

Contribution of Sorghum Production to Smallholder Farmers' Welfare in Rubanda District, Uganda

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Abstract: Sorghum is a cereal crop grown all over the world and the fifth most produced grain globally. In Uganda, smallholder farmers growing sorghum in Muko sub-county are relatively earning more profits than farmers growing other crops such as maize, sweet potatoes, and wheat. Despite that fact, sorghum producers face several challenges which include limited access to agricultural inputs, land scarcity, and limited access to credit institutions that would boost sorghum production in Rubanda District. The study assessed climate-smart agricultural practices adopted by smallholder sorghum producers in the study area. The study also evaluated the level of sorghum utilization among smallholder farmers and the contribution to household income. The study used simple random sampling techniques, to arrive at 60 smallholder farmers to participate in the study. The study revealed 88.3% of smallholder farmers' households produced sorghum and 11.7% produced other crops from the sampled households. Smallholder farmers 41.7% reported growing Rukutu local sorghum variety followed by Magune 31.7%, Kyatanombe at 20%, and Buhuri at 13.3% respectively. In this study, farmers also reported the crop to enhance food security and household nutrition. Furthermore, 76.7% of smallholder farmers earned income from sorghum sales. Sorghum production has a potential to boost income gains from crop production as compared to maize and other cereal crops. Therefore, there is a need to form a smallholder farmers' steering committee to oversee agricultural issues in Rubanda District. Establishment of the institutional framework, to provide the legal framework and the National Environmental Policy on sorghum production.

Keywords: Agriculture, Africa, Crop, Income, Livelihood, Policy, Producers

1. Introduction

Sorghum production is important for a wide-range food development as well as economic wealth for many of the world's middle-income countries [1, 2]. Africa and Asia produce 90% of the sorghum in the world, 10% from the rest of the world. Africa accounts for 59% and Asia 31% of production. The crop is known to improved livelihoods through better household nutrition and improved food security to curb world hunger issues [3, 4]. In Sub-Saharan Africa, sorghum production is eleven times more effective in reducing poverty as compared to its contribution to gross domestic product (GDP) [5]. The crop is mainly consumed as a grain, also prepared into a wide variety of food products such as

porridge [6], bread, lactic and alcoholic beverages [7]. Sorghum is particularly an essential crop in Africa, second to maize, as the staple grain for millions of people [5].

In Sub-Saharan Africa, sorghum is present in more than 25 countries including Uganda. In Uganda, sorghum production is up to 65% country's acreage in the districts of Apac, Lira, Gulu, Kitgum, Iganga, Kamuli, Soroti, Kabale, Rubanda, Kisoro, and Tororo. It is widely grown in dry areas of Northern, Eastern, and South-western parts of the country. However, in the East and some parts of the North (Lango) sorghum is grown twice while in some regions such as Karamoja and South-western the ratoon crop is promoted. Many varieties of sorghum are predominantly grown on sandy-loam soils where sowing is done mostly during the second rains (*i.e.*, in August) and ox-plowing is the common

method of land preparation.

Like many countries in Sub-Sahara Africa, in Uganda sorghum is produced by 47% smallholder farmers. The produce is mainly for household consumption and income generation that is through selling of the surplus [8]. Much of what is sold is used for making alcoholic beverages by East African Breweries and Nile Breweries in Uganda [9]. The grain is sometimes an ingredient for livestock feed and the stover is used for forage, and manure [10].

In Rubanda district of Uganda, sorghum is an important income and home consumption crop for smallholder farmers especially those living in drought-prone areas. Many varieties of the crop are grown in almost all zones of the district [3]. However, production is generally low due to several factors despite its benefits. It is on this background that the researcher intended to assess the contribution of sorghum production to smallholder farmers' livelihood in Rubanda district. The study also unravels the possible challenges and opportunities to improve sorghum production in the study area. The findings from this study will benefit to increase farmer's awareness of the potential of sorghum production.

2. Material and Methods

The study, considered 1,203 smallholder farmers households living in Rubanda District of Muko sub-county. These, smallholder farmers had similar characteristics and a majority actively produce sorghum as a main crop. However, to get the sample size of the study, Yamane's formula was used:

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

Where; n = sample size, N = population size, 1 = constant, e = marginal error 15%. A sample size of 60 smallholder farmers household was arrived at after calculations.

Purposive sampling was used to select 10 key informants (*i.e.*, lead farmers, extension workers, agricultural coordinators, area representatives, chiefs). This was done to obtain specific information to supplement household interviews. Six focus group discussions (FDGs) were conducted in the study area also to supplement to the data collected through individual interviews.

3. Results and Discussion

3.1. Demographic Characteristics of Smallholder Farmers

Out of 60 respondents that were selected to participate in the study, 70% were female and 30% were male participants (Figure 1). The number of female participants was more than of their male counterparts in Rubanda district.

3.1.1. Household Heads of the Respondents

It was found that 85% were male household heads and 15% were female heads as shown in Figure 2. The study findings indicate that the number of males was more than that of female

household heads in Rubanda district.

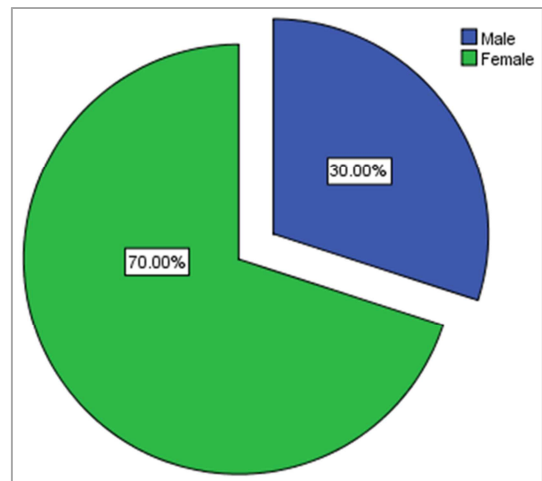


Figure 1. Pie chart showing the sex of participants.

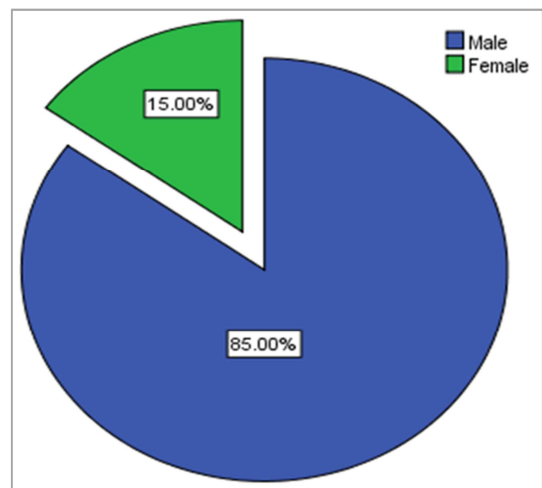


Figure 2. Pie chart showing household heads according to sex.

As shown in Table 1, the majority of 76.7% of the participants had two meals per day whereas 23.3% had more than two meals per day in Rubanda district. Some smallholder farmers households revealed that households involved in business farmers, however, eat more than three meals because they have money compared to other farming households in the area.

Table 1. Response on the meals taken per day by farmers in Rubanda District.

	Frequency	Percentage
3 meals	14	23.3%
2 meals	46	76.7%
Total	60	100.0

3.1.2. The Main Source of Income Among Sorghum Farmers in the Rubanda District

In the study area sorghum is one of the most important crops grown. Smallholder farmers have sought ways to improve yields across the region. Therefore, several CSA practices are adopted with the aim of increasing the production of the sorghum crop in the study area.

Climate-smart agricultural practices adopted in the study area are highlighted in Table 2. The study revealed 27% of interviewed smallholder farmers to have adopted relay cropping for sorghum production in the study area, followed by integrated agriculture 13.4%, integrated nutrient management 11.2%, conservation farming 9.8%, organic farming 9%, ratoon cropping 8%, integrated pest management 6.6% and sustainable agricultural intensification 5% respectively.

Table 2. CSA practices adopted by smallholder farmers in the study area.

CSA Practice	Percentage of Adoption
Sustainable Agricultural Intensification	5%
Organic Farming	9%
Ratoon Cropping	8%
Relay Cropping	27%
Conservation Farming	9.8%
Integrated Agriculture	13.4%
Integrated Pest Management	6.6%
Integrated Nutrient Management	11.2%
Total	100%

The study recorded 76.7% (Table 3) of farmers to have been obtaining income from sorghum production. It was also revealed that 16.7% of the participant farmers earned income from business and 6.7% got their income from employment.

Table 3. Household source of income.

	Frequency	Percent
Farming	46	76.7
Business	10	16.7
Employed	4	6.7
Total	60	100.0

3.1.3. Farmers Producing Sorghum in Rubanda District

As shown in Table 4, 88.3% of smallholder farmers grow sorghum, whereas 11.7% grow other crops. Smallholder farmers produced Irish potatoes, beans, and yams among others in the study area.

Table 4. Response from farmers who Grow Sorghum in Rubanda District.

	Freq.	Percent
Yes	53	88.3
No	7	11.7
Total	60	100.0

3.2. Common Varieties of Sorghum in Rubanda District

The majority of the farmers (41.7%) reported growing Rutuku local sorghum variety followed by Magune 21.1%, Kyatanombe with 20%, and the least Buhuri represented by 16.6%. Smallholder farmers in the study area alluded that local sorghum varieties have high nutrient concentrations and are a good source of starch, proteins, carbohydrates as well as vitamins. To justify the findings, sorghum is the most important cereal crop for home consumption and income generation. A similar study by Singh *et al.* [11] found that sorghum production yields have been increasing due to the development and dissemination of improved sorghum production technologies.

However, some smallholder farmers indicated that sorghum production can be raised by allocating more land for production, developing and adopting new technologies, and/or utilizing the available resources more efficiently. Increasing production through efficiency is an important move toward food security in Rubanda district.

Table 5. Sorghum varieties grown in Rubanda district.

Varieties Grown	Frequency (n=66)	Percentage
Rutuku	25	41.7
Magune	13	21.7
Kyatanombe	12	20
Buhuri	16	16.6
Total	66	100

3.3. Uses of Sorghum in Rubanda District

Table 6 shows the contributions of sorghum production to household income among smallholder farmers in the Rubanda district. Most of the participants (76%) sorghum contributed to household income and was used as a raw material for alcohol brewing. The study also revealed that sorghum is used for other industrial purposes such as livestock feed manufacturing. Sorghum is an important component in poultry feed and good progress has been made in the manufacturing of dog food, goat, and cow feed. A study by Lubadde [12] stated that developing sorghum genotypes is an attribute desired on the market to increase adoption rates. The market-driven attributes include; tolerance to drought and weeds, especially striga, drought, disease and insect pests, and low soil fertility.

The study further revealed that sorghum meal (26.7%) sells as one of the contributions to income among smallholder farmers in the study area. It was further reported that community members in the study area participate in the monitoring and evaluation of various land use activities that take place in and around sorghum plantations to avoid degradation, hence, increasing agricultural productivity. Chakrabarty [13] noted that sorghum is sold is used for making alcohol by East African Breweries and Nile Breweries. The study findings further also revealed 18.3% of the participants mentioned that among the contributions of sorghum was sorghum meal for consumption. This concurs with a study by Teferra [14] who also found that sorghum is an important food crop, and a greater percentage is stored mostly for later use in a year.

In the study area 15% of farmers reported sorghum production to significantly contribute to household income and in a long run increased gross return hence, reduced poverty. This is in line with the study by Okeyo [15] who found that the average cereal yield for the world and least developed countries were 37.08 qt/ha and 20.19 qt/ha, respectively, and recorded, 17.60 qt/ha average cereal yield in Ethiopia. The study also recorded 5% of farmers who reported sorghum to reduce famine hence, an important crop to curb food insecurity.

Table 6. Uses of Sorghum in Rubanda District.

Sorghum use	Frequency	Percent
Alcohol brewing	40	76.0%
Beer powder	16	26.7%
Sorghum meal	11	18.3%
Income generation	10	15.0%
Home consumption	8	5.0%

4. Results Summary

The sampled population composed of 70% female and 30% male smallholder farmers (figure 1), falling in the age bracket of 36 years and above. The majority 85% of the participants were male household heads and 15% were female heads (figure 2). It was also recorded that majority (*i.e.*, 76.7%) eat two meals per day and 23.3% eat normal full meals per day in the study area. And 76.7% of smallholder farmers reported farming to be their mainstay or source of household income whilst 16.7% earn income from businesses, and 6.7% from employment. The study found 88.3% of farmers grew sorghum in the study area and 11.7% produced other agricultural crops. Sorghum producers opted to uptake improved varieties to enhance yields in the study area. However, 41.7% produced Rutuku local sorghum variety followed by Magune at 31.7%, Kyatanombe at 20% and the least Buhuri at 13.3% respectively. Sorghum production contributed significantly to household income among smallholder farmers in Rubanda district. The majority of participants 76% reported that sorghum is an important raw material for alcohol production for breweries. To enhance yields in the study area smallholder farmers adopted climate-smart agricultural practices. Interviewed smallholder farmers 27% revealed practicing relay cropping for sorghum production in the study area, followed by integrated agriculture 13.4%, integrated nutrient management 11.2%, conservation farming 9.8%, organic farming 9%, ratoon cropping 8%, integrated pest management 6.6% and sustainable agricultural intensification 5% respectively.

5. Conclusion

Sorghum production has the potential to enhance smallholder farmers households' welfare. This could be achieved by the promotion of improved sorghum varieties and extension services among smallholder farmers. Smallholder farmers should adopt improved sorghum varieties to increase productivity as they mature early. More effort and investment by the government in the provision of improved sorghum varieties and land use management practices is needed due to the knowledge gap and production gap. Thus, there is a need also aid farmers to improve their indigenous knowledge, which will facilitate the adoption of climate-smart agriculture practices such as integrated pest management, agroforestry, and conservation agriculture. A farming steering committee is to be established as part of the institutional framework to oversee sorghum production in the study area.

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