards*, 95(3), 845-861.
- Aimin, H. (2010). Uncertainty, risk aversion and risk management in agriculture. *Agriculture and agricultural science procedia*, 1, 152-156.
- Alemu, G. M. (2019). Strategic use of branding for competitiveness: the rationale for branding and marketing agricultural products of African countries. *Journal of Fair Trade*, 1(2), 6-13.
- Alhassan, H., Frimpong, T., & Mohammed, A. S. (2015). Do Ghanaian rural consumers prefer imported rice to local rice? Evidence from Akuapem North Municipality. *Applied Research Journal*, 1 (3): 24, 34.
- Amevenku, F. K., Kuwornu, J. K., Seini, A. W., Osei-Asare, Y. B., & Anim-Somuah, H. (2019). Livelihood vulnerabilities and diversification of fishing households in Ghana. *Development in Practice*, 29(7), 867-881. <https://doi.org/10.1080/09614524.2019.1636933>
- Anang, B. T., Bäckman, S., & Sipiläinen, T. (2020). Adoption and income effects of agricultural extension in northern Ghana. *Scientific African*, 7, e00219. <https://doi.org/10.1016/j.sciaf.2019.e00219>
- Andam, K. S., Ragasa, C., Asante, S., & Amewu, S. (2019). *Can local products compete against imports in West Africa? Supply-and demand-side perspectives on chicken, rice, and tilapia in Accra, Ghana* (Vol. 1821). Intl Food Policy Res Inst.
- Anderson-Cook, C. M. (2006). Quantitative Risk Management: Concepts, Techniques, and Tools. Alexander J. McNeil, Rudiger Frey, and Paul Embrechts. *Journal of the American Statistical Association*, 101, 1731-1732
- Anholt, S. (2007). Competitive identity, policy and practice. *A Development Education Review*, 4, 3-13.
- Arens, William F. *Contemporary advertising*. Tata McGraw-Hill Education, 2002.
- Arthur, R., Baidoo, M. F., & Antwi, E. (2011). Biogas as a potential renewable energy source: A Ghanaian case study. *Renewable Energy*, 36(5), 1510-1516.
- Ayeduvor, S. (2018). *Assessing quality attributes that drive preference and consumption of local rice in Ghana* (Vol. 48). Intl Food Policy Res Inst.

- 
- Bannor, R. K., Oppong-Kyeremeh, H., & Adjei-Addo, E. (2017). Improving the income of small scale rice producers through outgrower scheme in the volta region of Ghana. *Indian Journal of Economics and Development*, 13(2a), 584-590.
- Barrett, C. B. (2010). Smallholder market participation: Concepts and evidence from eastern and southern Africa. *Food security in Africa*
- Begg, J. E., & Turner, N. C. (1976). Crop water deficits. *Advances in agronomy*, 28, 161-217.
- Boansi, D., & Favour, R. M. (2015). Why the persistent increase in Ghana's rice imports? Prescriptions for future rice policy. *Asian Journal of Agricultural Extension, Economics & Sociology*, 1-21.
- Bobby, J.C., Mark L.F., (2019). *The Financial Value of Brand*.
- Boyer, J. S., & McPherson, H. G. (1975). Physiology of water deficits in cereal crops. In *Advances in Agronomy* (Vol. 27, pp. 1-23). Academic Press.
- Breen, B., Hennessy, T., Donnellan, T., & Hanrahan, K. (2013). Tools and polices for agricultural risk management.
- Chaudhary, A., & Kastner, T. (2016). Land use biodiversity impacts embodied in international food trade. *Global Environmental Change*, 38, 195-204.
- Cunningham, M. S. (1967). The major dimensions of perceived risk. *Risk taking and information handling in consumer behavior*.
- Dapaah Opoku, P., Bannor, R.K. and Oppong-Kyeremeh, H. (2020), "Examining the willingness to produce organic vegetables in the Bono and Ahafo regions of Ghana", *International Journal of Social Economics*, Vol. 47 No. 5, pp. 619-641. <https://doi.org/10.1108/IJSE-12-2019-0723>
- Diabat, A., Govindan, K., & Panicker, V. V. (2012). Supply chain risk management and its mitigation in a food industry. *International Journal of Production Research*, 50(11), 3039-3050.
- Diao, X., and Hazell, P. (2004). Exploring market opportunities for African smallholders. Technical report, International Food Policy Research Institute (IFPRI)
- E. M. Kwofie, M. Ngadi, and A. Mainoo, "Local rice parboiling and its energy dynamics in Ghana," *Energy for Sustainable Development*, vol. 34, pp. 10–19, 2016.
- Fahad, S., Wang, J., Khan, A. A., Ullah, A., Ali, U., Hossain, M. S., ... & Bilal, A. (2018). Evaluation of farmers' attitude and perception toward production risk: Lessons from Khyber Pakhtunkhwa Province, Pakistan. *Human and Ecological Risk Assessment: An International Journal*, 24(6), 1710-1722.
- Fournier, S. and Srinivasan, S., 2018. Branding and the risk management imperative. *Marketing Intelligence Review*, 10(1), pp.10-17.
- Girdžiūtė, L. (2012). Risks in agriculture and their assessment methods. In *Proc. Annual 18th International Scientific Conference Research for Rural Development* (pp. 197-202).

- Gunawan, E., Kuwornu, J.K.M., Datta, A. and Nguyen, L.T. (2019), "Factors influencing farmers' use of the warehouse receipt system in Indonesia", *Agricultural Finance Review*, Vol. 79 No. 4, pp. 537-563. <https://doi.org/10.1108/AFR-11-2018-0099>
- Hazell, P., & Diao, X. (2004). Exploring market opportunities for African smallholders. In *2020 Africa Conference Brief* (Vol. 6).
- Holzmann, R., & Jørgensen, S. (2001). Social risk management: A new conceptual framework for social protection, and beyond. *International Tax and Public Finance*, 8(4), 529-556. <https://doi.org/10.1126/science.1204531>
- Harčariková, M. (2018). Managing price risk in the corn market using option strategies. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis*, 66(3), 767-779.
- Ikporah, E. N. (2012). Branding strategy for effective agricultural marketing in Nigeria. *MBA Thesis*.
- International Food Policy Research Institute (IFPRI). 2020. Ghana's rice market. MoFA-IFPRI Market Brief 2. Washington, DC: International Food Policy Research Institute (IFPRI). <https://doi.org/10.2499/p15738coll2.133697>
- Iqbala, M. A. (2017). Risk perceptions and management strategies of rice growing households: Evidence from a developing country. *J. Appl. Environ. Biol. Sci*, 7(3), 15-26.
- Itani, T., Tamaki, M., Arai, E., & Horino, T. (2002). Distribution of amylose, nitrogen, and minerals in rice kernels with various characters. *Journal of Agricultural and Food Chemistry*, 50(19), 5326-5332. <https://doi.org/10.1021/jf020073x>
- Jarh, A. K., Asiedu, S. Y., Azaglo, J. O., & Lavoe, R. (2020). ASSESSMENT OF QUALITY OF PARBOILED JASMINE AND TOGO MARSHALL RICE GROWN IN THE HOHOE MUNICIPALITY OF VOLTA REGION, GHANA. *European Journal of Social Sciences Studies*, 5(4). <http://dx.doi.org/10.46827/ejsss.v5i4.898>
- Kahan, D. (2013). *Market-oriented farming: An overview*. Food and Agriculture Organization of the United Nations.
- Keller, K.L. and Lehmann, D.R. (2006). *Brands and branding: Research findings and future priorities*. *Marketing science*, 25(6), pp.740-759.
- Kothari, C.R., (2004). *Research methodology: Methods and techniques*. New Age International
- Kotler, P. et al. (1999). *Principles of Marketing*, 2nd Edition, Europe: Prentice Hall.
- Kouame, E. B., & Komenan, A. (2012). Risk preferences and demand for insurance under price uncertainty: An experimental approach for cocoa farmers in Côte d'Ivoire. *ILO Microinsurance Innovation Facility Research Paper*, 13.
- Lebel, L., Lebel, P., Chitmanat, C., Uppanunchai, A., & Apirumanekul, C. (2018). Managing the risks from the water-related impacts of extreme weather and uncertain climate change on inland aquaculture in Northern Thailand. *Water International*, 43(2), 257-280. <https://doi.org/10.1080/02508060.2017.1416446>



- Lobell, D. B., Schlenker, W., & Costa-Roberts, J. (2011). Climate trends and global crop production since 1980. *Science*, 333(6042), 616-620. <https://doi.org/10.1126/science.1204531>
- Manley, B., & Watt, R. (2009). *Forestry insurance, risk pooling and risk minimisation options*. Ministry of Agriculture and Forestry.
- Mensah, N. O. (2017). *Risk perception and agricultural insurance development strategy for cashew crop farmers in the Brong-Ahafo region of Ghana* (Doctoral dissertation).
- Mensah, N.O., Amrago, E.C., Asare, J.K., Donkor, A., Tutu, F.O. and Ansah, E.O. (2021), "Perception and willingness to contribute towards food banking in the Ashanti Region of Ghana", *International Journal of Social Economics*, Vol. ahead-of-print No. ahead-of-print. <https://doi.org/10.1108/IJSE-08-2020-0576>
- Mensah, N.O., Amrago, E.C., Mensah, E.T.D., Asare, J.K. and Anang, S.A. (2021), "Prospects, determinants and profitability of aquaculture insurance among fish farmers in the Eastern Region of Ghana", *World Journal of Science, Technology and Sustainable Development*, Vol. ahead-of-print No. ahead-of-print. <https://doi.org/10.1108/WJSTSD-02-2021-0018>
- Mensah, N.O., Twintoh, J.J., Amrago, E.C., Donkor, A. and Anang, S.A. (2021), "Forestry insurance preference among tree growers in the Ashanti Region of Ghana: a tobit and multi-nomial regression approach", *Managerial Finance*, Vol. ahead-of-print No. ahead-of-print. <https://doi.org/10.1108/MF-10-2020-0535>
- Mitchell, V. (1998), "A role for consumer risk perceptions in grocery retailing", *British Food Journal*, Vol. 100 No. 4, pp. 171-183. <https://doi.org/10.1108/00070709810207856>
- Mgale, Y. J., & Yunxian, Y. (2021). Price risk perceptions and adoption of management strategies by smallholder rice farmers in Mbeya region, Tanzania. *Cogent Food & Agriculture*, 7(1), 1919370.
- MoFA-IFPRI Market Brief No. 2 | April 2020*: <https://www.ifpri.org/publication/ghanas-rice-market> (Accessed on 01/ 05/ 2021) <https://doi.org/10.2499/p15733coll2.133697>
- MOFA (Ministry of Food and Agriculture), Agriculture in Ghana. Facts and figures (2014). Statistics, Research and Information Directorate (SRID), MoFA, Accra, 2015.
- Nwanze, K.F, Mohapatra, S., Kermawa, P., Keya, S. and BruceOliver, S. (2006). *Perspective: Rice development in sub-Saharan Africa*. *Journal of the Science of Food and Agriculture* (86):675 –677
- Ojo, T. O., Ogundeji, A. A., Babu, S. C., & Alimi, T. (2020). Estimating financing gaps in rice production in Southwestern Nigeria. *Journal of Economic Structures*, 9(1), 12. <https://doi.org/10.1186/s40008-020-0190-y>
- Oppong-Kyeremeh, H., & Bannor, R. K. (2018). Off-Farm Job as Climate Change Adaptation Strategy for Small Scale Rice Producers in the Volta Region of Ghana. *Journal of Energy and Natural Resource Management (JENRM)*, 1(2).
- Oppong-Kyeremeh, H., Creppy, P., & Bannor, R. K. (2019). Marketing outlets choice modelling for commercialisation analysis of smallholder rice producers in Ghana. *International Journal of Value Chain Management*, 10(2), 162-179.

- Perreault, W. D., & McCarthy, E. J. (2002). *Basic marketing: A global managerial approach*. McGraw-Hill/Irwin.
- Pingali, P. L. (1997). From subsistence to commercial production systems: The transformation of Asian agriculture. *American journal of Agricultural economics*, 79(2), 628-634.
- Quarshie and Fraser 2021: Ghana's rice farmers need finance for new technologies, but banks don't trust them: <https://theconversation.com/ghanas-rice-farmers-need-finance-for-new-technologies-but-banks-dont-trust-them-167924> (Assessed on 21/10/2021)
- Pingali, P. L., & Rosegrant, M. W. (1995). Agricultural commercialization and diversification: processes and policies. *Food policy*, 20(3), 171-185.
- Ragasa, C., Dankyi, A., Acheampong, P., Wiredu, A.N., Chapoto, A., Asamoah, M. and Tripp, R., 2013. Patterns of adoption of improved rice technologies in Ghana. *International Food Policy Research Institute Working Paper*, 35, pp.6-8.
- Rizwan, M., Ping, Q., Saboor, A., Ahmed, U. I., Zhang, D., Deyi, Z., & Teng, L. (2020). Measuring rice farmers' risk perceptions and attitude: Evidence from Pakistan. *Human and Ecological Risk Assessment: An International Journal*, 26(7), 1832-1847.
- Velandia, M., Rejesus, R. M., Knight, T. O., & Sherrick, B. J. (2009). Factors affecting farmers' utilization of agricultural risk management tools: the case of crop insurance, forward contracting, and spreading sales. *Journal of agricultural and applied economics*, 41(1), 107-123.
- Salami, A., Kamara, A. B., & Brixiova, Z. (2010). *Smallholder agriculture in East Africa: Trends, constraints and opportunities*. Tunis: African Development Bank.
- Schaffnit-Chatterjee, C., Schneider, S., Peter, M., & Mayer, T. (2010). Risk management in agriculture. *Deutsche Bank Reseach*. Sept.
- Sedem Ehiakpor, D., Apumbora, J., Danso-Abbeam, G., & Adzawla, W. (2017). Households' preference for local rice in the Upper East region, Ghana. *Advances in Agriculture*, 2017.
- Sedgwick, P. (2013). Convenience sampling. *Bmj*, 347.
- Sefcik, S. E., & Thompson, R. (1986). An approach to statistical inference in cross-sectional models with security abnormal returns as dependent variable. *Journal of Accounting Research*, 316-334.
- Social protection, and beyond. *International Tax and public Finance* 8:529-556.
- Stevens, J. P. (2002). *Applied multivariate statistics for the social sciences*. Mahwah, USA: Lawrence Erlbaum Associates.
- Stevens, J. P. (2012). *Applied multivariate statistics for the social sciences*. Routledge.
- Subash, N., & Gangwar, B. (2014). Statistical analysis of Indian rainfall and rice productivity anomalies over the last decades. *International Journal of Climatology*, 34(7), 2378-2392.
- Tang, C. S. (2006). Perspectives in supply chain risk management. *International journal of production economics*, 103(2), 451-488.
- Tangermann, S. (2011). Risk management in agriculture and the future of the EU's Common Agricultural Policy. *Issue paper*, 34.

- Tomlins, K. I., Manful, J. T., Larwer, P., & Hammond, L. (2005). Urban consumer preferences and sensory evaluation of locally produced and imported rice in West Africa. *Food quality and preference*, 16(1), 79-89.
- Tong, Q., Swallow, B., Zhang, L., & Zhang, J. (2019). The roles of risk aversion and climate-smart agriculture in climate risk management: Evidence from rice production in the Jiangnan Plain, China. *Climate Risk Management*, 26, 100199.
- Tong, Q., Swallow, B., Zhang, L., & Zhang, J. (2019). The roles of risk aversion and climate-smart agriculture in climate risk management: Evidence from rice production in the Jiangnan Plain, China. *Climate Risk Management*, 26, 100199.
- Williams, B., Onsmann, A., & Brown, T. (2010). Exploratory factor analysis: A five-step guide for novices. *Australasian journal of paramedicine*, 8(3).
- Yu, B., Nin-Pratt, A., Funes, J., & Gemessa, S. A. (2011). *Cereal production and technology adoption in Ethiopia* (Vol. 31). Internat. Food Policy Research Inst.
- Zhou, Z., Robards, K., Helliwell, S. and Blanchard, C. (2002). *Composition and functional properties of rice*. *International Journal of Food Science and Technology*, (37): 849 –868

## Appendix

**Table A1:** Kaiser-Meyer-Olkin test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.764
Bartlett test of sphericity	Approx. chi –square	1416.599
	Df	159
	Significance	0.000***

Note(s): 1% significance =\*\*\*

Source(s): Author construct based on field data, 2020

H0: Variables are not intercorrelated

H1: Variables are intercorrelated

**Table A2:** Names of extracted factors

Variable	Explanation	Proportion	Cumulative
<b>Factor 1: Perception on Price and environmental risk</b>		0.237 (23.7%)	0.237 (23.7)
F1	Variability in Price		
F2	Interest rate		
F3	Excess rainfall		
F4	Deficit in rainfall		
F5	Pest and diseases		
<b>Factor 2: Perception on institutional risk</b>		0.168 (16.8%)	0.406(40.6%)
F6	Changes in Technology		
F7	Competition		
F8	Low demand for product		
<b>Factor 3: Perception of political related risk</b>		0.154(15.4%)	0.560(56.0%)
F9	Political situation		
F10	Government laws		
F11	Hired labour		

**Source:** Authors construct based on field data, 2020

**Table A3:** Rotated factor loadings

Variable	Factor components		
	Factor 1	Factor 2	Factor 3
F1	0.790		
F2	0.903		
F3	0.827		
F4	0.911		
F5	0.709		
F6		0.772	
F7		0.806	
F8		0.910	
F9			0.818
F10			0.848
F11			0.637

Source(s): field data, 2020

Note(s): Using 0.60 as cut off point , the rotation matrix was used to name the factors

**Table A4:** Scale of reliability coefficient

Risk perception	Number of items	Cronbach's alpha
Perception on Price and environmental risk	5	0.84
Perception on institutional risk	3	0.87
Perception of political related risk	3	0.82
Total		0.88

Source(s): field data, 2020