International Journal of Academic Pedagogical Research (IJAPR)
ISSN: 2643-9123
Vol. 7 Issue 3, March - 2023, Pages: 198-205

Factors Associated With Potato Yields' Variations In South Western Of Uganda. Case Study: Kanungu and Kisoro Districts

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Abstract*: With the help of secondary data, the study investigates the variables linked to variability in potato yields in south-western Uganda. The study's two main goals were to identify the elements most strongly influencing potato yields in located in the southwestern Uganda and to determine the connection between land-related factors and potato yields in that region. To ensure that the results would be linear, objective, and trustworthy, Stata was used to clean the data and perform further tests. Box plots were utilized to determine the yield dispersion between Kisoro and Kanungu, and adjustment was employed to examine the relationship between land-related parameters. Likewise, certain graphs were used to determine the status of categorical variables. Scatter plots were used to show the link between yields and the ground parameters (farmers' knowledge, land area for potato plots, number of cattle, farming experience, field location, and land ownership). According to the survey, there were four times as many potato producers with livestock as there were without it. The foot slope of the field is where the majority of potato farmers plant their crops, followed by the intermediate slope and the higher slope.*

Keywords: **potato yields, farmers experience and land size**

Background of Study.

After maize, rice, and wheat, potatoes (Solanum tuberosum) are the 4th significant staple crop in the world (CIP 2016). With a total production of 370 million tons in 2019, the crop was grown on roughly 17 million hectares (ha) of land around the world. China was the largest producer of potatoes, accounting for 25% of total output, which was followed by India (14%), the Russian Federation (6%), Ukraine (5%), and the United States (5%). (FAO, 2021). In developing nations, where potatoes are a significant food and economic crop for small - scale farmers, the importance of potatoes has progressively migrated over time from industrialized to developing nations (Burgos et al., 2020). With a yearly output of 99 million tons and 36% of China's total potato cultivation area (Chen et al., 2019), it is one of the most significant traditionally grown food crops in China. Because the northern region of the country has the cool temperatures and sunlight necessary for growing potatoes, 85% of this crop is manufactured there (Jansky et al., 2015).

In the tropical highlands of sub-Saharan Africa, where it is grown as both a horticulture commodity and a food security crop due to its high value, potatoes are a staple food and income crop. Low agricultural output and production have continued to be a significant development obstacle, which is causing considerable worry (Godfray, 2015; This is partially explained by the lack of focus on the policy element that encourages growth and efficiency in agriculture (Yami & Asten, 2017). In order to improve food security, nutrition, and farmer incomes in SSA, government and developmental partners' interest in agriculture as a development strategy expanded (Yami & Asten, 2017). The creation of the Complete African Agrarian Development Plan (CAADP) in 2003, when African Heads of State pledged at least 10% of their budgets to improve productivity in agriculture, is one example of this (Organization for Development and Economic Cooperation (OECD), 2016).

Statement of the problem

For small - scale farmers in southwestern Uganda, the potato crop is a significant source of food and cash. The Kanungu and Kisoro districts, among other places, exhibit a large difference in potatoes production. The causes of the different variants in potato yield in these districts were looked into in this study. The study investigated a number of variables, such as the socio - economic status makeup of the farmers, the crop rotation used, and the quality of the soil. The study specifically tried to ascertain how soil pH, amount of organic matter, and micronutrient intake affected potato yields. The study also looked into how warmth, rainfall, and other climatic factors affected potato production. The study also looked at the use of pesticides, fertilizers, and other agronomic techniques by local farmers.

Specific Objectives of the Study

Specifically, the objectives of study were;

1. To establish the relationship between land related factors and potato yields in south western Uganda.
2. To determine the factors which mostly affect the potato yields in south western Uganda.

Research Hypotheses

1. There's no relationship between land related factors and Potato yields in South western Uganda
2. None of the factors affect the potato yields.

Methodology

Research Design

Data was gathered for the study using a cross-sectional research approach at a single point in time. According to the Zikmund (2003) cross sectional research designs are employed for inhabitants surveys to evaluate the features of interest from nationally representative. When compared to other designs, such as longitudinal research, these studies may typically be completed very quickly and are less expensive. With a list of smallholder farmers received from each District, a sampling frame was created.

Sampling procedure

Table 1. Sampling frame

District	Number of Household	Proportion (%)
Kisoro	70	47.7
Kanungu	83	52.3
Total	153	100

Methods of data analysis

The data were examined using an economic model and descriptive statistics. To determine whether there are any variations or similarities between the sample households, descriptive statistical analysis were used to their fundamental characteristics. The homes were described using descriptive statistics including mean, standard deviations, minimum and maximum values, frequencies, and percentages.

Statistical framework

Identifying the variables influencing the difference in potato yields in western Uganda is the focus of this section of the analysis. The continuous variable "quantity of potatoes produced" reflects the actual amount of potatoes grown by each family. Model for multiple linear regression (OLS) was appropriate to analyze factors affecting production of potato because all sampled households is producers of potato.

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + D_1 X_4 + D_2 X_5 + D_3 X_6 + u_i$$

Where Y = Quantity of potato produced,

$X_1 = land\ size$

$X_2 = farming\ experience$

$X_3 = number\ of\ live\ stock$

$D_1 = live\ stock\ ownership$

$D_2 = field\ location$

$D_3 = live\ stock\ ownership$

$u_i = error\ term$

Variable Description

Table 2: variable description

Variable	Description
Land Size	Potato land size in acres
Field location	Location of the potato plot (1=Upper slope, 2=Middle slope, 3=Foot slope)
Landownership	ownership status (1=Owned by the farmer, 2=Rented land, 3=Borrowed land)
Experience	Experience in potato farming in years
Livestock ownership	Livestock ownership status (1=Yes, 2=No)
No Livestock	Number of livestock owned by the farmer
Yield	Potato yield in tons per hectares

Data Analysis

The preferred statistical package that was used for analysis of data in this study was STATA version 15. Different statistical techniques such as correlation and regression analysis were used. The upper level of the statistical significance for hypothesis testing will be at 5%. All the statistical test results are to be computed at 2 – tailed level of significance.

RESULTS

Univariate analysis

Tables 2: shows descriptive Statistical for quantitative variables

Variable	Observations	Mean	Std. Dev.	Minimum	Maximum
land size	153	1.50	2.41	0.25	21
Experience	153	12.88	9.81	1	47
number of livestock	153	3.06	3.42	0	20
yields her hectare	153	15.72	10.15	0	52.63

According to the data in table 2, the average land size is 1.50, with a standard deviation of 2.41 and a range of 0.25 to 21. The average number of animals is 3.06, with a confidence interval of 3.42, and the average number of farmers' years of experience is 12.88, with a minimum and maximum of 1 and 47, respectively. The average yield per hectare for this farmer is 15.72, with a standard deviation of 10.15 and a low and highest of 0 and 52.63, respectively.

Categorical Variables Frequencies.

Table 3: showing the distribution of livestock ownership in south western Uganda

Livestock ownership	Frequency	Percentage	Cumulative
Own	122	79.74	79.74
Don't own	31	20.26	100
Total	153	100	179.74

***Figure 1*: A pie chart showing the percentage distribution of livestock ownership in south western Uganda**

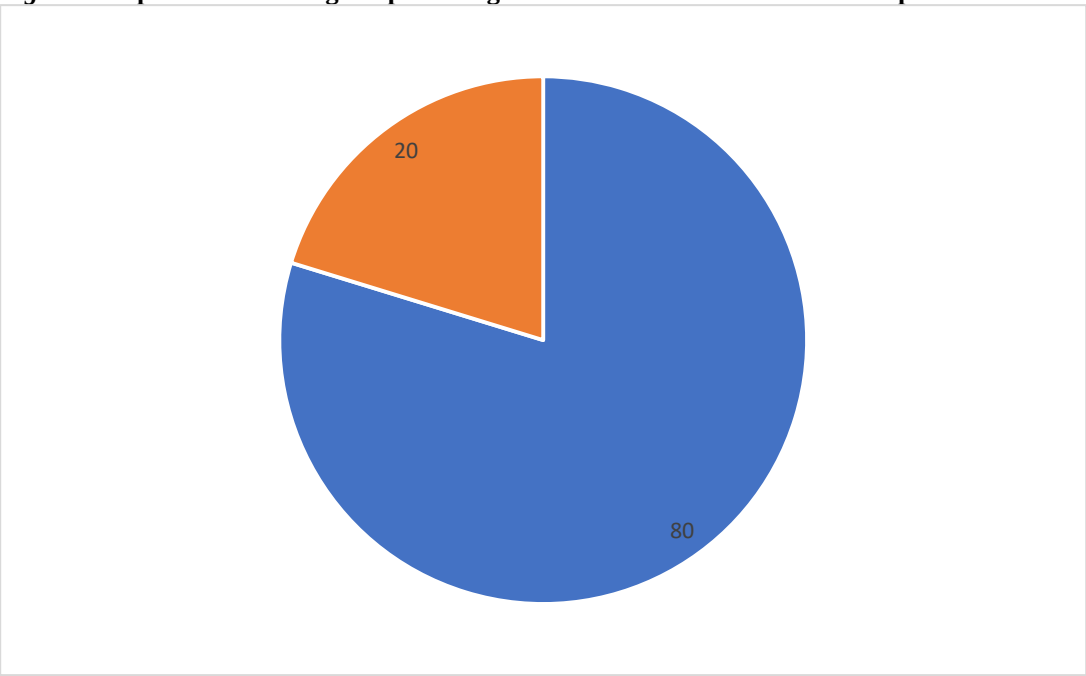

Figure 1: shows the livestock ownership

From figure 1 and table 3 a1bove, 22 farmers from Kisoro and Kanungu said they owned livestock which is about 80 percent and 31 farmers said they did not own livestock which is about 20 percent of the farmers. According to the above analysis, farmers who own livestock were 4 times more than those who don't own.

Table 4: Shows location of the potato plot proportions in south western Uganda

Field location	Frequency	Percentage	Cumulative
Upper slope	13	8.5	8.5
Middle slope	67	43.79	52.29
Foot slope	73	47.71	100

Total	153	100

Figure 2: A bar graph showing location of the potato plot proportions in south western Uganda

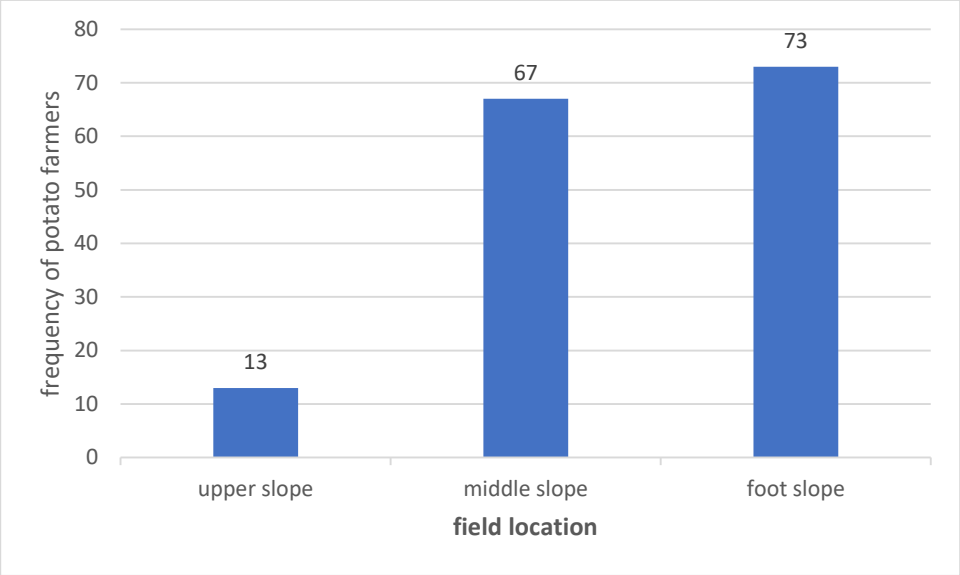

Figure 2: show the field location of the potato plots

Figure 2 show that of the study population, 13 famers were growing potatoes on upper slope, 67 on the middle slope and 73 on the foot slope with 8.5 percent, 43.79 percent and 47.71 percent respectively. This shows that the highest number of famers grow potatoes on the foot slope followed by those on the middle slope and the least number grow on the upper slope.

Figure 3: A bar graph showing frequency of land ownership status of potato farmers in south western Uganda

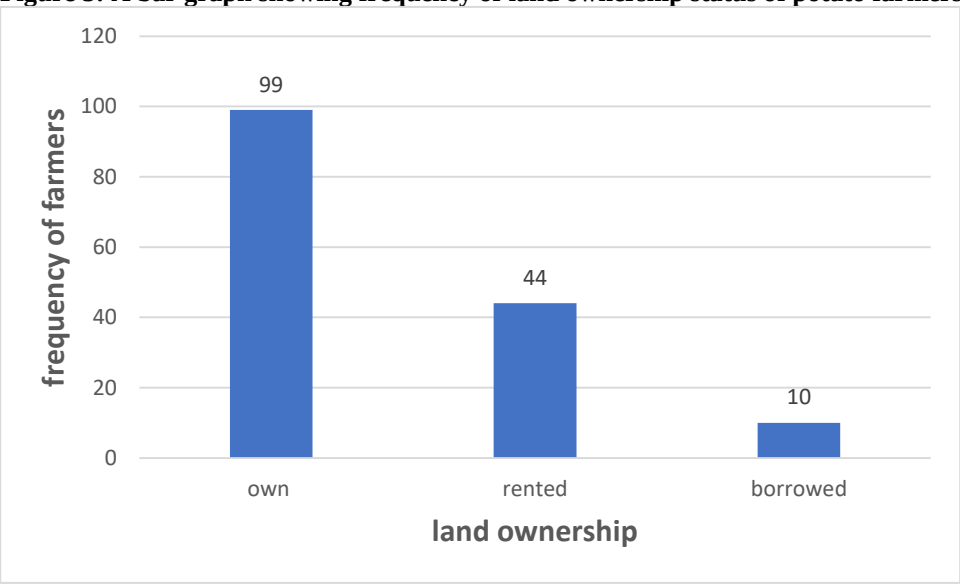

Figure 3: shows the land ownership status

Figure 3 shows that of the 153 potato farmers in south western Uganda 99 owned land, 44 rented land and 10 borrowed land for potato farming. This implies that the highest number of potato farmers owned the land, followed by those who rented and very few farmers borrowed land for potato farming in south western Uganda**.**

Figure 4: Shows a box plot showing the distribution of yields by Districts

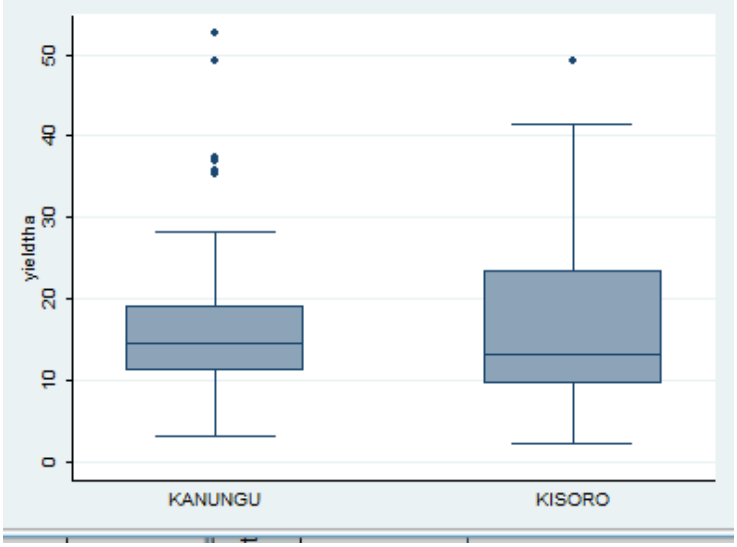

Figure 4 showing the yield distribution by yields

Measures of statistical significance like the mean, min, max, and median are displayed in the box plot above for south-western Uganda. Above all, it demonstrates how the two districts' data points are distributed. In accordance with Figure 4, Kisoro District has a median yield per hectare of 12, while Kanungu District has a normal yield per hectare of 15, with 55 being the largest outlier. Figure 4 shows that Kanungu has higher yields than Kisoro, as seen by the highest outliers.

Bivariate analysis

Table 5: Correlation between the independent variables and the dependent variable

	land size	Experience	number of livestock	Yield
land size	1			
Experience	0.09 0.30	1		
number of livestock	0.26 0.00*	0.20 0.01*	1	
Yields in tons per hectare	-0.15 0.07	-0.02 0.81	0.05 0.57	1

Correlation analysis is used to determine how the various variables are related to one another. The researcher looked into the connections among the quantitative study variables to determine the degree of collinearity, and the results are shown in Table 5. As the correlation coefficients are below 0.5, there is generally little connection between most variables. The findings indicate a very modest, non-significant positive association between the area of the farming field and the amount of experience of the farmers. Also, there is a very slight but substantial association between the size of the farmer's land and the quantity of livestock on it. Moreover, there is a negligibly small correlation between outputs and land size.

MULTIPLE REGRESSION

Table 6: Show the multiple regression between independent variables and dependent variable

Yields per hectare	Coef.	Std. Err.	T	P>t	[95% Conf.	Interval]
land size	-0.60	0.37	-1.64	0.104	-1.3	0.1
Experience	-0.01	0.09	-0.08	0.935	-0.2	0.2
number of livestock	0.08	0.28	0.3	0.768	-0.5	0.6
land ownership						
Rented	0.02	2.05	0.01	0.991	-4.0	4.1
Borrowed	0.29	3.50	0.08	0.933	-6.6	7.2
field location						
middle slope	-2.19	3.20	-0.68	0.494	-8.5	4.1
foot slope	0.30	3.19	0.09	0.925	-6.0	6.6
livestock ownership						
don't own	-0.29	2.43	-0.12	0.906	-5.1	4.5
_cons	17.31	3.54	4.89	0.000	10.3	24.3
Source	SS	Df	MS	Number of observations	=	153
Model	459.18	8	57.39739	Prob > F	=	0.82
Residual	15198.04	144	105.542	R-squared	=	0.03
				Adjusted R-squared	=	-0.02
Total	15657.22	152	103.008	Root MSE	=	10.27

The R-square (0.03) implies that 3 percent of the variations in the potato yields per hectare can be explained by land size, experience, livestock ownership, number of livestock and field location, hence a very poor fit.

According to the constant's coefficients (17.31), the yields per hectare would typically be 17.31 regardless of factors like land size, expertise, the quantity of animals on the property, field position, land ownership, and livestock ownership. It is statistically significant because of the p-value (0.000.05).

The coefficient for potato land size (-0.60) indicates that, on average, a unit increase in potato farmland will result in a 0.60 drop in production per hectare while holding other variables constant. We draw the conclusion that the size of the potato land does not affect yields per hectare since the p-value (0.10>0.05) indicates that the size of the potato land is statistically negligible. The average production per hectare would decline by 0.01 with each additional year of expertise in potato farming, if all other factors remained constant, according to the coefficient for experience for potato farming years (-0.01). We draw the conclusion that yields per hectare do not depend on experience for potato farming in years because the p-value (0.94>0.05), expertise is statistically unimportant.

The statistic for the number of animals a farmer owns (0.08) suggests that, on average, an increase in a farmer's livestock holdings boosts yields per hectare by 0.08 while holding other variables constant. Since the p-valve is absolutely minuscule (0.77>0.05), we draw the conclusion that the farmer's animal holdings have no bearing on the yields per hectare.

The coefficient for field location (-2.19) indicates that those who grow potatoes in the center of a slope get 2.19 units less of a hectare's yield than those in the bench category, and the coefficient for field location (0.30) indicates that those who grow potatoes on the foot of a slope get 0.30 units more of a yield per hectare than those in the bench category. We draw the conclusion that the location of a potato growing plot has no bearing on yields per hectare because the p-values for both the middle slope and the foot slope are greater than (0.05).

The potato growers who rented property increased yields per hectare by 0.02 units more than the bench category, according to the coefficient for land ownership (0.02). Since their p-values are greater than 0.05, land ownership is statistically insignificant therefore we conclude that yields per hectare does not depend on the land ownership for potato farming.

The coefficient livestock ownership (-0.29) implies that who don't own livestock get 0.29 potato yields per hectare less than the bench category. Since the p-value (0.91 >0.05), it is statistically insignificant and we conclude that yields per hectare does not depend on livestock ownership.

Conclusion

On the influence land size and number of livestock on variation potato yields per hectare, the study found out that land size had a very week negative insignificant relationship on yields which is in line with (Wang'ombe , 2013) assessed the causes of low potato yields in Kenya but also contradicting with Denis et al. (2022) who assessed the extent and determinants of Yields among smallholder potato farming households in Nyandarua County, Kenya and found out that land size have a positive significant influence.

Recommendation

With reference to the finding of this research, the following recommendations are preferred in order to influences the yields per hectare in Uganda.

Farmers for potatoes should not over rely more on these factors to determine their yield

On the point of experience and land size, research should be carried out to find out which factors affect land size and farmers experience to influence more yields per hectare in South Western Uganda.

References

Barasa , A., Odwori , P., Barasa , J., Ochieng S, & S. (2019). Technical Efficiency and Its Determinants onIrishPotato Farming among Small Holder Farmers inTrans-Nzoia County-Kenya. *International journal of Research and Innovation in Social Science, 5*(3), 235-238.

BARBARA . , M., ZAWEDDE , C., & REBECCA , G. (2014, pp. 337–349). Factors Influencing Diversity of Farmers' Varieties of Sweet Potatoin Uganda: Implications for Conservation. *Economic Botany , 68*(3). Retrieved August 13, 2014

Beriso, B. B. (2018). Factors Affecting Smallholder Farmers Potato Production in Shashemene District, West Arsi Zone, Oromia National Regional state Ethiopia. *Food Science and Quality Management* .

Bonabana-Wabbi, J. A. (2013). The perfomance of potatoes markets in south western Uganda. *Agric.Econ*, 225-235.

CIP. (2016). Potato facts and figures [Online]. *Centro Internacional dela Papa, Lima, Peru.* Retrieved jULY, from http://cipotato.org/potatoes/facts/

Denis , W., Josiah, A., Robert , M., & Luke, O. (2022). *Determinants of Irish Potato (Solanum tuberosum) Commercialization in Nyandarua County, Kenya.* kENYA: Jomo Kenyatta University of Agriculture and Technology, Department of Agriculture and Resource Economics.

FAO. (2018). *Food and Agriculture Organization of the United Nations.* Retrieved from http://faostat3.fao.org/browse/Q/QC/E

FAOSTAT. (2016). *Production statistics.* Retrieved JULY 11, 2016, from Available at http://faostat.fao.org.

Kafle, B., & P, S. (2012). ADOPTION OF IMPROVED POTATO VARIETIES IN NEPAL: A CASE OF BARA DISTRICT. *The Journal of Agricultural Sciences, 7*(1).

Knoema. (2016). *Production Statistics—Crops.* Retrieved from Retrieved from: https://knoema.com/FAOPRDSC2015Feb/production-statistics-crops-crops-processedebruary-

Kothari, C. R. (2004). Research Methodology: , 2 . In *Methods and Techniques.* New Delhi, India: New Age International (P) Ltd.:.

Namugga, P. M. (2017). Participatory assessmentof potato farming systems, production constraints and cultivar preferences in Uganda. *Australian Journal of Crop Science, 11*(8), :932–940. doi:10.21475/ajcs17.11.08.pne339

Sebatta, C., Mugisha, J., Katungi, E., Kashaaru, A., & Kyomugisha, H. (2014). Smallholder Farmers' Decision and Level of Participation in the potato market in uganda. *Mod.Econ*, 895–906.