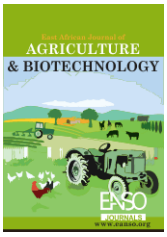
East African Journal of Agriculture and Biotechnology, Volume 5, Issue 1, 2022
Article DOI: https://doi.org/10.37284/eajab.5.1.532



**East African Journal of Agriculture and Biotechnology**
eajab.eanso.org
**Volume 5, Issue 1, 2022**
**p-ISSN: 2707-4293 | e-ISSN: 2707-4307**
Title DOI: https://doi.org/10.37284/2707-4307

EAST AFRICAN NATURE & SCIENCE ORGANIZATION

*Original Article*

# Determinants of Maize Production Income in Western Uganda.

*Midamba Dick Chune*

[1] Gulu University, P. O. Box 166, Gulu, Uganda.
* Author for Correspondence ORCID ID: https://orcid.org/ 0000-0003-4467-419X; Email: midambadick@gmail.com.

**Article DOI: https://doi.org/10.37284/eajab.5.1.532**

**Date Published:**

*18 January 2022*

**Keywords**:

*Maize, Low Income, Ordinary Least Squares, Farmers Training, Uganda*

## ABSTRACT

Many smallholder farmers produce maize for both consumption and income purposes. Despite the role played by maize, its income production is low, especially in developing countries. In order to formulate policies targeting maize productivity, it was necessary to have knowledge of the determinants of maize production income. As such, this study aimed at determining the level of income and its determinants from maize farmers. Consequently, data was collected from 220 maize farmers using structured questionnaires. The ordinary least squares model was used to determine the determinants. The results showed that the farmers earned a mean of 372,207 Ugandan shillings (105.18 USD) from maize production. Accordingly, farm size, access to credit and household size had a significant positive influence on income from maize production, while gender (female) of the household heads had a significant negative relationship with income from maize production. It is based on these results that this study recommended that the government should offer training programs targeting female-headed households. These trainings should incorporate farm production as well as marketing. Additionally, farmers should be encouraged to access various sources of agricultural credit including financial institutions that offer agricultural loans at low-interest rates.

**APA CITATION**

Chune, M. D. (2022). Determinants of Maize Production Income in Western Uganda. *East African Journal of Agriculture and Biotechnology*, *5*(1), 1-13. https://doi.org/10.37284/eajab.5.1.532

**CHICAGO CITATION**

Chune, Midamba Dick. 2022. "Determinants of Maize Production Income in Western Uganda". *East African Journal of Agriculture and Biotechnology* 5 (1), 1-13. https://doi.org/10.37284/eajab.5.1.532.

**HARVARD CITATION**

Chune, M. D. (2022) "Determinants of Maize Production Income in Western Uganda", *East African Journal of Agriculture and Biotechnology*, 5(1), pp. 1-13. doi: 10.37284/eajab.5.1.532.

Article DOI: https://doi.org/10.37284/eajab.5.1.532

**IEEE CITATION**

M. D. Chune, "Determinants of Maize Production Income in Western Uganda", *EAJAB*, vol. 5, no. 1, pp. 1-13, Jan. 2022.

**MLA CITATION**

Chune, Midamba Dick. "Determinants of Maize Production Income in Western Uganda". *East African Journal of Agriculture and Biotechnology*, Vol. 5, no. 1, Jan. 2022, pp. 1-13, doi:10.37284/eajab.5.1.532.

## INTRODUCTION

The majority of sub-Sahara African countries depend on agriculture as a source of food, implying that it plays a significant role in achieving household food security among smallholder farmers (Diao et al., 2010; FAO, 2002, 2005; Imam & Kushwaha, 2013; Mozumdar, 2012; Pawlak & Kołodziejczak, 2020). In the year 2014, agriculture accounted for over 80% of the total employment in East Africa. Besides the consumption role, agriculture has also increased employment opportunities both in developed and developing countries (FAO, 2002). Massive investment in agriculture has made it easier for the increased growth of agricultural organizations, companies and industries (Singer, 1971). In the long run, farmers' living standards have greatly improved both in the developed and developing economies are able to access markets for their produce due to the growth of the agro-industries and companies (Kadzere et al., 2016).

Uganda, one of the sub-Sahara African countries, is endowed with good climatic conditions and fertile soils that support farming (UBOS, 2018). As such, the majority of Ugandans have resorted to farming as a way of meeting their daily livelihood needs (Bamwesigye et al., 2020). Like other African countries, Ugandans produce both food and cash crops (MAAIF, 2020). The cash crops produced in Uganda include tobacco, cotton wool, tea, coffee, sugar cane, pyrethrum, wheat, fruits and cocoa, while the food security crops include maize, beans, cassava, sweet potatoes, vegetables, bananas and groundnuts (MAAIF Performance Report, 2017). These crops have not only improved the living standards of farmers in terms of household food security and income but also boosted the gross domestic product in Uganda. In terms of economic development, agriculture contributes 25% of the total gross domestic product in this country. Majority of Ugandans (65%) are engaged in agriculture, agroforestry and fisheries while 36% of the working class are employed in agricultural related organizations (MAAIF, 2020).

Maize, one of the important agricultural products, has played a significant role in reducing poverty and food insecurity, especially in Africa (Walaga & Hauser, 2005). In Uganda, maize is one of the staple foods depended on by many households (Epule et al., 2021). It is produced by over 3 million farmers owning and depending on less than 0.5 hectares of land (Daly et al., 2016). Besides the consumption role, maize plays a significant role in increasing financial cash flow among the farmers. The majority of the farmers sell their surplus maize produce to the millers in order to get finances to meet other financial needs. Additionally, maize can be used to process different products including corn flour, corn oil, animal feeds, among others (Daniel et al., 2018). Nevertheless, the benefits of maize production in Uganda are not only felt at the country level but also at the East Africa Community level due to the exportation to different neighbouring countries.

When farmers obtain enough income from farming, they can purchase farm inputs including land, labour hiring, seeds, fertilizers, pesticides and farm machinery needed to massively invest in maize production. This will not only realize high income but also enable them to enjoy the benefits accrued from economies of scale due to large scale maize farming. A recent study done in Kenya by Gichangi et al. (2019) showed that an increase in farm income would increase the inputs purchased for production. Therefore, farm income is one of the key issues which should be carefully discussed. Low farm income from maize production would make farmers divert to other lucrative farming alternatives. This is because farmers are driven by the profit-maximization goal regardless of the type of crop they produce.

Despite the evident role of maize production among the smallholder farmers, past studies have reported that its farm income is low especially in developing countries (Epule et al., 2021; Justin, 2015;

Article DOI: https://doi.org/10.37284/eajab.5.1.532

Yassoungo et al., 2018). This discourages farmers from engaging in continuous maize production, a situation that is not good for the country's economic development, poverty alleviation and food security goals. Many socioeconomic factors may have contributed to the low income the farmers receive from maize production (Epule et al., 2021). However, the current level of income from maize production and its determinants are unknown, especially in the Kiryandongo district in Western Uganda, a region characterized by high levels of poverty and full of refugees ( Kiryandongo District Development Plan, 2020; UBOS, 2020; UNDP, 2014). As such, this study was guided by the objectives below:

- To determine the current level of income from maize production in the Kiryandongo district
- To determine the determinants of income from maize production in the Kiryandongo district

## LITERATURE REVIEW

Many studies have been done on the factors influencing income from different crops. These studies have found different results due to the different methods used in the study and the regions where the study where done. For instance, results found in Southern Africa may not be the same as the results found in Eastern Africa due to the difference in policies and governance among the two regions. As such, generalizations cannot be made on the factors affecting income from maize production in the Kiryandongo district based on the previous studies. Consequently, this study was motivated by the fact that the Kiryandongo district lacks literature that talks about the factors affecting income from maize production.

Existing literature has found out that education may have a positive influence on farm income. As the level of education advances, farmers acquire production skills which later improve farm income. Oduro et al. (2014) conducted a study aimed at determining the effect of education on agricultural productivity among farmers in Ghana. They reported a positive relationship between education and farm output. This implies that education level may positively influence farm income. Similar findings were also reported by Serin et al. (2009), Ashraf et al. (2019) and Korgitet & Biru (2019).

Farm size can either increase or decrease farm income depending on the methods and farming system employed by the farmer. When farmers use their input appropriately, they would earn more income from large portions of land due to the benefits that accrue from the economies of scale. A recent study by Noack and Larsen (2019) aimed at determining the effects of farm size on agricultural income in Uganda found out that agricultural income increases with an increase in farm size. Similar findings were also reported by Doti (2017). However, Das and Ganesh-Kumar (2017) reported a U-shaped association between farm size and farm income, a situation which implies that farm size increases farm income up to a certain level then starts to reduce it.

Farming experience has been found to have an effect on agricultural productivity. This in turn affects farm income. As farmers gain more years of continuous farming, they are able to access better agricultural technology, better market prices and better crop varieties that yield high income. On the other hand, more experienced farmers tend to stick to certain farming methods which become outdated with time hence resulting in low farm income. As such, farming experience may either increase or reduce farm income. A study done by Nkari et al. (2016) combined age, gender education and farming experience as the farmers features that influence farm performance leading to either reduced or increased farm income among farmers in Kenya. They found that these factors have a positive association with farm performance, a situation that increases farm income in the long run.

Access to the agricultural extension has been found to have a positive effect on farm income. Farmers who have access to extension can easily access farm inputs, agricultural markets, better prices for their produce as well as accessing the existence of adoption practices that improve farm income. As such, access to extension services may have a positive association with farm income. A study by Danso-Abbeam et al. (2018) to determine the effect of access to agricultural extension services on-farm productivity and income showed that access to extension increases farm income in Ghana.

Article DOI: https://doi.org/10.37284/eajab.5.1.532

Male headed households may have a higher income than their female-headed counterparts since they can access the farm training and workshops, farm inputs, adoption practices easily than females. Therefore, the gender of the household head may have an influence on farm income. In most African communities, females do not possess the right to own land. Nevertheless, if they do, they always receive small portions as compared to males. Additionally, the female gender is unable to access credit and extension services easily than males (Sexsmith et al., 2017). A recent study in Ethiopia to analyse the influence of gender on agricultural productivity on maize farmers by Gebre et al. (2021) clearly showed that male-headed households had 44.3% higher farm productivity than those headed by females. Additionally, Palacios-López and Lopez (2014) reported that agricultural labour productivity was 44% lower in female-headed household farms than those headed by males. This reveals that the gender of the household head may have an influence on farm income.

Similarly, farmers with access to credit services are likely to receive more income than their counterparts without access to credit. This is due to the fact that farmers who have access to credit are able to purchase farm inputs such as seeds, fertilizers, pesticides and pay for the farm labour easily and in time than their counterparts who do not have access to credit. Reducing agricultural credit constraints among farmers would increase their farm income Dong et al. (2010). When these inputs are assembled in time, farmers are able to plant and harvest their produce in time; this in turn may increase farm income. A study done by Danso-Abbeam et al. (2016) reported a positive association between farm income access to credit in Ghana. Studies that have found a positive association between access to credit and farm income include Ogundeji et al. (2018) and Abdallah et al. (2019).

Many smallholder farmers depend on family labour as a source of labour for their farms. This is because of the high levels of poverty making the farmers rely heavily on family labour rather than hired labour. Consequently, existing literature shows that households with many members are able to provide farm labour efficiently at the right time resulting in increased income. A study in Mexico by Posadas-Domínguez et al. (2014) with the aim of determining the effect of family labour on the profitability of dairy farmers clearly reveal that family labour is an important tool in increasing farm income. Contrary to this, families with many members have a higher dependency ratio than their counterparts with few members. As such, much of their finances is diverted to consumption rather than farm production. This reduces farm income (Abdallah et al., 2019). As such, household size may either increase or reduce farm income.

Farmers who are located near the trading centres have a higher competitive advantage than their counterparts who are located far away from the trading centres. This is because they can access the inputs and output markets easily. In addition, they incur low costs of transporting their produce to the markets than those located far away from the trading centres. In the long run, they obtain high income. As such, distance to the trading centres may have an influence on farm income. Existing literature clearly shows that in areas characterized by high poverty levels, the distance to the nearest market has a negative influence on-farm income since these areas offer low output prices than the urban centres (Danso-Abbeam et al., 2018).

Group membership can either increase or reduce farm income. If a farmer belongs to a savings group, he is more likely to access finances from the groups and allocate them to farm production. As such, they receive high income from those who are not members of such groups. Vu et al. (2020) conducted a study to determine the effects of farmers groups on household income for tea farmers in Vietnam. Their findings clearly show a positive influence of group membership on household income. Similarly, a study done in Guinea to determine the influence of group membership on smallholder sweet potatoes farm income shows a positive relationship between farm income and group membership Tolno et al. (2015).

## MATERIALS AND METHODS

### Study Area

This study was done in the Kiryandongo district. It has a population of 132,822 people. From this population, 66,810 are males, while 66,012 are females (UBOS, 2018). Kiryandongo district is in

Article DOI: https://doi.org/10.37284/eajab.5.1.532

the mid-western part of Uganda with its headquarters in the Kiryandongo sub-county. Its neighbouring districts include Nwoya, Oyam, Nakasongola, Masindi and Buliisa districts. Its average altitude is 1290 meters above sea level. It covers an area of 3,621 square kilometres which is mostly arable land. The main economic activity in this district is farming. Apart from maize, the farmers here practice tobacco, cassava, sweet potatoes, groundnuts, beans and rice production. This district was purposively selected due to the high numbers of maize farmers making it suitable for study as well as ease of accessing the study respondents.

**Sampling Procedure**

This study adopted multistage sampling. In the first stage, Kiryandongo and Kigumba sub-counties were purposively selected because of the high numbers of maize farmers. Consequently, in the Kigumba sub-county, Mboira and Kiigya were considered for the study, while in the Kiryandongo sub-county, Kitwara and Kikuube were considered. In order to access the farmers easily, a list of all maize farmers was obtained from the district production officer. Finally, simple random sampling was then used to collect data from 220 maize farmers.

**Data Collection**

Before data collection, pretesting was done in the Gulu district to ascertain that the questionnaire captured all the study variables accordingly. Consequently, data was then collected from 220 maize farmers using a well-structured questionnaire by the trained enumerators who were not only familiar with the location but also had a knowledge of the local language. The first section of the questionnaire covered farmers' socio-demographic features such as farmers age, gender, household size, farm location, years of continuous engagement in farming, access to extension services, group membership, access to credit, among others. The second section of the questionnaire included farm production factors such as farm size, quantities of pesticides, fertilizer, seeds used and their unit prices, among others. In the last section, farm output and marketing factors such as quantity harvested, consumed, sold, output price, cost of shipping maize to the market, distance to the output market were all captured. After data collection, data was entered into an SPSS template. Accordingly, data cleaning was done to eliminate outliers and missing values during the analysis. Consequently, 20 questionnaires were removed from the study due to the presence of outliers. A total of 200 questionnaires were then considered for the analysis.

**Data Analysis**

***Determining Maize Farm Income***

First, farm income was calculated using the formula below. In the calculation, we considered the total quantity harvested in kilograms (including quantity consumed). This was done because the farmers could have spent their money to purchase maize for consumption. Specifically, the quantity consumed also has a monetary value which should be included in calculating the total farm income.

$$\text{Farm income} = \text{Total quantity harvested (Kg)} * \text{Output unit price (Ugx)}$$

This gave us the total amount the farmers received from their farming in Ugandan shillings.

***Determinants of Maize Farm Income***

The ordinary least squares (OLS) model was then used to determine the determinants of maize farm income.

According to Eisenhauer (2003), the ordinary least squares (OLS) model is specified as;

$$Y = \beta_0 + \beta_i(X_i) + \varepsilon_i$$

The model was then modified as;

$$\text{Farm Income (Y)} = \beta_0 + \beta_1\text{Education} + \beta_2\text{Farming Experience} + \beta_3\text{Household size} + \beta_4\text{Access to Extension services} + \beta_5\text{Acess to credit} + \beta_6\text{Group membership} + + \beta_7\text{Farm size} + \beta_8\text{Distance to the nearest market} + \beta_9\text{Farmers gender} + \varepsilon_i$$

Y represents the dependent variable (farm income), $\beta_0$ is the coefficient of intercept, $\beta_i$ is the regression coefficient which is to be determined. $X_i$ contains the socioeconomic factors which presumed to be influencing farm income.

Article DOI: https://doi.org/10.37284/eajab.5.1.532

## RESULTS AND DISCUSSION

### Socio-Demographic Features of the Farmers

*Table 1* presents farmers socio-demographic characteristics. Farmer's age was categorized into three categories, 18 – 30 years, 31 – 45 years and above 46 to 87 years. The results showed that 44.5% of the farmers were falling under the 31 – 45 years age bracket. This implies that the majority of the farmers are still in their active age. Similar findings were reported by Nientao et al. (2019), who reported that the majority of cotton farmers were in the 31 to 50 years age bracket in Mali. In terms of education, the majority of the farmers (68.5%) achieved primary education, implying that the education level of most smallholder farmers in Uganda is low. Similar findings were reported by Anderson et al. (2016), Hyuha et al. (2007) and Ekepu & Tirivanhu (2016).

**Table 1: Socio-demographic features of the farmers**

| Variables | Measurement | Category | f | (%) |
|---|---|---|---|---|
| Age | Years | 18 – 30 | 49 | 24.5 |
| | | 31 – 45 | 89 | 44.5 |
| | | 46 – 87 | 62 | 31.0 |
| Education level | Primary | Primary | 137 | 68.5 |
| | Secondary | Secondary | 37 | 18.5 |
| | Post-secondary | Post-secondary | 26 | 13.0 |
| Total land size | Hectares | 0.10 – 2.30 | 167 | 83.5 |
| | | 2.40 – 4.00 | 33 | 16.5 |
| Land under maize production | Hectares | 0.10 – 1.00 | 190 | 95.0 |
| | | 1.10 – 4.00 | 10 | 5.0 |
| Household size | Number | 1 – 4 | 37 | 18.5 |
| | | 5 – 10 | 131 | 65.5 |
| | | 11 – 20 | 32 | 16.0 |
| Farming experience | Years | 0 – 10 | 76 | 38.0 |
| | | 11 – 20 | 66 | 33.0 |
| | | 21 – 30 | 37 | 18.5 |
| | | 31 – 62 | 21 | 10.5 |
| Gender | 1-Female, 0-otherwise | Male | 153 | 76.5 |
| | | Female | 47 | 23.5 |
| Member to agric. Groups | 1-member, 0-otherwise | Member | 162 | 85.5 |
| | | Non-member | 38 | 14.5 |
| Access to extension services | 1-Access, 0-otherwise | Has access | 171 | 85.5 |
| | | No access | 29 | 14.5 |
| Access to credit | 1-Access, 0-otherwise | Has access | 147 | 73.5 |
| | | No access | 53 | 26.5 |

The results further showed that the majority of the farmer depended on less than 2.3 hectares of land. This is due to the fact that as the population increases in African countries, the landholdings decline. A study conducted by Amone (2014) reported that the majority of smallholder farmers in Uganda depended on a mean of 1.2 hectares of land. Majority of the farmers (95%) allocated between 0.10 and 1.00 hectares of land to maize production. Household size was also categorized into three categories; the results revealed that the majority of the farmers fall under the category consisting of 5 to 10 household members. This implies that massive farm production is necessary in order to feed the large household size.

Accordingly, the results showed that 76.5% of the farmers were males. In Africa, males are mostly the household heads who have the obligation of providing food to the family. As such, they

Article DOI: https://doi.org/10.37284/eajab.5.1.532

prioritize food crop (maize) production as a way of attaining household food security. This is in agreement with the findings reported by Okello et al. (2019), who reported that the majority of the engaged in cassava production in the Gulu and Amuru district were males. Lastly, the results showed that the majority of the farmers (73.5%) had access to credit while (85.5%) of them could access extension services. Similar findings were reported by Tolno et al. (2015), who found out that the majority of smallholder farmers have access to extension services as well as being members of different agricultural groups. This is, however, contrary to Amano's (2014) results which showed that only 10% of the farmers in Uganda had access to extension services.

**Farm Income**

*Table 2* presents the average farm income from maize production. On average, the farmers planted 11.87 kilograms of maize seeds on 0.47 hectares of land; this implies that the farmers were using the right seed rate per hectares. According to Seed Company Group (2017), the recommended seed rate is 25 kg/ha (approximately 11.75 kilograms of seeds on 0.47 acres of land). This yielded an average of 716.38 kilograms (approximately 1,524.21 kg/ha) of maize. A recent study by Epule et al. (2021) clearly showed that in 2017, maize farmers harvested 23,177 kg/ha (approximately 2,317.7 kilograms per hectare). This was, however lower than the projected yield of 25,271.5 kg/ha (approximately 2,527.15 kilograms per hectare) (Epule et al., 2021). This study reported less quantity of harvested maize than in 2017 by 34.24%. The low yield reported in this study may have been contributed by the effects of the coronavirus resulting in the slow movement of farm inputs due to the lockdown (Fowler, 2020).

**Table 2: Farm income from maize production**

| | Variables | Unit | Mean | Std Dev. | Min | Max |
|---|---|---|---|---|---|---|
| **Output** | Maize harvest | Kilograms | 716.38 | 505.50 | 100 | 3100 |
| **Inputs** | Land | Hectares | 0.47 | 0.77 | 0.25 | 5.00 |
| | Seeds | Kilograms | 11.87 | 8.64 | 1.00 | 10.00 |
| | Output price | UgSh. | 516.00 | 83.53 | 300 | 1,000 |
| | Kilograms per yield | | | | | |
| | Gross income | UgSh. | 372,207 | 275,723 | 50,000 | 1,705,000 |

The farmers sold their produce at a unit price of 516.00 Ugandan shillings (0.15 USD) per kilogram of dry maize grains. However, a recent study done by GIEWS (2020) reported that the price of dry maize ranged from 775.15 to 880.40 Ugandan shillings (approximately 0.22 to 0.25 USD) per kilogram across different regions in Uganda. This was slightly higher than the findings of this study. However, the low market price reported in this study was attributed to low prices evident during the harvesting season (De Beurs & Brown., 2013) since this study was done when the farmers had just harvested their produce. Consequently, the farmers earned a mean gross income of 372,207 Ugandan shillings (105.18 USD) from their maize production. Indeed, the results proved that the farm income was generally low as opposed to the farmers' expectations. Many factors might have contributed to this. Similar findings were reported by Epule et al. (2021), Justin (2015) and Yassoungo et al. (2018) who found that income from maize production is generally low is low.

**Income Distribution Across the Farmers**

The results depicted in *Table 3* and *Figure 1* below show that the majority of the farmers were able to earn up to 600,000 Ugandan shillings (168.58 USD). However, a few of them obtained above 1,000,000 Ugandan shillings (280.96 USD) from maize production. This further shows that majority of maize farmers received low income.

Article DOI: https://doi.org/10.37284/eajab.5.1.532

**Table 3: Income distribution across the farmers**

| Income (Ugandan shillings) | Number of farmers | Percentage |
|---|---|---|
| Less than 200,000 | 65 | 32.50 |
| 200,001 – 600,000 | 108 | 54.00 |
| 600,001 – 1,000,000 | 21 | 10.50 |
| 1,000,001 – 1,400,000 | 04 | 02.00 |
| 1,400,001 – 1,800,000 | 02 | 01.00 |

**Determinants of Income from Maize Production**

Four pre-estimation tests were carried out before the main analysis. Variance inflation factor analysis (VIF) test for multicollinearity, heteroscedasticity, and omitted variable tests were also run to eliminate any chances of heteroscedasticity and omitted variables, respectively. Fortunately, these tests showed positive results (see *Appendix 1*). The VIF mean insignificant value of 1.17 implied that there was no multicollinearity among the explanatory variables. Accordingly, the insignificant value (0.9378) from the heteroscedasticity test unfolded the absence of heteroscedasticity. Similarly, the omitted variable test had an insignificant value of 0.6145, ruling out any chances of the omitted variables.

The results from OLS (depicted in *Table 4*) showed that farm size had a positive and significant ($p < 0.05$) influence on farm income. An increase in farm size by one unit would increase farm income by 5.97%. Land is an important factor of production. Even though land is a fixed factor of production, it plays a significant part in farming. Farmers with more portions of land enjoy the economies of scale which increases their farm income than those who depend on small portions. In the study area, maize was the farmers' main crop and staple food. As such, farmers who allocated large portions of their land could get high income due to the high demand for maize grain. Additionally, the high population of refugees (Kaiser, 2015) in this district makes food crops to be in high demand which yields more income to the farmers who cultivated on large portions of land. This is consistent with the findings reported by Doti (2017), who found out that a unit increase in farm size would result in an increase in farm income by 19%. Additionally, Xaba and Masuku (2013) reported that increasing the size of farms under vegetable production would result in an increase in vegetable profitability by 21.5%; this further confirms the positive influence of farm size on farm income. Similar findings were also reported by Noack and Larsen (2019). However, Das & Ganesh-Kumar (2017) reported a U-shaped association between farm size and farm income, a situation which implies that farm size increases farm income up to a certain level then starts to reduce it.

Similarly, household size had a positive and significant ($p<0.05$) association with farm income. A unit increase in land size would result in an increase in farm income by 3.44%. Maize production is a labour-intensive activity. Among the activities that require high labour for producing maize include land preparation, planting, weeding, harvesting and grains removal from the cobs. Since many African smallholder farmers depend on family labour, families with large numbers of household members were able to provide labour in the farms resulting in increased farm income and efficiency in production. Additionally, maize is one of the important staple foods that many Ugandans depend on. Families with large numbers of household members would need more food than their counterparts with few members. The food is mostly obtained from farming. As such, the food requirement would make the families with many members heavily invest in production in order to feed the large household size. In the long run, this increased farm income. This finding is in line with the findings reported by Safa (2005), who found a positive relationship between farm income and household size among coffee farmers in Yemen. Using the weighted least squares model, he reported that an increase in household size by one unit would result in an increase in farm income among the highland agroforestry farmers by 29%.

Article DOI: https://doi.org/10.37284/eajab.5.1.532

**Table 4: Determinants of maize income**

| Variables | Coefficient | Std errors | P>t |
|---|---|---|---|
| Education (years) | -0.00889 | 0.0101572 | 0.383 |
| Farming experience (years) | -0.0018971 | 0.0041245 | 0.646 |
| Household size (Number) | 0.0344034 | 0.0146645 | 0.020** |
| Access to extension services (1-yes, 0-otherwise) | 0.1623031 | 0.1392099 | 0.245 |
| Access to credit (1- yes, 0-otherwise) | 0.1991244 | 0.1186028 | 0.095* |
| Group membership (1-Membership, 0-Otherwise) | -0.1791055 | 0.1299289 | 0.170 |
| Farm size (hectares) | 0.0597082 | 0.0280943 | 0.035** |
| Distance to the nearest market (Kilometers) | 0.0192951 | 0.0256981 | 0.454 |
| Gender (1- Female, 0-Otherwise) | -0.2906712 | 0.1116421 | 0.010** |
| Constant | 12.05896 | 0.2402604 | 0.000 |
| R squared | | | 0.1335 |
| Adjusted R squared | | | 0.0925 |
| Prob>Chi$^2$ | | | 0.0011 |
| N | | | 200 |

**, **and***represents the statistical significance at 10%, 5% and 1% respectively*

Female-headed households had a 29.1% significant ($p<0.05$) lower farm income than male-headed households. Normally, males are mostly the household heads with decision making roles and responsibilities. They make decisions on the type of crop to be grown every season, the inputs combination, marketing, labour allocation to the farm, among others. Additionally, male farmers are able to access market information, crop varieties, adoption practices, farm training and workshops easily than females. This makes them have higher farm income than their female counterparts. Consequently, female-headed households suffer the problems of low accessibility of these services (agricultural markets, farm workshops, agricultural training, access to inputs, access to agricultural technology and adoption practices), which contributes to low income. A study done by Palacios-López & Lopez (2014) reported similar findings. In their study, they reported that agricultural labour productivity was 44% lower in the female-headed household farms than those headed by males. Additionally, a recent study was done in Ethiopia to analyse gender the influence on agricultural productivity on maize farmers by Gebre et al. (2021) clearly showed that male-headed households had a 44.3% higher farm productivity than their fellow female counterparts.

The results reveal that farmers who had access to credit had a 19.91% significantly ($p<0.10$) higher income than their counterparts who did not have access to credit. Farmers who had access to credit could purchase the farm inputs easily and in time than those who did not have access to credit. This in the long run increased farm income. Additionally, accessing the agricultural market needed ready finance to transport the produce to the markets offering sustainable output price. As such, farmers who did not have access to credit depended entirely on the local markets, which offered low output prices than those in the cities. Lastly, having enough inputs, farmers who had access to credit were able to increase the farm size under maize production resulting in the benefits of economies of scale. As such, they ended up getting more farm income than their counterparts who depended on small portions of land due to credit constraints. Existing studies have reported similar findings. For instance, a study done by Sedem et al. (2016) to determine the effects of agricultural credit on farm income reported that access to credit had a positive association with farm income. As such, they concluded that accessing credit is a tool for reducing poverty and increasing food security among farmers in Ghana. Similarly, Ogundeji et al. (2018) reported that access to credits increased farmers income from 116.608 USD to 136.894 among farmers in Lesotho. Accordingly, Xaba and Masuku (2013) reported that farmers who had access to credit had a 23.1% increase in the vegetable yield than those who did not.

Article DOI: https://doi.org/10.37284/eajab.5.1.532

## CONCLUSION

This study aimed at determining the current level of income from maize production and its determinants in western Uganda. Data were collected using structured questionnaires from 220 maize farmers in the Kiryandongo district in western Uganda. Based on the results, farm income was confirmed to be low among the maize farmers. Additionally, household size, access to extension had a positive and significant influence on farm income. However, the gender of the household heads (female) was found to be having a negative and significant influence on farm income. This study therefore concluded that farm income from maize production is low and it is determined by farm size, household size, access to credit and gender of the household heads.

### Recommendation

Female-headed household farms had a lower farm income compared to the male household headed. As such, this study recommends that the government should implement programs that train female household headed farmers on maize production and marketing. Farmers who had access to credit had higher farm incomes compared to their counterparts who did not have access to credit. Consequently, this study recommends that farmers should be trained on the various ways of acquiring credit used for maize production. These may include banks, SACCOs and financial institutions that offer agricultural credit at a lower interest rate as well as forming saving groups that offer loans.

### Conflict of Interest

No conflict of interest

## REFERENCES

Abdallah, A. H., Ayamga, M., & Awuni, J. A. (2018). Impact of agricultural credit on farm income under the Savanna and Transitional zones of Ghana. *Agricultural Finance Review*, 79(1), 60–84. https://doi.org/10.1108/AFR-02-2018-0009

Amone, W. (2014). *Agricultural productivity and economic development in Uganda: An inclusive growth analysis*. Doctoral dissertation. Mbarara University of Science & Technology.

Anderson, J., Learch, C. E., & Gardner, S. T. (2016). *National Survey and Segmentation of Smallholder Households in Bangladesh. Understanding Their Demand for Financial, agricultural and digital solutions*. CGAP Working Paper April 101.

Ashraf, M., Qasim, M., & Gul, F. (2019). Impact of education on farmers earning: a house hold survey data analysis. *Educational Research*, *10*(1), 200-213.

Bamwesigye, D., Doli, A., Adamu, K. J., & Mansaray, S. K. (2020). A Review of the Political Economy of Agriculture in Uganda: Women, Property Rights, and Other Challenges. *Universal Journal of Agricultural Research, 8*(1), 1–10. https://doi.org/10.13189/ujar.2020.080101

Daly, J., Hamrick, D., Gereffi, G. & Guinn, A. (2016). *Maize Value Chains in East Africa*. International Growth Centre.

Danso-Abbeam, G., Ehiakpor, D. S., & Aidoo, R. (2018). Agricultural extension and its effects on farm productivity and income: insight from Northern Ghana. *Agriculture & Food Security*, *7*(1), 1-10. https://doi.org/10.1186/s40066-018-0225-x

Das, V. K., & Ganesh-Kumar, A. (2017). *Drivers of farmers' income: The role of farm size and diversification* (No. 2017-013). Indira Gandhi Institute of Development Research, Mumbai, India.

De Beurs, K. M., & Brown, M. E. (2013). The effect of agricultural growing season change on market prices in Africa. *Climate Variability-Regional and Thematic Patterns*.

Diao, X., Hazell, P., & Thurlow, J. (2010). The role of agriculture in African development. *World development*, *38*(10), 1375- 1383. https://doi.org/10.1016/j.worlddev.2009.06.011

Dong, F., Lu, J. & Featherstone, A. M. (2010). *Effects of Credit Constraints on Productivity and Rural Household Income in China*. Working Paper 10-WP 516, October.

Article DOI: https://doi.org/10.37284/eajab.5.1.532

Doti, A. G. (2017). Causes and Effects of Land Size Variation on Smallholder's Farm-Income: The Case of Kombolcha District of East Hararghe, Oromia, Ethiopia. *Open Access Library Journal*, *4*(01), 1. https://doi.org/10.4236/oalib.1103312

Eisenhauer, J. G. (2003). Regression through the origin. *Teaching Statistics*, *25*(3), 76–80. https://doi.org/10.1111/1467-9639.00136

Ekepu, D., & Tirivanhu, P. (2016). Assessing socio–economic factors influencing adoption of legume-based multiple cropping systems among smallholder Sorghum Farmers in Soroti, Uganda. *South African Journal of Agricultural Extension*, *44*(2), 195- 215. https://doi.org/10.17159/2413-3221/2016/v44n2a421

Epule, T. E., Dhiba, D., Etongo, D., Peng, C., & Lepage, L. (2021). Identifying maize yield and precipitation gaps in Uganda. *SN Applied Sciences*, *3*(5), 1- 12. https://doi.org/10.1007/s42452-021-04532-5

FAO. (2002). *The Role of Agriculture in the Development of Least-developed Countries and their Integration into the World Economy*. FAO. http://www.fao.org/3/a-y3997e.pdf

FAO. (2005). T*he state of food insecurity in the world. Eradicating world hunger - Key to achieving the Millennium Development Goals*. Food and Agriculture Organization of the United Nations.

Fowler M (2020). The impact of the COVID-19 pandemic on Uganda's agricultural sector. Usad, September 1–11.

Gebre, G. G., Isoda, H., Rahut, D. B., Amekawa, Y., & Nomura, H. (2021). Gender differences in agricultural productivity: Evidence from maize farm households in southern Ethiopia. *GeoJournal*, *86*(2), 843- 864. https://doi.org/10.1007/s10708-019-10098-y

Gichangi, A., Birachi, E., Wambua, S., Kavoi, J., Karanja, D., Muriithi, F., & Mutua, M. (2019). Factors influencing smallholder farmers' inputs use in major bean production corridors in Kenya. *Journal of Agriculture and Food Sciences*, *17*(1), 136-147.

GIEWS. (2020). *Monthly reports on food price trends-Food Price Monitoring and Analysis 3*. GIEWS

Hyuha, T. S., Bashaasha, B., Nkonya, E., & Kraybill, D. (2007). Analysis of profit inefficiency in rice production in Eastern and Northern Uganda. *African Crop Science Journal*, *15*(4), 243–253.

Imam, E., & Kushwaha, S. P. S. (2013). Habitat suitability modelling for Gaur (Bos gaurus) using multiple logistic regression, remote sensing and GIS. *Journal of Applied Animal Research*, *41*(2), 189- 199. https://doi.org/10.1080/09712119.2012.739089

Justin, K. U. (2015). Factors influencing maize crop production at household levels: A case of Rukwa Region in the southern highlands of Tanzania. *African Journal of Agricultural Research, 10*(10), 1097– 1106. https://doi.org/10.5897/ajar2014.9262

Kadzere, C. T., Poswal, M. A. T., Ngada, L. L., Dayimani, B., Coetzee, L., & Bese, D. L. (2016). The crucial role of agricultural development in economic growth and industrialization of Africa and the call for integrated services delivery. In *Fifth African Higher Education Week and RUFORUM Biennial Conference 2016* (pp. 177-183). RUFORUM.

Kaiser, T. (2015). *UNHCR's withdrawal from Kiryandongo*. Anatomy of a handover Working Paper No.32 UNHCR' s withdrawal from Kiryandongo. Anatomy of a handover. January 2002.

Kiryandongo District Development Plan for FY 2015/2016 – 2019/2020.

Korgitet, H. S. & Biru, M. W. (2019). The Effect of Farmers Education on Farm Productivity: Evidence from Small - Scale Maize Producing Farmers in North Bench District, Bench Maji Zone. *Research on Humanities and Social Sciences*, *9* (17), 26- 34. https://doi.org/10.7176/rhss/9-17-04

Article DOI: https://doi.org/10.37284/eajab.5.1.532

MAAIF. (2020). *The Republic of Uganda Ministry of Agriculture, Animal Industry and Fisheries Draft Anual Report*. Uganda Ministry of Agriculture, Animal Industry and Fisheries

MAAIF Performance Report. (2017). The Republic of Uganda Ministry of Agriculture, Animal Industries and Fisherise: Performance Review Report 150. https://www.agriculture.go.ug/

Mozumdar, L. (2012). Agricultural productivity and food security in the developing world. *Bangladesh Journal of Agricultural Economics, 35(*1/2), 53–69.

Nientao, A, Mwangi, D., Ayuya, O. I. & Kergna, A. O. (2019). Resource Optimization in Crop Livestock Integrated Production System among Small-Scale Cotton Farmers in Southern Mali. *Advances in Agricultural Science, 7*(1), 85–98.

Nkari, D. I. M., & Kibera, P. F. N. (2016). The influence of farmer characteristics on performance of commercial farmers in Kiambu County, Kenya. *European Journal of Business and Social Sciences, 5*(03), 63-78.

Noack, F., & Larsen, A. (2019). The contrasting effects of farm size on farm incomes and food production. *Environmental Research Letters, 14* (8), 084024. https://doi.org/10.1088/1748-9326/ab2dbf

Oduro-Ofori, E., Aboagye, A. P., & Acquaye, N. A. E. (2014). Effects of education on the agricultural productivity of farmers in the Offinso Municipality. *International Journal of Development Research, 4*(9), 1951–1960.

Ogundeji, A. A., Donkor, E., Motsoari, C., & Onakuse, S. (2018). Impact of access to credit on farm income: Policy implications for rural agricultural development in Lesotho. *Agrekon, 57*(2), 152-166. https://doi.org/10.1080/03031853.2018.1483251

Okello, D. M., Bonabana-Wabbi, J., & Mugonola, B. (2019). Farm level allocative efficiency of rice production in Gulu and Amuru districts, Northern Uganda. *Agricultural and Food Economics, 7*(1), 1- 19. https://doi.org/10.1186/s40100-019-0140-x

Palacios-López, A., & Lopez, R. (2014). *Gender Differences in Agricultural Productivity: The Role of Market Imperfections* (No. 164061). Department of Agricultural and Resource Economics, the University of Maryland.

Pawlak, K., & Kołodziejczak, M. (2020). The role of agriculture in ensuring food security in developing countries: Considerations in the context of the problem of sustainable food production. *Sustainability*, *12*(13), 5488. https://doi.org/10.3390/su12135488

Posadas-Domínguez, R. R., Arriaga-Jordán, C. M., & Martínez-Castañeda, F. E. (2014). Contribution of family labour to the profitability and competitiveness of small-scale dairy production systems in central Mexico. *Tropical Animal Health and Production*, *46*(1), 235-240. https://doi.org/10.1007/s11250-013-0482-4

Safa, M. S. (2005). Socioeconomic factors affecting the income of small-scale agroforestry farms in hill country areas in Yemen: A comparison of OLS and WLS determinants. *Small-scale Forest Economics, Management and Policy*, *4*(1), 117-134.

Sedem, E. D., William, A., & Gideon, D. A. (2016). Effect of access to agriculture credit on farm income in the Talensi district of northern Ghana. *Russian Journal of Agricultural and Socio-Economic Sciences*, *55*(7), 40–46. https://doi.org/10.18551/rjoas.2016-07.06

Seed Company Group (2017). *Maize Growers Guide. Department of Agriculture and Obtainable from Resource Center 19*. http://www.seedcogroup.com/sites/default/files/Maize Growers Guide.

Serin, V., Bayyurt, N., & Civan, A. (2009). Effects of formal education and training on farmers income. *European Journal of Social Sciences, 7*(3), 52-62.

Article DOI: https://doi.org/10.37284/eajab.5.1.532

Sexsmith, K., Smaller, C. & Speller, W. (2017). *How to Improve Gender Equality in Agricultur*e. Policy Brief 5. 1–8.

Singer, H. W. (1971). The Role of Agriculture in Economic Development. *The Economic Journal, 81*(323), 673- 676. https://doi.org/10.2307/2229883

Tolno, E., Kobayashi, H., Ichizen, M., Esham, M., & Balde, B. S. (2015). Economic analysis of the role of farmer organizations in enhancing smallholder potato farmers' income in middle Guinea. *Journal of agricultural science*, *7*(3), 123. https://doi.org/10.5539/jas.v7n3p123

UBOS. (2018). The 2018 Statistical report. 345. Uganda Bureau of Statistics.

UBOS. (2020). U*ganda Bureau of statistics 2020 statistical abstract*. Uganda Bureau of Statistics.

UNDP (2014). Poverty Status Report. 53(9): 1689–1699.

Vu, H. V., Ho, H., & Le, Q. H. (2020). Impact of Farmers' Associations on Household Income: Evidence from Tea Farms in Vietnam. *Economies*, *8*(4), 92. https://doi.org/10.3390/economies8040092

Walaga, C., & Hauser, M. (2005). Achieving household food security through organic agriculture? Lessons from Uganda. *Journal Fur Entwicklungspolitik, 21*(3), 65– 84. https://doi.org/10.20446/JEP-2414-3197-21-3-65

Xaba, B. G., & Masuku, M. B. (2013). Factors affecting the productivity and profitability of vegetables production in Swaziland. *Journal of Agricultural Studies*, *1*(2), 37-52. https://doi.org/10.5296/jas.v1i2.3748

Yassoungo, T. I., Olarewaju, A. O., & Emmanuel, A. A. (2018). Factors influencing maize production in Sikasso Region of Mali. *Journal of Agricultural Extension*, *22*(3), 31-39.