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Email: [editorinchief@aesonnigeria.org](mailto:editorinchief@aesonnigeria.org); [agricultural.extension.nigeria@gmail.com](mailto:agricultural.extension.nigeria@gmail.com)

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## Food Safety Practices of Maize Farmers in Taraba State, Nigeria

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### Agou, Gabriel Daniel

Department of Agriculture,  
Alex Ekwueme Federal University, Ndufu Alike, Ikwo,  
Email: [aguogabriel@gmail.com](mailto:aguogabriel@gmail.com)  
Phone: +2348160943162  
ORCID: <http://orcid.org/0000-0003-4039-9493>

### Onwubuya, Elizabeth Amaechi

Department of Agricultural extension  
Faculty of Agriculture,  
University of Nigeria, Nsukka.  
Email: [elizabeth.onwubuya@unn.edu.ng](mailto:elizabeth.onwubuya@unn.edu.ng)  
Phone no. +234805033860  
ORCID: <https://orcid.org/0000-0002-9832-9431>

### Agwu, Ekwe Agwu

Department of Agricultural extension,  
Faculty of Agriculture,  
University of Nigeria, Nsukka  
Email: [ekwe.agwu@unn.edu.ng](mailto:ekwe.agwu@unn.edu.ng)  
Phone no. +2348034024251  
ORCID: <https://orcid.org/0000-0002-6842-0955>

### Chah, Jane Mbolle

Department of Agricultural extension,  
Faculty of Agriculture,  
University of Nigeria, Nsukka  
Email: [jane.chah@unn.edu.ng](mailto:jane.chah@unn.edu.ng)  
Phone No. +2348032420600  
ORCID: <https://orcid.org/0000-0001-9144-1845>

### Olaolu, Michael Olatunji

Department of Agriculture,  
Faculty of Agriculture  
Alex Ekwueme Federal University,  
Ndufu-Alike, Ikwo,  
Ebonyi state, Nigeria.  
Email: [michealolaolu@yahoo.com](mailto:michealolaolu@yahoo.com)  
Phone no. +2348065489702  
ORCID: <https://orcid.org/0000-0001-7819-4675>

### Izuogu, Chibuzo Uzoma

Department of Agriculture,  
Faculty of Agriculture  
Alex Ekwueme Federal University,  
Ndufu-Alike, Ikwo,  
Ebonyi state, Nigeria.  
Email: [chibuzoizuogu@gmail.com](mailto:chibuzoizuogu@gmail.com)  
Phone no. +23480669 03334  
Orcid: <https://orcid.org/0000-0002-4792-5081>

### Njoku, Loveday Chukwudi

Department of Agriculture,  
Faculty of Agriculture  
Alex Ekwueme Federal University,  
Ndufu-Alike, Ikwo,  
Ebonyi state, Nigeria.  
Email: [chukzy41980@gmail.com](mailto:chukzy41980@gmail.com)  
Phone no. +2347064749413  
ORCID: <https://orcid.org/0000-0003-1205-8720>

### Obazi, Sunday Alagba

Department of Agricultural extension,  
Faculty of Agriculture,  
University of Nigeria, Nsukka  
Email: [sunday.obazi@unn.edu.ng](mailto:sunday.obazi@unn.edu.ng)  
Phone no. +2348067839018  
ORCID: <https://orcid.org/0000-0003-4597-3255>

### Inyang, Paul

Department of Agriculture,  
Faculty of Agriculture  
Alex Ekwueme Federal University,  
Ndufu-Alike, Ikwo,  
Ebonyi state, Nigeria.  
Email: [paulinyang@yahoo.com](mailto:paulinyang@yahoo.com)  
+2347059596856  
ORCID: <https://orcid.org/0000-0002-0561-3792>  
Submitted: 29<sup>th</sup> July, 2023.  
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Agou, Gabriel Daniel. Onwubuya, Elizabeth Amaechi and Agwu, Ekwe Agwu: Conceptualization of the study objectives, literature search, methodology and design of the instrument for the study.

Chah, Jane. M. Olaolu, M. O, and Izuogu, C. U: Data curation, analysis and discussion.

Njoku, Loveday Chukwudi, Obazi, Sunday Alagba and Inyang Paul: editing, reviewing.

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## Abstract

*The study evaluated the food safety practices of maize farmers in Taraba state, Nigeria and employed multistage sampling procedure to select one-hundred and fifty-six respondents from six local government areas of Taraba State. Results were analyzed using frequency, percentage, mean and multiple regression model. Findings revealed that 56.4% of the respondents were male, 35.9% were between the ages of 28 and 37 years and had the annual income of ₦123,108.87. Use of organic agricultural methods in maize production ( $\bar{x}=2.42$ ), not allowing animals marching through maize sprayed on a sheet and not drying of maize on dirty/filthy tarpaulins ( $\bar{x}=2.00$ ) were the correct food safety practices used by the farmers while leaving maize to dry along the roadside on a bare ground ( $\bar{x}=1.77$ ) was one of the wrong food safety practices. Family (58.3%), fellow farmers (54.1%), public sanitary and health authorities (53.2%) were sources of information on maize food safety practices by the respondents. Poor enforcement of food safety policies ( $\bar{x}=2.13$ ) was a constraints to food safety practices. Age ( $p=0.090$ ) and farm size ( $p=0.087$ ) were factors influencing food safety practices of the respondents. The study concludes that the maize farmers practiced poor food safety practice of leaving maize to dry along the roadside on a bare ground and recommends that farmers should be well educated about the danger associated with poor food safety practice.*

## Introduction

The global maize production in 2020 was estimated to be 1,162 million thousand tons. This indicates that the world experienced a rapid increase in maize production from 313 million thousand tonnes in 1971 to 1,162 million thousand tonnes in 2020 at the annual rate of 3.06% as confirmed by Knoema (2022). According to FAOStat (2021), global maize food consumption was estimated at 18.5kg/capita/year, 11% of the annual cereal human consumption, excluding beverages. Africa produced 87 million tons of maize in 2018 (Knoema, 2021). Maize is consumed above wheat and rice as more than 300 million Africans rely on it as their primary source of food and nutritional staple (Food and Agriculture Organization, 2020).

Production of maize in Nigeria was valued to be 12 million metric tons in 2020 as against 12.7 metric tons in 2019 accounting for 33% of total household food

consumption in Nigeria with an estimated consumption rate of 10,350 metric tons in 2020 (IndexMundi, 2021). The Northern states of Nigeria particularly Kano, Kaduna, Bauchi, Gombe, Adamawa, Taraba, Jigawa and Taraba has been among the top maize producing states in Nigeria with production increasing from 1977-2006 to 444.4 metric tons in 2006 (Knoema, 2022).

Maize is widely consumed in Taraba State as hot and cold pap, '*tuwo*,' '*masa*,' '*couscous*,' '*gwarte*,' '*nakia*,' '*dakuwa*,' '*dambu*,' '*abba*,' '*kunu*,' '*Burukwutu*,' boiled and roasted maize, and popcorn (Onu, et al. 2019). However, the harmful practices that compromise the safety of maize grains include: excessive use of inorganic fertilizer and herbicides; the use of pesticides on stored maize grains and chemical treated sacs; smoking of grains, as well as farmers leaving maize in the field or in an open space around the farmer's house or along the sides of the major roads; and either on bare ground or on unclean spraying sheets which is unhygienic (Tibaingana, et al. 2022). Therefore, proper handling of maize products by maize farmers plays a significant role in maintaining the safety of maize across the supply chain for guaranteeing the safety of consumers (Didier, et al. 2020). This is important because, safety measures prevent food from being contaminated which is capable of causing foodborne diseases among many households and other consumers (Adrian, 2021). Therefore, considering the importance of maize and how its safety ensures safety of consumers, the research sought to evaluate food safety practices of maize farmers. The specific objectives were to: ascertain maize farmers' food safety practices; identify sources of information on food safety; identify the constraints to food safety practices and to determine factors influencing food safety practices of maize farmers.

## **Methodology**

The study area was Taraba State which is a state in Nigeria's north-east and is located between latitudes 6<sup>0</sup>30' and 8<sup>0</sup>30' North of the equator and longitudes 9<sup>0</sup>00' and 12<sup>0</sup>00 East of the Greenwich Meridian. The state has 54,473km<sup>2</sup> and a population of 2,294,800 people with 16 Local Government Areas, with Jalingo serving as the state capital. Majority of the inhabitants of the state cultivate crops such as maize, rice, sorghum, millet, cassava, and yam but maize is widely grown surpassing other crops and serving as the main staple.

All maize farmers in Taraba state were the target population for the study. Multistage sampling procedure was used to select respondents for the study. A purposive sampling technique was used to select two local government areas in each of the three senatorial zones based on their prominence in maize production. The selected local government arrears were: Wukari; Ibi; Gassol; Bali; Ardo Kola and Jalingo. Two rural communities were purposively selected from each of the selected local government area based on their prominence in maize production using a purposive sampling technique, giving a total of twelve rural communities. Thirteen maize farmers were purposively chosen from each of the selected rural community based on their involvement in maize cultivation totalling one hundred and fifty-six (156) respondents for the study. The interview schedule was used to gather information from the respondents which was divided into specific objectives of the study.

Information on the socio-economic characteristics of the maize farmers was sought on the following variables: Sex, age, educational level, household size, Membership of social organization, farming experience, farm size, access to credit facilities, extension visits and annual income.

The food safety practices of maize farmers in maize production, storage and processing were ascertained. Maize farmers were given a total of twenty-four (24) positive and negative food safety practice statements to rate on a 5-point Likert-type scale of always (4) often (3) sometimes (2) rarely (1) never (0) with a mean score of 2.0. Furthermore, the mean was used to categorize farmers' food safety practices into: poor practice (0-2.0) and good practice (2.1-4.0) and each good practice received a score of '1', whereas the poor practice received a score of '0.' The food safety practice score was then used as dependent variable to determine factors influencing food safety practices of the farmers.

The sources used by maize farmers to obtain information about food safety practices were identified. A list of 15 agricultural information sources was supplied to identify the sources. Each option asked respondents to select 'yes' or 'no,' with a score of one (1) for yes and zero (0) for no.

The maize farmers' perceived constraints to food safety in maize cultivation, storage, and processing were identified. Respondents were given a list of 21 constraint statements to score on a 5-point Likert-type scale of extremely (4) very (3) moderately (2) slightly (1) not at all (0) with a mean score of 2.0. Therefore, variables with a mean score  $\geq 2.0$  were considered constraints while variables with  $< 2.0$  were not. The data collected were analyzed using frequency, percentage, mean, and multiple regression model.

## **Results and Discussion**

### **Food safety practices of maize farmers**

Data in Table 1 shows that the respondents always practiced use of organic agricultural methods in maize production ( $\bar{x}=2.42$ ); not allowing animals marching through maize sprayed on a sheet ( $\bar{x} = 2.33$ ); and not drying of maize on dirty/filthy tarpaulins ( $\bar{x} = 2.00$ ). The results also reveal that poor food safety practices such as leaving maize to dry by the roadside on a bare ground ( $\bar{x}=1.77$ ); excess application of fertilizer ( $\bar{x}=1.60$ ), using chemical bags for bagging maize ( $\bar{x}=1.33$ ), applying pesticides on stored maize ( $\bar{x}=1.77$ ) and not processing in a dirty environment ( $\bar{x}=1.01$ ). The poor food safety practices could be caused by unfavourable attitudes and an inability to put food safety information into practice (Tuglo, et al. 2021).

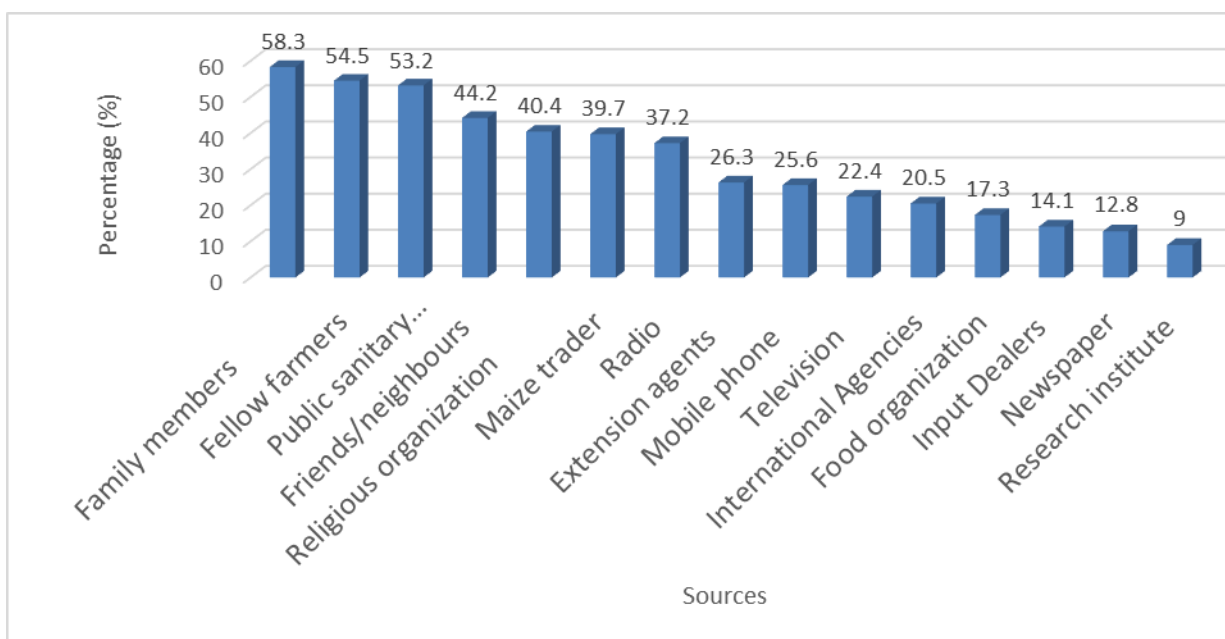
**Table 1: Maize farmers' food safety practices**

<b>Food safety practices</b>	$\bar{x}$	<b>S.D</b>
<b>Production</b>		
Using organic agricultural methods in maize production	2.42	1.52
Not allowing animals marching through maize sprayed on a sheet	2.33	1.64
Not drying of maize on dirty/filthy tarpaulins	2.00	1.53
Not following direction of use before application of chemicals	1.96	1.62
Leaving maize to dry along the roadside on a bare ground	1.77	1.35
Allowing Children to play and throw debris on sprayed maize	1.69	1.49
Excess application of fertilizer	1.60	1.40
Harvesting of maize at the right time	1.17	1.12
<b>Storage</b>		
Not applying pesticides on stored maize	1.77	1.27
Using erected platform for storage	1.55	1.24
Using trap or domesticate animals to chase away rodents during storage	1.41	1.23
Regularly inspecting maize during storage	1.35	1.13
Using chemical bags for bagging maize	1.33	1.39
Avoid the use smoke for drying maize grains	1.23	1.31
Allow ventilation during storage	1.12	1.15
Ensuring that maize flour is properly covered after processing	0.69	0.97
Correctly drying of maize before storage	0.62	0.97
<b>Processing</b>		
Not grinding maize along with the spoilt seeds	1.21	1.29
Processing must not be done in a dirty environment	1.01	1.14
Properly winnow maize before selling	1.00	1.11
Washing of garment frequently worn during processing/grinding	0.96	1.16
Properly winnow maize before grinding	0.81	0.98
Washing of hands after toilet during processing and preparation	0.81	1.04
Observing environmental hygiene during and preparation	0.75	1.23

**Source:** field survey, 2022, Cut-off points of 2.0,  $\geq 2$  correct practices and  $< 2.0$  poor practices

#### **Sources of information by the farmers on food safety**

Figure 1 reveals that majority of the farmers cited family (58.3%), fellow farmers (54.1%), public sanitary and health authorities (53.2%) as their primary sources of information on maize food safety practices. This suggests that family, fellow farmers and public sanitary/health authorities were the major sources of food safety practices among maize farmers and this agrees with Raimi, et al. (2020).



**Figure 1: Sources of information by the farmers on food safety**

### **Maize farmers' constraints to food safety practices**

Table 2 shows that major constraints were lack of smoking leading to grains maize spoilage ( $\bar{x}=2.55$ ), nonchalant attitude of the health officers towards food safety ( $\bar{x}=2.29$ ), social conflicts that have resulted to displacement ( $\bar{x}=2.26$ ) and poor enforcement of food safety policies ( $\bar{x}=2.13$ ). The nonchalant attitude might be linked to weak governance, insufficient funds, a lack of human resources for health enforcement, and a shortage of both essential and important drugs (Favour-Klingbeil and Todd, 2019; Muanya, et al., 2021). The weak institution and poor enforcement of food safety policies by relevant government agencies such as National Agency for Food, Drug Administration and Control, extension service, research institutes, federal and state ministries of health and agriculture is supported in the review of Gizaw (2019). Not Using chemicals for storage reduces the shelf-life of maize grains ( $\bar{x}=2.05$ ). Lack of institutional support from extension workers or public officials was another constraint to food safety practices ( $\bar{x}=2.03$ ) and price fluctuations in agricultural goods ( $\bar{x}=2.02$ ). Utiya, Gummi, Hassan, Maria, Abubakar, and Zoranmawa (2020) reported that price changes affect farmers' product safety practices in Sokoto State.

**Table 2: Constraints to food safety practices encountered by the maize farmers**

<b>Constraints</b>	<b><math>\bar{x}</math></b>	<b>S.D</b>
Lack of smoking leads to grains maize spoilage	2.55*	1.53
Nonchalant attitudes of the health officers towards food safety	2.29*	1.19
Social conflicts that have resulted to displacement of farmers	2.26*	1.30
Poor enforcement of food safety policies	2.13*	1.22
Not Using chemicals for storage reduces the shelf-life of maize grains	2.05*	1.27
Weak institutional support services by extension workers/public officers	2.03*	1.15
Fluctuation in prices mostly affects our decision to properly store maize	2.02*	1.30
The volume of our farm produce may not allow food safety practices	1.94	1.31
Moulds will grow without applications of pesticides on stored maize	1.91	1.22
Good storage facility is sometimes hard to construct	1.89	1.19
Inadequate tarpaulins to allow maize grains dry properly before bagging	1.89	1.11
Lack of sensitization and campaigns on food safety	1.88	1.23
Not applying chemicals during storage allow rodents to destroy maize	1.84	1.18
Low knowledge on food safety	1.72	1.01
Low income from agricultural activities	1.71	1.06
Use of chemicals to control weeds is faster than using hand weeding	1.68	1.04
Processing activities along with observing food safety is time consuming	1.66	1.14
Lack of relevant skills on food safety practices	1.63	1.01
Poor access to credit facilities	.55	0.91
Inadequate finance for use to procure modern processing equipment	1.55	0.10
Lack of finance to construct modern storage facility	1.50	0.98

**Source:** Field survey, 2022, \*Constraint to food safety practices, (Cut-off point of 2.0)

### **Factors Influencing Food Safety Practices of Maize Farmers**

Table 3 shows that the age of maize farmers ( $p=0.090$ ) influenced their food safety practices. The finding conflicts with that of Awoyemi, et al. (2019) and the negative coefficient implies that as respondents' age increased, their food safety procedures deteriorated. The construction of modern storage facilities, use of modern processing equipment, proper application of fertilizer and chemicals, avoidance of roadside sun drying, and use of organic manures are practices that younger farmers are more likely to follow than the aged farmers who might not have the strength needed.

Farm size ( $p=0.087$ ) was significant and positive at 10% level as a factor influencing food safety practices of maize farmers. The positive coefficient implies that farmers with large farm size observed food safety practices than farmers with smaller farm size and this could probably be due to the fact that farmers with large farm size have higher farm income that could enable them build modern storage and processing facilities, buy new tarpaulins for drying maize, use soil friend chemicals and access extension training for effective food safety practices Haruna, et al. (2023).



**Table 3: Factors influencing food safety practices of maize farmers**

Independent Variables	Unstandardized Coefficients		Standardized Coefficients	T	p-values
	B	Std. Error	Beta		
<b>(Constant)</b>	<b>4.840</b>	<b>1.105</b>		<b>4.380</b>	<b>0.000</b>
Sex of the respondents	-0.098	0.469	-0.018	-.209	0.835
Age of the respondents	-0.055	0.033	-0.228	-1.705	0.090*
Household size	0.090	0.074	0.116	1.213	0.227
Farm size	0.176	0.102	0.178	1.723	0.087*
Member of any social org	-0.288	0.619	-0.039	-0.465	0.643
Farming experience	0.047	0.033	0.186	1.417	0.159
Annual income of the farmers	-1.740e-006	0.000	-0.053	-0.579	0.564
Access to credit facilities	0.117	0.487	0.021	0.239	0.811
Extension visit in the last one year	0.094	0.405	0.020	0.233	0.816

**Source:** Field survey, 2022, \*Significant at 10%.

### Conclusion and Recommendation

Despite the importance of maize safety in preventing foodborne diseases in consumers, the study concludes that maize farmers observed poor food safety practices of leaving maize to dry along the roadside on bare ground. and recommends. The use of organic methods, not allowing animals to march through maize sprayed, and not drying maize on dirty/filthy tarpaulins were major safety practices. Factors that influenced the use of the practices were farm size and the age of the farmers. The government should set up initiatives to educate farmers about the dangers associated with drying maize on bare ground as well as encourage the use of safety practices among farmers of different age grades.

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