Socioeconomic and Farm Structure Characteristics of Potato Farmers in Kuresoi North Sub-County, Nakuru County, Kenya

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ABSTRACT

It is vital to understand the socio-economic characteristics of farmers as it aids in solving multiple challenges that farmers undergo. This study analyzed the socio-economic characteristics of potato farmers in Kuresoi North Sub-County. Simple random sampling was used to select 395 smallholder potato farmers who participated in the household survey. A semi-structured questionnaire was used to collect socio-economic data from the respondents. STATA version 15.0 aided in analyzing data and results presented in the form of frequencies, percentages and charts. The results posited that farmers were middle-aged (a mean of 49 years), experienced in potato farming (11 years on average), and literate with basic secondary education (11 years on average). They possess a household land size of 1.6 hectares with 0.71 hectares dedicated to potato farming. Most farmers (77%) were married. Aside potato production, farmers practiced livestock keeping (67.59%) and production of other crops (4.56%). Only few farmers, 19.24% accessed certified seeds while the rest purchased seeds from open-air markets and neighbors. A large proportion of farmers (72.15%) diversified their agricultural production with 27.85% sticking to potato production. The observed socio-economic profile posit that farmers are literate, experienced and diversified. However, there is need to capacity build farmers to venture into profit-oriented off-farm activities such as value addition which will enhance their earnings.

Moreover, farmers should be encouraged to form cooperatives that will simplify access to high-quality inputs and ready market that will further translate to better productivity and profitability.

Keywords: Socio-economic characteristics, smallholder farmers, agricultural diversification, value-addition, Kuresoi North

INTRODUCTION

Agriculture plays a crucial role in contributing greatly to job creation, rural livelihoods and food security. The sector contributes up to 33% of the country's Gross Domestic Product (GDP) directly and a further 27% indirectly via linkages with other sectors including manufacturing, trade and transport [1]. Agriculture remains the primary source of income in the rural areas for over 70% of households, most of whom are smallholder farmers managing less than 2 hectares of land [2]. As it stands, more than ten million people suffer from severe food insecurity and dietary inadequacy where an approximately 3 million people on average require urgent food supply at a given point in time [3].

Potato stands out as the second most important food crop after maize in the country, both in terms of production and consumption with more than 800,000 small-holder farmers involved in its production [4]. Amongst the areas dominated by potato farming are the Rift Valley region, Central Kenya and parts of the Eastern region.

Within the Rift Valley Region is Nakuru County which is among the potato-producing counties. Many parts in the county produce an average yield of 8 to 10 tonnes per hectare whereas the potential yields under favorable conditions are estimated as 25 tonnes per hectare using improved agronomic practices [5].

Kuresoi North Sub County, one of the sub counties in Nakuru county has been acknowledged as a key potato growing zone owing to its conducive agro-ecological conditions i.e. reliable rainfall, cool temperatures and

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fertile volcanic soils. The sub county is largely dominated by smallholder farmers who rely greatly on potato farming both for household food security and cash income [6]. Despite potato being of great essence, its farming has remained underexploited both in Kuresoi North and Kenya at large. The crop's yields have continually fallen below the potential levels owing to a myriad of factors including; improper soil fertility management practices, high production input costs, inadequate access to certified inputs (seeds), susceptibility to diseases and poorly structured marketing systems [7].

These mentioned challenges are not solely technical, they are strongly associated with the socio economic and farm structure characteristics of farmers including; age, gender, education level, household size, access to extension services, land tenure system, farming experience and gender. For instance, while a large household tends to provide cheap and available labour, they end up placing higher demands on food consumption [8]. Several studies have put forward the aspects of agronomic, economic and marketing of potato with only few systematically profiling socioeconomic and farm structure characteristics of farmers, specifically in Kuresoi North sub-county. This less-researched area is very essential in understanding the diversity of potato farmers across various regions and thus aids in coming up with targeted interventions addressing various farmer category needs [9].

Moreover, absence of this knowledge may render interventions ~~being~~ generalized and thus lacking effectiveness in addressing unique challenges affecting farmers in diverse socio-economic conditions. This study thus focuses on the socio-economic and farm structure characteristics of potato farmers in Kuresoi North Sub-County, Nakuru County. By assessing demographic factors, farmers' asset base, agricultural practices and access to institutional support, the study looks forward to providing empirical insights into the prevailing conditions of potato farming.

Findings from this study will inform not only academic literature but will also play a significant role in shaping policies aimed at enhancing potato productivity, profitability and sustainability in the country's most important potato-growing zones.

METHODOLOGY

Area of study

The study was done in Kuresoi North Sub-County. It is one of the administrative units lying within Nakuru County with a land size of 618.1sq.kms. The sub-county has an aggregate population of 175,074 and a population growth rate of 3.5% per annum as per the 2019 census results [10]. It is located on the west Mau escarpment and borders Molo constituency to the East, Kuresoi South to the south-east, Kipkelion East to the west and Eldama Ravine to the north [11]. The sub-county exhibits temperate climatic conditions favoring agricultural production, in particular, horticultural crops and temperate fruits, including; cabbage, kale~~,~~ peas, plums and pears [12]. The average altitude in the area is 2500m above sea level [13].

Table I **Kuresoi North Sub-County Agro-Ecological Zones (AEZs)**

Altitude (meters)	Avg Rain (mm)	Temp (ºC)	AEZs areas
2400-2700	1500-1800	8ºC-18ºC	Forest, Kiptororo,
2100-2400	1300-1500	10ºC -28ºC	Kamara, Kuresoi,

Source: Kuresoi North Sub-County Agricultural Reports

Potatoes do well in areas with an altitude of 1500-2800 meters above sea level, under well-distributed rainfall patterns ranging between 850-1400 mms per annum, with a temperature range of 16-20ºC for tuber development [14]. The soils supporting excellent performance of potatoes should be well-drained, loamy-sandy soils with a PH of 5-6.5 that are rich in organic matter concentration [15].

This therefore makes Kuresoi North one of the suitable areas supporting the growth of potatoes.

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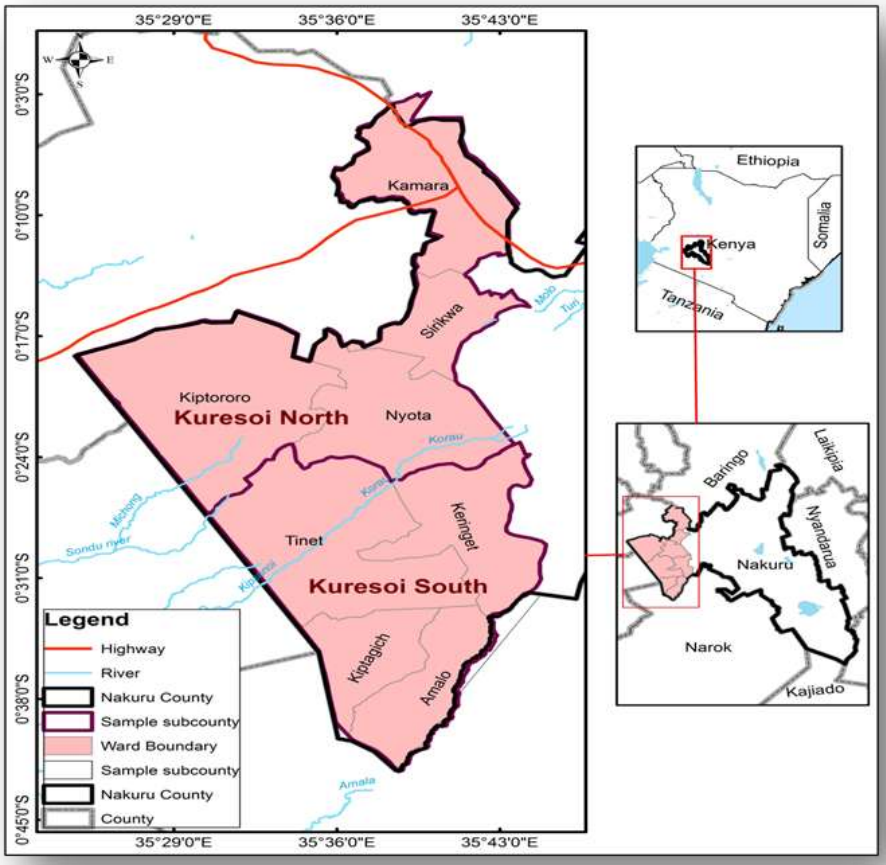
Figure 1 Area of Study Map. Source: Modified from (Independent Electoral and Boundaries Commission) IEBC 2013



Research design

The study adopted a descriptive design. A descriptive research design often aims to precisely describe a phenomenon, population or situation [16]. It will therefore, allow for the description of socio-economic factors attributed to the potato farmers at a given point in time [17].

One of the benefits attached to this study design is that it coincides with the cross-sectional research data which enables the researcher to make comparisons amongst a large number of variables at the same time or at a specific point in time.

Target population

The study focused mainly on potato farmers in Kuresoi North Sub County. Kuresoi North Sub County was selected precisely since it is a major producer and a potential area for potato production. According to the Ministry of Agriculture, Kuresoi Sub County 2023, there are approximately 23,949 potato farmers in the sub county which made up the target population for this study.

Sample size determination

The sample size was determined using Slovin's formula as it is suitable for determining samples from large populations [18].

$$n = \frac{N}{1 + N(e^2)}$$

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$n = 23949/1+23949(0.05^2) = 393.4289 \approx 394$ farmers

The sample size in each ward was determined as shown

Table II Sample Size Determination

S.No	Ward	Population of farmers	Sample size
1	Kamara	5,686	94
2	Kiptororo	9,150	150
3	Sirikwa	5,800	95
4	Nyota	3,313	55
Total		**23,949**	**394**

Source: Author

Sampling Procedure

Kuresoi North Sub-county was first stratified into its administrative wards. Proportionate sampling was then employed to determine the number of farmers to be selected from each ward. Finally, simple random sampling was used to select individual respondents within each ward.

Data collection instruments

Both primary and secondary data were gathered to meet the objective of this study. Primary data was collected using a semi-structured questionnaire and interviews. Secondary data was collected from previous studies and reports conducted by scholars and institutions.

RESULTS AND DISCUSSION

Continuous variables

Table II Sampled Potato Farmers' Socio-Economic Characteristics

Variable	n	Mean	Std. Dev.	Min	Max
Age (years)	395	49.02	13.0	18	80
Potato farming years	395	11.89	7.58	1	40
Household size (number)	395	6.61	2.39	1	16
Education years	395	11.04	2.86	1	20
Household land size (ha)	395	1.60	1.03	0.05	8.09
Potato land size (ha)	395	0.71	0.47	0	4.04

From the results, the mean age of potato farmers was 49years ranging from 18 to 80 years with a standard deviation of 13.04years.These findings coincided with those of [19] , [20] and [21] who reported that majority of their respondents were middle-aged. In contrast, [22] posited that sampled potato farmers had an average age

of 39years suggesting that a majority of them were at their prime stages of life.

However, from the current study results, the majority of potato farmers in the study area were experienced and in their mid-years. The survey results put forward that farmers had 12years of experience on average in potato farming. Similar results were reported by [23] and [24] who obtained the farmers' years of experience to be 13 and 12 respectively.

The more experienced a farmer is in agricultural production, the higher the possibility of an increase in production. This will further translate to better decision-making with regards to farming thus minimizing losses. The number of family members on average was found to be 7. [25], [26]and [27] reported similar results of seven family members on average among the sampled potato farmers. However, these results were contrasted by [28] who obtained a mean of 3 members per household. Family size is very key as it plays a critical role in providing family labour. This in extension implied that a farmer's household size may have an influence on the production level via labour supply. On average, farmers possessed 11 years of formal education indicating a literate group with secondary education where the least and most learned farmers had 1 and 16 years of study respectively.

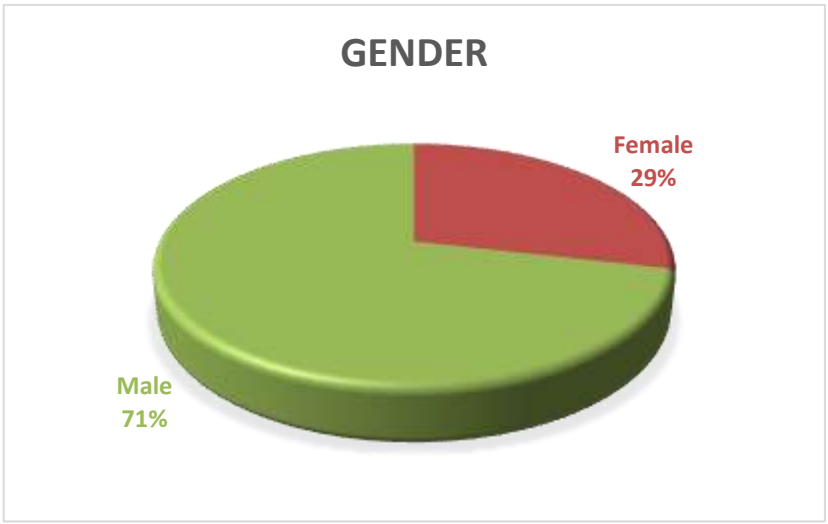
This further portrayed the presence of basic education among the sampled potato farmers. [29] presented similar results emphasizing on the vitality of education in farming as it enhances decision making. However, controversial results were depicted by [30] who obtained an average of 8 years of study suggesting an attainment of primary education. The household land size on average was obtained to be 1.6ha, implying that the farmers in the area of study were practicing small-scale farming. These findings coincided with those of [31] who posited that on average, farmers possessed an average household land size of 2 hectares.

From an average land size of 1.6ha, these farmers dedicated 0.71ha, on average, to potato farming explaining how essential it is to venture into potato production. These results were concurrent with those of [32] and [20]who revealed that 66.7% and 40.8% of the sampled farmers respectively 0.8ha of their land to potato production.

Categorical variables

Gender of the respondents: The highest number of respondents were male constituting 71% of the farmers while only 21% were female as depicted in figure 2.

Fig. 2 Gender of the respondents.



Despite the females being much involved in agricultural production, they have considerably less access to resources and essential services thus impeding their increased productivity and income-earning capacity. [33] who obtained the male percentage to be 89.3 and just 10.7% being females presented similar arguments.

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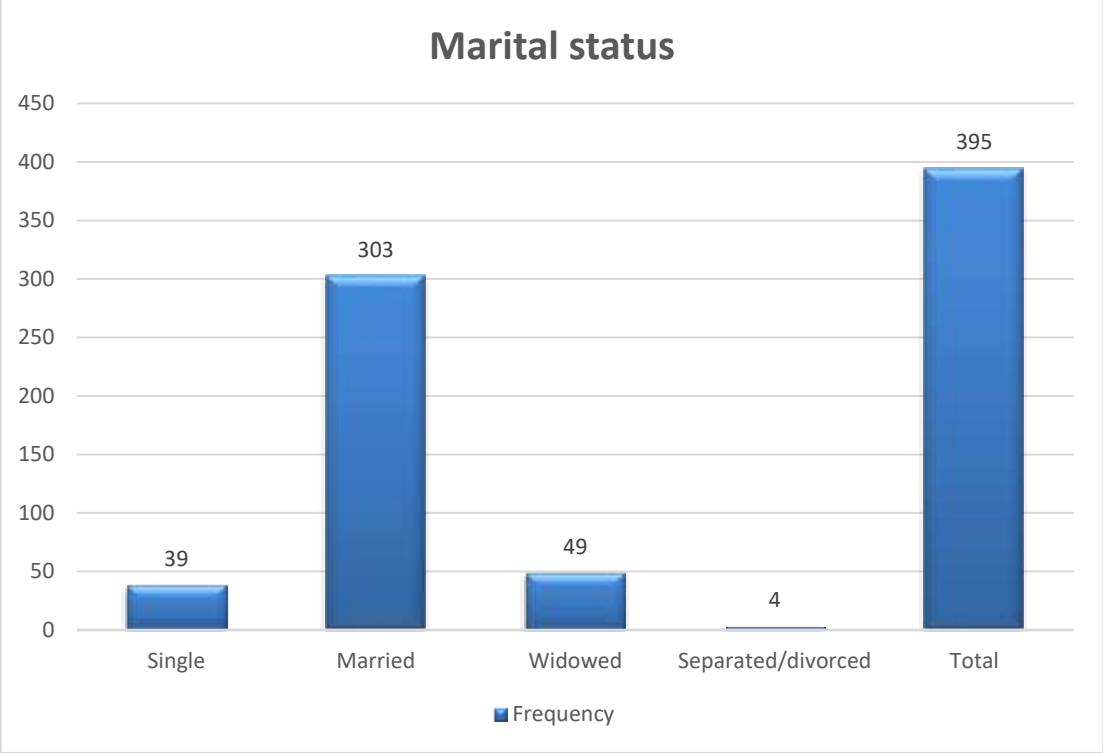
Marital status of the respondents: Figure 3 indicates the marital status of the farmers where majority (303) being married and the least number of farmers (4) as being divorced.

Fig. 3 Marital status of the respondents



Married couples play a crucial role in farming as they aid each other in decision-making as well as spreading risks involved in production. They further utilize additional labour for enhanced profitability. These results concur with those put forward by [34] and [35]who realized that a large proportion of the sample farmers were married.

Land under potato farming: The findings as depicted by table 4 indicate that a majority of the farmers (365) cultivated potatoes on their own pieces of land with just 30 of them renting ~~in~~ land for potato production.

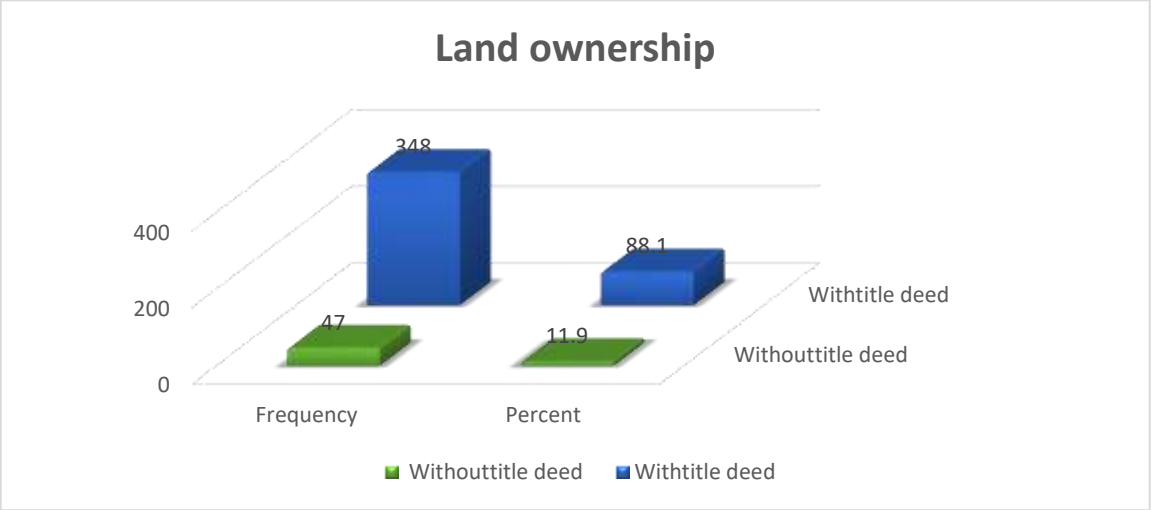
Table III Land Under Potato Production

Land under potato production	Frequency	Percent
Rented land	30	7.59
Own land	365	92.41
Total	395	100

Large portions of land being allocated to potato farming out of the total household land indicated how crucial potatoes were to the farmers in the area of study. A Similar argument was put forward by [36] who posited that 92.7% of the farmers carried out potato farming on their own land while only 7.3% of the sampled potato farmers rented in land for potato production.

Land ownership: A large proportion of farmers (88.1%) claimed ownership of their lands via title deeds with only 11.9% missing title deeds. This is illustrated clearly by the results in figure 4.

Fig. 4 Land Ownership status



Possession of title deeds eases farmers' ability to access credit facilities thus enhancing their productivity which translates to increased returns [37] and [38].

The results obtained were in agreement with those of [39], [40], [41] and [42] who further emphasized the vitality of cultivating lands with title deeds.

Use of certified seeds: The results presented in table 5 indicate the ability of potato farmers to access certified potato seeds.

Table IV The Use of Certified Seeds

Certified seeds	**Frequency**	**Percent**
Lack of access	319	80.76
Access	76	19.24
Total	395	100

A majority of the farmers, 80.76% were not in a position to access certified seeds with only 19.24% reaping bumper harvests from cultivating certified potato seeds.

This is an indicator of a critical challenge in addressing poor agricultural productivity and food insecurity. It therefore exercabate the already worsened state of poor yields and susceptibility to pests and diseases. [43] presented similar results where only 36% of the farmers were in a position to access certified seeds indicating how challenging it was for the potato producers.

Engagement in other farming activities: The results in table 6 illustrate the rate at which farmers engaged in other farming activities other than potato production.

Table V Engagement in Other Farm Activities

Other farm activities	**Frequency**	**Percent**
Animal production	267	67.59

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Crop production	18	4.56
	285	**72.15**
No other farm activities	110	27.85
Total	**365**	**100**

It is presumed that up to 72.15% (285) of the farmers were in a position to get involved in other farm activities with only 27.85% concentrating on potatoes.

Amongst those that ventured into additional farm duties, the lion's share was taken by animal production with 67.59% of the farmers and only 4.56% engaging in the production of other crops alongside potatoes. Similar results were presented by [44] and [45] thus placing more emphasis on the essentiality of diversified agriculture.

Involvement in off-farm economic activities: The extent to which sampled farmers took part in off-farm economic activities is as stipulated in table 7.

Table VI Off-Farm Economic Activities

	Business	**Informal**	**Formal employment**	**Frequency**	**Percent**
	No	No	No	145	36.71
No off-farm				**145**	**36.71**
	No	No	Yes	19	4.81
	No	Yes	No	5	1.27
	Yes	No	No	173	43.8
	Yes	No	Yes	46	11.65
	Yes	Yes	No	6	1.52
	Yes	Yes	Yes	1	0.25
Off-farm				**250**	**63.29**
Total				**395**	**100**

It was revealed from the findings that quite a significant portion of the farmers were in a position to venture into other economic activities aside from farming. The majority of the growers, 250 (63.29%) managed to take part in off-farm economic activities while 36.71% of them just majored on agricultural production. Very few of them 19 (4.81%) were formally employed.Quite a number of them 46 (11.65%) were formally employed and in business. Those who–managed to take part in informal economic activities were 5 (1.27%). Several famers majored on doing business and this constituted (173) 43.8% of the respondents.

Just one farmer (0.25%) managed to take part in informal economic activities and business in addition to being formally employed. Similar arguments were put forward by [46], [47] and [48] who placed more emphasis on

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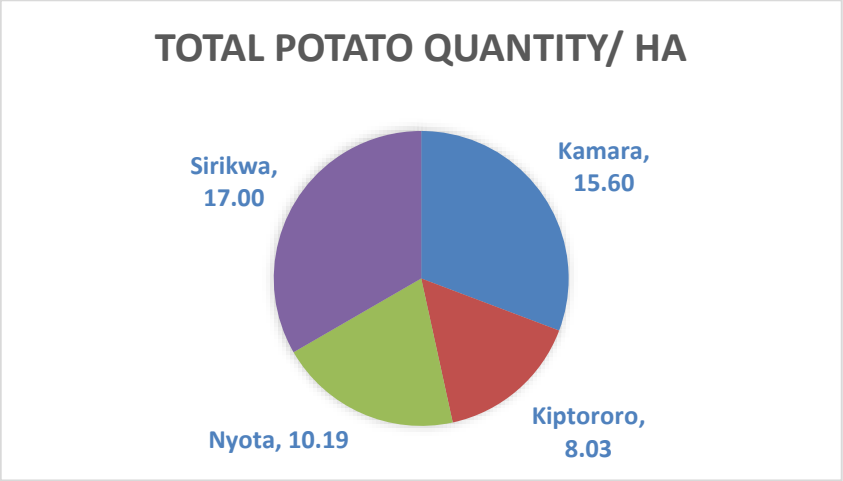
the criticality of diversified income sources as it aids in cushioning risks and losses.

Mean potato production/ha per ward: Results depicted in figure 5 display the quantity (in 50kg bags) of potatoes produced per ha in each ward in the area of study.

Fig. 5 Mean potato production/ha per ward



Sirikwa had the highest number of bags produced per ha constituting approximately 17 bags. From that, Sirikwa was rated as the most productive with Kiptororo depicting least productivity with only 8.03 bags per ha. However, this output was way ~~much~~ below the standard output of potato production per ha which is often expected to be 64.75 (50kg bags) per ha as opined by [49].

CONCLUSIONS AND RECOMMENDATIONS

This study assessed the socio-economic and farm structure characteristics of potato farmers in Kuresoi North sub-county, Nakuru county. The results put forward that potato farming in the region is largely composed of middle-aged, literate farmers with substantial farming experience.

Farmers had 12 years of potato farming experience on average, reflecting deep knowledge in the venture. An average of seven members was obtained for each household posting a high potential for family labour availability to support farming activities.

An average of 1.6 hectares was the size of landholdings, with 0.7 hectares dedicated to potato production thus placing the crop at a crucial position in the study area. Seventy-one percent of the potato farmers were men highlighting persistent gender disparities in access to and control over productive resources. With 88% of farmers holding title deeds is a clear indication that access to credit was not a toll order. However, the remaining 12% had a limited ability to leverage land for financial services. A total of 81% of the farmers relied on uncertified seeds making it a key constraint to potato productivity. In extension, potato yield was significantly undermined as it exposed farmers to the risk of pests and diseases.

Potato productivity levels varied across wards with Sirikwa and Kiptororo being the most and least productive wards respectively. However, production was below national and research station averages indicating intra-regional variability and an overall productivity gap.

More than 63% of the households diversified their incomes, and this involved engagement in other farm and off-farm economic activities. This was a clear indication that, whereas potato production was central, farmers rely on diversified livelihoods to mitigate risks and stabilize income.

The study generally concludes that potato farming in Kuresoi North is characterized by experienced but resource-constrained small holder farmers who cultivate small plots with limited access to improved inputs, specifically certified seeds thus contributing to suboptimal productivity.

The study recommends that seed multiplication and distribution systems should be strengthened at the local level through farmer cooperatives. Gender inclusivity should be promoted and thus enable women to have access to land, credit, extension services and training to address gender disparities in productivity. Intensification strategies such as intercropping and soil fertility management should be promoted. Moreover, county and national governments should promote agricultural credit facilities linked to land ownership and group collateral mechanisms.

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Conflict Of Interest

The author declares no conflict of interest.

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