



## ASSESSMENT OF SOCIO-ECONOMIC CHARACTERISTICS OF SMALL-SCALE IRISH POTATO FARMERS IN NIGERIA AND KENYA UNDER THE POTATO INITIATIVE AFRICA PROJECT

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### ABSTRACT

*The study analyzed the socio-economic characteristics and production challenges of small-scale Irish potato farmers in Nigeria and Kenya. Multi-stage sampling procedure was adopted to select study locations in both countries. A total of 295 small-scale Irish potato farmers were interviewed, 188 from Nigeria and 107 from Kenya. In both countries however, farmers interviewed were beneficiaries of the Potato Initiative Africa Project. Data were subjected to descriptive statistics to obtain results of the study. The results from the studies disclosed that most of the farmers ranges between 36-59 age class hence categorized as adults. Majority were reportedly married in Nigeria with 50.5% while 29.0% of farmers in Kenya were reportedly single. The mean household size in Nigeria was 7 members and 6 members for farmers in Kenya. More than 50% of farmers in both countries had formal education. In Nigeria, 38.3% of Irish potato farmers were civil servants and 100% of farmers in Kenya had farming as major activity. In Nigeria, 54.8% of farmers were members of an association (that is farmer's association) while 51.4% of farmers in Kenya were members of farmer's association. Major constraints that limit Irish potato production for both farmers' groups in Nigeria and Kenya included blight infestation, high input costs, poor pricing and corrupt retailers, poor road network and inadequate institutionalized credit sources. It was recommended that farmers in both countries to leverage upon existing farmers group and adopt an integrated/unified disease management system of conducting spraying activity collectively and at the same time. Also, research institutes with the mandate on root and tuber crops should be empowered and funded to conduct research intended in improving local Irish potato varieties.*

**Keywords:** Nigeria, Kenya, Constraints, Blight, Potato

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## INTRODUCTION

Irish potato (*Solanum tuberosum*) is indigenous to South America in the Andes Mountains and is believed to have been brought to Africa in the 19<sup>th</sup> century International Potato Centre (IPC, 2015). It requires an optimum temperature of 15°C for tuber formation National Root Crop Research Institute (NRCRI, 2015). The crop has been an important commodity to farmers, traders, and consumers as it adds to the household economy and food security in areas where it is heavily cultivated for the single reason that the crop is cultivated for income generation and not to be consumed. Potatoes mature in 3-4 months, compared to other tuber crops; its short maturity makes it possible to be grown throughout the year under both rainy and irrigated systems (Okonkwo, 1992, Food and Agricultural Organization (FAO), 2008, NRCRI, 2015 and Hudu, 2018) hence ideally suited to developing nations like Nigeria which is characterized by abundant cultivable land and labour. The annual world Irish potato production was estimated at 376,119,974 Metric Tons (MT), cultivated in an estimated land area of 18,132,694 ha in 2021. The three largest producers in the world are China, India and Ukraine with 94,362,175 MT, 54,230,000 MT and 20,269,190 MT respectively in an estimated land area of 5,782,738 ha, 2,248,000 ha and 1,283,200 ha, (FAO, 2020). Of the total world production, Africa accounts for 28,099,322 MT in 1,870,630 ha of land. Egypt being the largest producer in Africa, record an annual output of 6,902,817 MT cultivated in a land area of 262,706 ha. In Nigeria, production has increased from 838 metric tons (MT) in 2006 to 1,210,936 MT in 2019 while land area cultivated has also increased from 266,000 ha to 319,352 ha for the same period (FAO, 2020). Kenya for the same period produced 2,415,080 MT in 120,754 ha and 1,978,952 MT in 212,976 ha respectively.

Africa is among the continent with the lowest contribution to the global production of potato tubers, with Oceania being the lowest. Currently, potato production is largely a smallholder activity (FAOSTAT, 2021). Average cultivated land sizes are less than two hectares in both Kenya and Nigeria, and farmers mostly perform farm operations manually with traditional farm tools and production techniques. Smallholder farmers are usually constraints with poor quality inputs (seeds, fertilizers and agrochemicals), inadequate information, and access to credit institutions, storage facilities and other production and/or processing equipment (Muthoni and Nyamongo, 2009 and PIA, 2016). This situation has resulted in low yields, high postharvest losses, and poor quality of produce in both countries (GIZ, 2016). The study is intended to analyze the socio-economic characteristics of small-scale Irish potato farmers and also identify their production constraints in Nigeria and Kenya.

## METHODOLOGY

### Description of the Study Area

Plateau State is located in the North Central geopolitical zone of Nigeria. It lies between latitude 9.2422°N - 10.1153°N and longitudes 8.6957° East - 9.5210° East (Majekodunmi, 2013). The state has a land area of 30,913 km<sup>2</sup> with an estimated population of 4,373,708 as of 2020 based on an annual growth rate of 2.6% (World Bank, 2019). The state is about 1230m above sea level, with about 1400mm of annual rainfall which spans from April to October (NRCRI, 2015). The climate is characterised by two distinct seasons, the rainy season, and the dry season, which falls between November and March. High temperatures

are recorded in March–May while the lowest temperatures popularly called the Harmattan months are between December and January. These seasons are suitable for potato production because they meet the required 15 °C for tuber formation. Other crops produced in these areas include tomato, cabbage, carrots, lettuce, cucumber, green beans and onions. Cereal crops such as maize, sorghum and millet are also grown in the area. Potato-producing seasons are April – July (rainy season) and September – January (dry season). Over 80% of potatoes are produced as a sole crop during the dry season and in mixtures during the rainy season. The climate of the State is ideal for Irish potato production as well as vegetables, fruits and other exotic crops.

Nyandarua County is situated in the centre of Kenya. The county lies between latitude 0° 33' 0" S and Longitude 36° 37' 0" It has an average elevation of 2,238 m. The mean annual rainfall is 1500mm distributed between March and November and a drier period from December to February (Muthoni *et al.*, 2013). The annual temperature of the county ranges between 21-26 °C, the lowest is usually recorded in June while the highest is in February and March. The county has a land area of 3,304 km<sup>2</sup> and an estimated population of 667,650 in 2020 based on 2.3% annual growth (World Bank, 2019). The farming system is majorly rain-fed. The conditions of both countries made it feasible for the potato to thrive well.

### **Sampling Procedure and Sample Size**

For the study, farmers under the Potato Initiative Africa Project were sampled in both countries. Plateau state and Nyandarua county were selected purposively being the PIA project sites and also the major producers of Irish potatoes in both countries (Muhammad, Gindi, Gona, and Kaka, 2016). Mangu and Pankshin LGA were purposively selected because they are the two locations in which the project took place in Nigeria while Oljoro Orok and Kipipiri sub-counties were also selected purposively in Kenya. Finally, 188 Irish potato farmers were interviewed from Pankshin (104) and Mangu (84) while 107 farmers were interviewed in Kenya being the total project farmers in both locations. A total of 295 PIA farmers were interviewed, 188 from Nigeria and 107 from Kenya. Data were obtained from primary and secondary sources; the primary data was sourced through the use of structured questionnaire in digital format (CAPI) while secondary sources were through data from the Plateau Agricultural Development Programme (PADP), National Agricultural Extension and Research Liaison Services (NAERLS) and National Potato Council of Kenya (NPCK) to serve as a means of triangulation and validating data obtained from primary source. Trained enumerators from both Countries were utilized for data collection while the researcher supervised the conduct of the exercise in Nigeria and NPCK supervised the exercise in Kenya. Using resident enumerators was so helpful as enumerators were able to use their local language for data sourcing in both countries.

### **Analytical Techniques and Specification of Models**

Data obtained for the study were subjected to descriptive statistics using frequencies, percentages and means to get results of the study.

## RESULTS AND DISCUSSION

### Socio-economic Characteristics of Irish Potato Farmers in Nigeria and Kenya I

Table 1 presents findings of the Socio-economic Characteristics of Irish Potato Farmers in Nigeria and Kenya. These are presented in the subsequent sections.

#### Age of Irish Potato Farmers

Age is the number of years one has lived and the result is as presented in Table 1. In Nigeria, the mean age of the Irish potato farmers was 51 years. The majority (66.0%) of Irish potato farmers were within the age class of 36-59 years. While mean age of Irish potato farmers in Kenya was 48 years. Just like in Nigeria, farmers within the age class of 36-59 were the majority (53.3%) in Kenya. The result implied that Irish potato farming in both countries is an activity majorly practiced by the middle aged (36-59 years) while fewer youths were involved. This is expected to inversely affect the productivity of Irish potato farmers and might likely affect the adoption of improved farming techniques since aged citizens are known to be more risk averse than youths. The findings of this study agreed with that of Ogheneruemu and Dominic (2020) who opined that 38.9% of Irish potato farmers in developing countries fall within 41-50years age category. It however contradicts the findings of Khan *et. al* (2019) that reported 33 years as the mean age of Irish Potato farmers. These differences could be a result of variance in study sites.

#### Household Size of Irish Potato Farmers

Household size is the total number of people living together under the same roof and sharing the same sources of food. It is also a group of people living together under one household head and eating from the same pot. Table 1 indicated the mean household size of 7 and 6 for Irish potato farmers in Nigeria and Kenya, respectively. Both farmers in Nigeria and Kenya had 38.8% and 36.5% within the class of 7-10 members per household. The mean household size indicated that farmers in Nigeria had more members than of Kenya.

The general implication of the findings was that farmers in both countries had a household size of between 1-10 members. In developing nations, a high family size also translates to the availability of family labour hence complementing and reducing family expenses on hired labour. Higher household members are also expected to result in higher household productivity and a valid reason to adopt new farming techniques in order to fend for the household dependents. The results correspond to that of Ogheneruemu and Dominic (2020) that reported a household size of between 6-10 members as the majority with over 37.3% of respondents falling to that threshold. Also, Mgema (2021) reported that over 59.0% of Irish potato farmers have a household size of less than 10.

**Table 1: Socio-economic Characteristics of Irish Potato Farmers in Nigeria and Kenya I**

Socio-Economic Variables	Nigeria		Kenya	
	Freq.	%	Freq.	%
<b>Age</b>				
18-35 (Youth)	22	11.7	22	20.6
36-59 (Middle age)	124	66.0	57	53.3
60 and Above (Aged)	42	22.3	28	26.2
Total	188	100.0	107	100.0
Mean	51.4		48.2	
Std. Dev.	14.1		12.9	
Min	28		27	
Max	87		70	
<b>Household Size</b>				
1-3	19	10.1	32	29.9
4-6	69	36.7	27	25.2
7-9	73	38.8	39	36.5
>10	27	14.4	9	8.4
Total	188	100.0	107	100.0
Mean	7.3		5.7	
Std. Dev.	3.9		2.9	
Min	1		1	
Max	20		10	
<b>Farm Size</b>				
0.1-1.9ha	137	72.9	23	21.5
2.0-3.9ha	27	14.4	28	26.2
4.0-6.0ha	24	12.8	56	52.3
Total	188	100.0	107	100.0
Mean	1.6		3.4	
Std. Dev.	1.5		1.7	
Min	0.2		1	
Max	6		6	
<b>Years of Experience</b>				
< 10	65	34.6	26	24.3
11-20	69	36.7	34	31.8
21-30	48	25.5	32	29.9
31-40	6	3.2	15	14.0
Total	188	100.0	107	100.0
Mean	15.2		19.2	
Std. Dev.	8.5		9.9	
Min	1		2	
Max	40		35	

Source: Survey Data (2022)

### Land Size of Irish Potato Farmers

Land size refers to the size of plots or land dedicated for agricultural purposes and in this case for Irish potato production. The results in Table 1 indicated that Irish Potato farmers

in Nigeria cultivates a mean of 1.6ha while Kenyan farmers had an average of 3.4ha. Most of the farmers in Nigeria (72.9%) operate within 0.1-1.9ha of land, hence operating at a small-scale level. The result implied that Irish potato farmers in Nigeria operate in smaller landholdings than those in Kenya. This could probably be attributed to the populations of both countries which in the case of Nigeria is large and people are already competing for space for residential and farming activities, especially down north where much of agricultural activities takes place. The findings corroborated that of Nyagaka *et al.* (2010) who reported most Irish potato farmers in developing countries operated at a small-scale level with an average of 2.46 Ha.

### **Experience in Irish Potato Production**

The years of experience gives an idea of how long a respondent had been into Irish potato production. In Nigeria, the average years of Irish Potato farming experience was 15 years. About 36.7% of farmers in Nigeria had experience of between 11-20 years. On the other hand, Irish potato farmers in Kenya had average years of experience of 19 years and manyt (31.8%) just like in Nigeria belonged to the 11-20 years' experience. The result in both countries implied that Irish potato farmers relatively belonged to same experience level. The findings agreed with Ogheneruemu and Dominic (2020) who reported that 46.03% of Irish potato farmers have an experience range of between 11-20 years and at the same time contradicted Mgema (2021) who reported that 70% of Irish potato farmers had experience between 1-12 years.

### **Socio-economic Distribution of Irish Potato Farmers in Nigeria and Kenya II**

#### **Sex of Irish Potato Farmers**

The sex of respondents determines the differences in morphological appearance and categorized individuals into males and females. The differences also help to inform researchers and all interested individuals of the roles assigned to each group or category. The reason of inclusion of this variable into this study is to get to know whether female also participate in Irish potato production. Majority (61.7%) of Irish potato farmers in Nigeria were male and 38.3% were females while in Kenya, 55.1% of the beneficiary group were males while 44.9% were females as presented in Table 2. The finding indicated that females were into Irish potato production in both countries. The hub of Irish potato production in Nigeria is Plateau state and unlike some areas in Nigeria particularly where females due to some cultural or religious limitations find it difficult to participate actively in farming thus denying them the opportunity to access agricultural inputs, females in Plateau state were fully involved in agricultural activities in the production process ranging from land clearing down to harvesting. Mgema (2021) and Uche *et al.* (2020), reported that 72% and 66.7% of Irish potato farmers are males.

**Table 2: Socio-economic Distribution of Irish Potato Farmers in Nigeria and Kenya II**

Socioeconomic Variables	Nigeria		Kenya	
	Freq	%	Freq	%
<b>Sex</b>				
Male	116	61.7	59	55.1
Female	72	38.3	48	44.9
Total	188	100.0	107	100.0
<b>Marital Status</b>				
Single	32	17.0	31	29.0
Married	95	50.5	29	27.1
Divorced	22	11.7	21	19.6
Widowed	39	20.7	26	24.3
Total	188	100.0	107	100.0
<b>Educational Background</b>				
No Formal Edu.	11	5.9	19	17.8
Primary Edu.	51	27.1	21	19.6
Secondary Edu.	52	27.7	39	36.5
Tertiary Edu.	74	39.4	28	26.2
Total	188	100.0	107	100.0
<b>Primary Occupation</b>				
Civil Servant	72	38.3	-	-
Crafts work	33	17.6	-	-
Farming	61	32.5	107	100.0
Trading	22	11.7	-	-
Total	188	100.0	107	100.0
<b>Association membership</b>				
Yes	103	54.8	55	51.4
No	85	45.2	52	48.6
Total	188	100.0	107	100.0
<b>Access to Credit</b>				
Yes	87	46.3	60	56.1
No	101	53.7	47	43.9
<b>Contact with Extension Agent</b>				
Yes	99	52.7	56	52.3
No	89	47.3	51	47.7
Total	188	100.0	107	100.0

Source: Survey Data (2022)

**Marital Status of Irish Potato Farmers**

This variable classified respondent into married, single, widowed or divorced as presented in Table 2. A great percentage (50.5%) of the farmers in Nigeria were married. The least percentage (11.7%) belonged to the divorced status. In Kenya, the majority (29%) were reported to be single followed by 27.1% who were married. Generally, farmers in Nigeria and particularly in the north get married at an early age which could buttress and support the reason for the differences in the result obtained.

### **Educational Background of Irish Potato Farmers**

Ability to read, write and understand is important to whatever activity a person does especially in farming. This ability can allow farmers to source information that can help improve their productivity on their own and by so doing the pressure on the inadequate extension personnel will be brought to a minimum. Generally, more than half of Irish potato farmers (94.2%) in Nigeria attended formal education. Only 5.8% had no formal education. In the case of Kenya, over 82.2% attended formal education while 17.8% had no formal education. The result indicated that majority of farmers in both countries can read, write and also be able to comprehend simple farming instructions on print materials hence making it easier for extension agents to share written instructions with farmers. The findings from both countries as presented in Table 2 agreed with that of Njuguna *et. al* (2015) and Karanja (2008) who reported that 70% and 65.6% of Irish potato farmers respectively were literate and could read and write.

### **Primary Occupation of Irish Potato Farmers**

This variable indicated the major means each household unit derived income to fend for the needs of their dependents. Having other activity aside farming as the major occupation entailed that such farmer derived sustenance means from that activity and can as well complement the demand of farming from savings gotten from the primary activity. Having knowledge of this will help reach a better inference for potential investors. Thirty-eight per cent (38%) of farmers reached out to in Nigeria belonged to the civil service and takes farming as a secondary occupation. Other income sources in Nigeria included farming (32.5%), craftworks (17.6%) and trading (11.7%). The case in Kenya was quite different to that in Nigeria in the sense that farming was reported as the primary occupation. The result as presented in Table 2 implied that farming in both countries is a major activity that provides for many households, especially in the rural setups where farming is domiciled. The findings were supported by Karanja (2008) who reported that over 94.8% of Irish Potato producers were real-time farmers that had farming as their major income source.

### **Association Membership**

Association membership indicated whether the farmers were in groups. Being in groups helped farmers in bulk input purchase, group marketing and also gave them the advantage of building the capacity of one another through engaging experts to train them on improved farming processes. The results of the analysis as presented in Table 2 indicated that the majority (54.8%) of Irish potato farmers in Nigeria are members of the farmer associations while only 46.7% of farmers in Kenya are members of farmers group. The results indicated that many of farmers in both countries are members of farmers' groups and could use that membership to their advantage through group inputs purchase and group sales of proceeds.

### **Credit Access**

Credit access entailed the ability of farmers to access loan facilities from either bank of agriculture, commercial banks or other money lenders. This allowed farmers to purchase required inputs needed to cultivate their landholdings. A reasonable (46.3%) number of Irish potato farmers in Nigeria had access to credit while 56.1% of the Irish potato farmers



in Kenya accessed credit as presented in Table 2. The result showed that many farmers in both countries had access to credit, the source of which varied and affected the amount of facilities accessed. This was expected to improve level of livelihood standard among Irish potato farmers in both countries because the inaccessibility of small-scale farmers to quality inputs was majorly due to insufficient capital that deter them from optimally attending to the needs of the enterprise.

### **Contact with Extension Agents**

Contact with extension agents is an important factor that to a great extent determines farmers meet with personnel that advice and put them through new farming ideas capable of improving their outputs. The result on contact with extension agents as presented in Table 2 indicated that the majority (52.7%) of respondents in Nigeria had access to the services of extension agents while 52.3% in Kenya also have access to the service of extension agents. The result implied that majority of Irish potato farmers in both countries had access to the services of extension agents and this improved the productivity of Irish potato and ensure project adoption and sustainability.

### **Production Challenges of Irish Potato Production**

Irish potato production challenges are all those factors that directly or indirectly affects productivity of Irish potato farmers. Table 3 identified most prominent challenges in the study area. The most prominent challenges of Irish potato farmers in Nigeria as seen in table 3 were Irish Potato blight disease, high input costs, poor road network, and poor pricing among others. Irish Potato Blight is a major threat to Irish potato production, over 90.4% of the respondents reported it as a challenge. High cost of inputs and limited government support were the second and third most important challenge reported by over 82.5% and 80.2% of the farmers respectively. Other production challenges that affected Irish potato production in Nigeria included; inadequate institutionalized credit sources, less contact with extension agents (EAs), limited or inadequate government support and inadequate social amenities. In Kenya, the major production challenge was inadequate institutionalized credit sources reported by 57.9% of the farmers and ranked 1<sup>st</sup>. Limited government support and other potato diseases were reported by 51.4% each. High input costs and poor road networks were also serious production challenges amongst and were reported by 48.6% each.

Other production challenges of Irish potato farmers in Kenya included Blight infestation (47.7%), poor pricing and corrupt retailers (46.7%), inadequate social amenities (43.9%) and less contact with Extension agents (43.0%). The findings of this study corroborate those of Uche *et al.* (2020), Karanja *et al.* (2014), Muthoni *et al.* (2013) and Mutuah (2021) that identified High input costs, Inadequate Credit Facilities, Pests and Diseases, Lack of clean seeds, Insufficient Capital and Poor marketing strategies to be the major challenges limiting Irish Potato Production in Plateau State, Nigeria and Kenya.

**Table 3: Distribution of Farmers According to Production Constraints**

Challenges	Nigeria		Kenya	
	Freq	%	Freq	%
High Input Costs	155	82.5	52	48.6
Inadequate Institutionalized Credit Sources	64	34.2	62	57.9
Blight Infestation	170	90.4	51	47.7
Poor Pricing and corrupt marketers	149	80.1	50	46.7
Poor Road Network	137	73.3	52	48.6
Less Extension Agent	65	34.6	46	43.0
Limited Gov't Support	150	80.2	55	51.4
Other Potato Disease	66	35.3	55	51.4
Inadequate Social Amenities	62	33.9	47	43.9

Source: Survey Data (2022)

## CONCLUSION

The study concluded that in both countries farming Irish potato was left to the middle aged category (36-59 years). Majority of farmers in Nigeria were married while majority of the farmers in Kenya were single. Other demographic characteristics studied indicated that farmers in both countries in terms of their characteristics could be able to effectively cultivate reasonable farm size and still got reasonable profit margin. Some challenges hindering effective production of the crop in both countries included Irish Potato blight disease, High input costs, poor road network, and poor pricing. The study therefore recommended the following;

- i. Farmers should be encouraged to leverage upon existing farmers group and adopt an integrated/unified disease management system of conducting spraying activity collectively and at the same time. Extension organizations could help on this by coming up with seasonal calendars for different crops
- ii. Research institutes with the mandate on root and tuber crops should be empowered and funded to conduct researches intended in improving local Irish potato varieties

## REFERENCES

- Agriculture Information Bank (2016). *Cultivation of Potato (Solanum Tuberosum lj)*. Agriculture Information Bank. <http://agriinfo.in/> Retrieved April, 2021 <https://agriinfo.in/cultivation-of-potato-solanum-tuberosumlj-927/>
- Nyagaka, D. O., Obare, G. A., Omiti, J. M. and Nguyo, W. (2010). Technical efficiency in resource use: Evidence from smallholder Irish potato farmers in Nyandarua North District. *Kenya African Journal of Agricultural Research* 5(11): 1179-1186
- Dominic, M. G. and Ogheneruemu, O. (2021). Technical Efficiency of Irish Potato Production: A Case Study from Nigeria. *Review of Agricultural and Applied Economics*, 24(2): 112-120

- Elmar, S. G. (2012). Tackling Low Potato Yields in Eastern Africa: An Overview of Constraints and Potential Strategies. *The International Potato Center*, 72–80.
- Food and Agriculture Organization of the United Nations (2021): *Crop and Livestock Products*. FAOSTAT. <http://www.fao.org/> Retrieved August, 2023 from <http://www.fao.org/faostat/en/#data/QC>
- International Potato Centre (2015): *Potato*. CIP International Potato Centre. <http://cipotato.org/> Retrieved November, 2020 from <http://cipotato.org/potato/>
- Muthoni, J. and Nyamongo, D. O. (2009): A review of constraints to ware Irish potatoes production. *Kenya Journal of Horticulture and Forestry* 1(7): 98-102
- Muthoni, J., Mbiyu, M. and Kabira, J. N. (2020): Up-scaling production of certified potato seed tubers in Kenya: Potential of aeroponics technology. *International Journal of Agricultural Extension and Rural Development*, 8(9): 001-006.
- Karanja, A. M. (2008). Analysis of Rainfall Variability on Irish Potato Production in Oljoro-Orok Division, Nyandarua County, Kenya. An unpublished MSc. Thesis in the School of Humanities and Social Sciences of Kenyatta University.
- Karanja, A. M., Shisanya, C. and Makokha, G. (2014). Analysis of the Key Challenges Facing Potato Farmers in Oljoro-Orok Division, Kenya. *Agricultural Sciences*, 5, 834-838.
- Mengui, K. C., Oh, S. and Lee, S. H. (2019). The Technical Efficiency of Smallholder Irish Potato Producers in Santa Subdivision, Cameroon *Agriculture* 2019, 9, 259
- Hudu, M. I., Ahmed, M. M., Yusuf, M., Saleh, I. and Abdullahi, A. Y. (2018). Analysis of Small-Scale Irish Potato Farmers Income in Plateau State presented at the 52nd Annual Conference of Agricultural Society of Nigeria October 2018. ARCN, Abuja.
- Majekodunmi, A. O., Fajinmi, A., Dongkum, C., Kim P., Michael, V., Thrusfield, A. and Susan, C. W. (2013). A longitudinal survey of African animal trypanosomiasis in domestic cattle on the Jos Plateau, Nigeria: Prevalence, distribution and risk factors. *Parasites Vectors* 6, 239
- Mgema, J. M. (2021). The Role of Socio-Economic Groups on Rural Irish Potato Seed Obtainability in Lushoto District, Tanzania. *East African Journal of Social and Applied Sciences*, 3(1), 172-180
- Muthoni, J., Shimelis, H. and Melis, R. (2013). Potato Production in Kenya: Farming Systems and Production Constraints. *Journal of Agricultural Science*, 5(5): 20-33
- Mutuah, B. P. (2021). Cost and Return Analysis of Irish Potato Production in Two Local Government Areas of Plateau State. *Journal of Economics and Allied Research*, 6(1):27-37.

- National Root Crop Research Institute, (2015). *Improved Irish Potato Cultural Practices*. National Root Crop Research Institute website Retrieved November, 2015  
<http://www.nrcri.gov.ng/sub-stations/#kuru-jos-plateau-state>
- Njuguna, I. M., Munyua, C. N. and Makal, S. K. (2015). Influence of Demographic Characteristics on the adoption of Improved Potato Varieties by Smallholder Farmers in Mumberes Division, Baringo County, Kenya. *Journal of Agricultural Extension and Rural Development* 7(4): 114-121.
- Ojo, A. M. (2005). *Economic Analysis of Irish Potato Production in Plateau State*, Unpublished Thesis, Ahmadu Bello University, Zaria, Nigeria.
- Okonkwo, J. C. (1992). Irish potato production in Nigeria. Training Workshop Paper, NRCRI, Vom, Nigeria.
- Rosner, F. (2016): Economic assessment of Agricultural Production Systems under Potato Initiative Africa in Kenya and Nigeria. A working paper for GIZ by Agribenchmark, Thunen Institute of Farm Economics, Germany.
- Uche, C. O., Umar, H. S., Girei, A. A. and Ibrahim, H. Y. (2020). Assessing the Profitability and Constraints to Irish Potato Production in Plateau State, Nigeria *International Journal of Innovative Research and Advanced Studies (IJIRAS)* 7(5):13-20
- World Bank (2019). *Nigeria Annual Population Growth*. The World Bank. Retrieved April 2021 from  
<https://data.worldbank.org/indicator/SP.POP.GROW?locations=NG>