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Gender Analysis of Sweetpotato Production in Ghana

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Abstract: Gender issues have become key in agricultural research and activities mostly focusing on the differences between sexes in production. The Ghanaian traditional setting perceives farming as a man's world due to its tedious and laborious nature. Gender distribution along the sweetpotato value chain is vital in modern research as it affects adoption of technologies and output. This study cuts across various stages in sweetpotato production with emphasis on gender analysis at various levels in production in 4 districts (Bawku municipal, Kwahu East, Twifo Ati Mokwa and Akatsi South) with total sample size of 120 farmers obtained through multi-stage sampling. Data was gathered from sweetpotato farmers using both qualitative (community level discussion and key informant interviews) and quantitative techniques (structured questionnaire administration). 69% of farmers sampled were males, 68% had varied levels of education, 83% married and they fell within the age range of 23 and 67 years with a mean of 44 years. Six (6) major activities identified in this study were land preparation, planting, weed control, fertilizer application, harvesting/packaging and marketing. Males dominated in land preparation and planting, whereas females dominated in weed control, fertilizer application, harvesting and marketing with across variable and location mean of 51.4% and 48.6% for males and females respectively. 61.9% had awareness of improved sweetpotato varieties out of which 21% were growing one or more of improved varieties; an indication of low adoption of improved sweetpotato varieties. Adoption rate in males (23.7%) was higher than the adoption rate in females (18.3%). It is recommended thereof that; sweetpotato farming be mechanized; subsidies in the form of fertilizer and other agro inputs should be given to female sweetpotato farmers; sweetpotato farmers should be taken through modern and good agricultural practices to enhance production output and encourage more women in sweetpotato production.

Key words: Gender · Sweetpotato · Awareness · Adoption · Improved varieties

INTRODUCTION

Sweetpotato (*Ipomoea batatas)* is the seventh most important food crop in the world. In developing countries it ranks fifth in terms of economic value of production [1]. Among the tropical root crops it is the second most important after cassava. In sub-Saharan Africa, where the crop is grown on some 13.37 million hectares of land, it is the third most important root crop after cassava and yam [2] The largest producer in Africa is Tanzania, followed closely by Nigeria with production figures of about 3.6 and 3.3 million tons respectively. In Ghana and parts of West Africa it is referred to as a secondary crop because it complements the major root crops like cassava and yam.

Sweetpotato has many positive attribute such as production of more carbohydrate per unit area per unit time than other root crops, has short production cycle, grows well in many agro ecologies, requires low inputs and is fairly tolerant to production stresses such as high temperature, water deficits, insects, diseases and low soil fertility.

Gender issues have become key in agricultural research and activities mostly focusing on the differences between sexes in production. A number of possible factors may lead to agricultural productivity differences between men and women in the developing world. Holding all other things constant the quantity of inputs (e.g., fertilizer, seeds, or labor) applied by men and women

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may differ [3]. The quality of inputs may differ. Land quality may differ between men and women, including, but not limited to, soil quality, topography and proximity to access points such as water sources, roads and housing [3,4]. Men and women may have different agricultural production functions, possibly because crop choice differs by gender, whether influenced by cultural norms [5,6] or by other considerations such as the lack of resources to cultivate specific crops and the culturally appropriate division of labour. For instance, cultural norms attempt to deter the women fraternity from involving in very physical farming practices in Ghana, as in Ethiopia women are forbidden from using the plough because such work is perceived to be too physically strenuous [7] Even if men and women have the same agricultural production function, shadow prices of inputs and credit may lead the women's production frontier to lie beneath the men's frontier, implying that women are less productive. In a review of empirical evidence and methodology in gender analysis of agricultural productivity, Quisumbing [8] found that the majority of studies conducted from the mid-1980s to 1990s showfemale farmers are equally productive as male farmers once inputs and other background characteristics are controlled for.

In the Ghanaian traditional setting, farming has been predominantly described as a man's world due to its tedious and laborious nature. Gender issues in agricultural production have become an important subject of investigation, ever since questions were raised on whether women and men benefit equally from economic development. It has been observed that women are under-nourished, under- educated, over–worked, under-paid and hence poorer than their male partners, evident by the 70% of the 1.3 billion people living on a dollar a day being women [9].

Sweetpotato production goes through processes from land preparation to harvesting and storage (production) as well as packaging, processing and marketing. The gender distribution along these processes is widely unknown. This paper seeks to disaggregate gender roles in sweetpotato production in Ghana as well as they affect the adoption of improved technology.

MATERIAL AND METHODS

This study cuts across various stages in sweetpotato production with emphasis on gender analysis at various levels in production unit. The study covered four major sweetpotato growing regions (Upper East, Eastern, Central and Volta of Ghana) as indicated in Table 1. Information of the area under cultivation and the volume of production were obtained from the Statistical, Research and Information Department (SRID) of Ministry of Food

Table 1: Selected regions, sweetpotato area cultivated and output

Region	Area cultivated (Ha)	Production (Mt)
Upper East	5,550	46,000
Eastern	1,030	34,910
Volta	880	15,340
Central	371	6,490

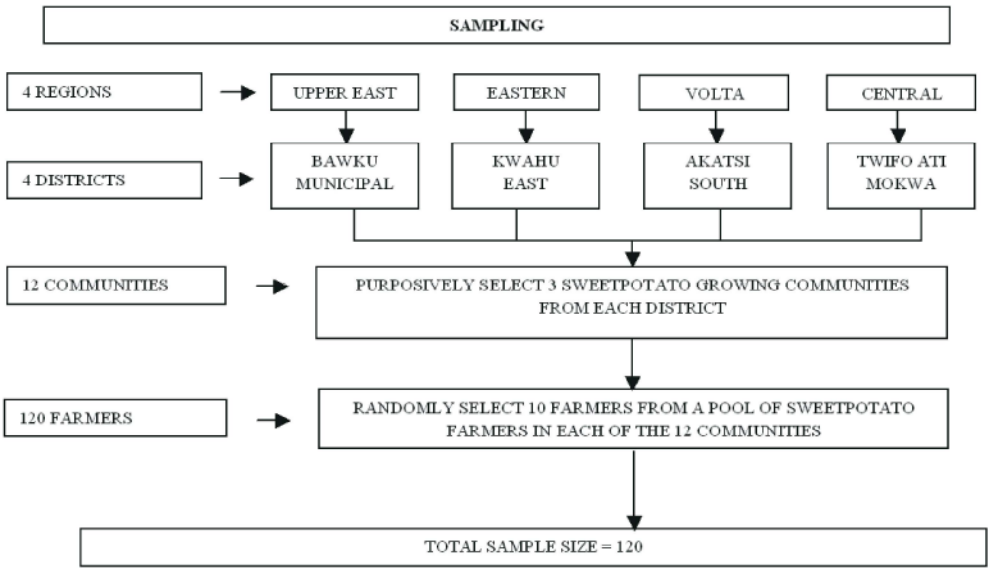

Fig. 1: Sampling and sample size

and Agriculture Report, 2012. In each region one district was selected purposively based on sweetpotato production hence narrowing the focus to 4 districts (Bawku municipal, Kwahu East, Twifo Ati Mokwa and Akatsi South).

Data was gathered from sweetpotato farmers using both qualitative and quantitative techniques. Qualitative data was collected through community level discussion and key informant interviews using semi structured questions. Quantitative data was obtained through structured questionnaire administration to individual farmers for information on sweetpotato production. Field visits were undertaken to observe some of the practices the farmers undergo in discharging their duties during production.The study employed descriptive analysis using SPSS 20.0 hence information is presented in tables and charts using percentages and standard deviation.

RESULTS AND DISCUSSIONS

Socio-Demographic Characteristics of Respondents: Sex representation has gained massive attention in most socioeconomic works in recent times. 69% of farmers sampled were males and 31% were females; See Table 2. This confirms the old African mentality that describes farming as a male dominated venture. It is worth noting however that a 31% female representation is worth commending and is an indication that gradually females are taking interest in sweetpotato farming. The FAO [10] fact sheet dealing with gender equality supporting this assertion quotes a higher margin for women; showing women composition of labour force at a mean of 43 percent. This can also be attributed to the fact that the primitive societies of old that saw farming and fending for the family as the duty of the man only and that the woman's duty is to keep the home and cater for the children is also changing into the case where both sexes are contributing to the up keep and well being of of the African home.

Education leads to improved attitudes, beliefs and habits that could lead farmers to embrace risk, adopt technologies and also rely on productive practices [11, 12]. It could increase prior access to external sources of information or enhance the ability to acquire information through experience with new technology. When it happens to people who are already farmers, it becomes on the job training for them. Capacity is enhanced to adopt the best practices that yield the greatest output [13]. In the study area basic education (44.6%) dominated the level of education of farmers. Summing up Basic, Secondary and Tertiary Education holders gives a total of 68%, representing educated farmers in sweetpotato farming in the study areas. This is a good prospect for adoption of improved varieties and technologies hence a high potential for increasing farmers' productivity. 32% of farmers had no education at all. This falls below the Ghanaian adult illiteracy rate of 46.3% as quoted by the Ministry of Education in 2012. Sampled areas are therefore improving in terms of literacy. Refer to table 2 for details of age distribution. Adesina and Zinnah [14] outlined that agricultural technological practices and adoption are positively related to education.

Marriage plays a vital role in Africa's agriculture and that of Ghana is no exception. It is therefore significant to record 83% of respondent farmers as married. Spouses serve as major sources of labour in Ghana as they lend

Table 2: Socio-demographic characteristics of respondents

	Frequency	Percentages
Sex distribution		
Males	74	69.1
Females	46	30.9
Total	120	100
Educational level of respondents		
No formal education	38	32
Basic Education	54	44.6
Secondary Education	25	21.7
Tertiary Education	3	1.7
Total	120	100
Marital Status		
Single	12	10
Married	100	83
Widowed	8	7
Total	120	100
Age		
Minimum age	23	
Maximum age	67	
Mean age	44	
Youthful farmers	70	59
Matured farmers	17	41
Total		100

Improved Sweetpotato Varieties Cultivated and sold		
Type of Variety	Improved	Local
	Santom Pona	Agbeyeyie
	Sauti	Eworleworme
	Faara	Akete
	Okumkom	Disco
	Apomuden	Obaari
		Kuffour
		Abontem

helping hand on farms and are mostly in charge of harvesting and packaging of sweetpotato roots. Harun [15] outlines that singlehood, divorced and widowhood had negative impact on agricultural production as well as the economic growth of farm household. This emphasizes the fact that marriage enhances productivity as outlined earlier. Details are provided in Table 2.

Minimum farmer age recorded was 23 and the maximum was 67 years. They fall within the legal working age hence issues of child labour are obviously non-existent in sweetpotato production in the sampled areas. The mean age of farmers however was 44years. Categorizing youths from the age of 15 to 35 and matured farmers 36 to 60, 59% of farmers were youths. This leaves sweetpotato farming in a bright future because the youths have taken interest in it cultivation. Productivity is likely to increase in the near future as outlined by Adesina, *et al*. [16] in the theory of human capital; new agricultural technologies which leads to higher productivity are mostly adopted by the younger farmers.

Sweetpotato varieties grown were categorized into improved and local varieties. Improved varieties grown were Santom Pona, Sauti, Faara, Okumkom and Apomuden. All these varieties were developed by the CSIR- Crops Research Institute. Local varieties that were grown were outlined in Table 2.

Component of Sweetpotato Production in Ghana: Sweetpotato production in Ghana as the case may be with other food crops goes through specific stages from conception to harvesting through storage and marketing to the final consumer. This section focuses on the major activities that the farmer engages in during the production of sweetpotato. Six (6) major activities identified in this study were land preparation, planting, weed control, fertilizer application, harvesting/packaging and storage/marketing. These processes are discussed in details as follows;

Land Preparation: Farmer fields were predominantly prepared by hand clearing. In addition to the hand clearing, some farmers employed tractor services and/or herbicides. It is worth noting that across location, 80.8% and 74.3% of farmers were aware of the existence of herbicides and tractors for land preparation respectively but in terms of usage, 46.6% and 15% respectively. The low patronage of these products was due to inaccessibility and the high cost of using them in areas where they existed. Mounding and Ridging were employed in all the study areas. However, mounding was more pronounced because farmers argued that harvesting was easier on the mounds than on ridges, though vines were easier to manage on ridges. Farmers cultivate sweetpotato either on ridges or on mounds depending on the farmers' choice. Ennin *et al*. discovered the different mounding and ridging methods and how they affected sweetpotato yields and concluded that ridging resulted in increased yield than mounding under favorable rainfall conditions [17]. According to the study, farmers perceived harvesting on mounds was easier than on ridges but weeding was easier on the ridges than on the mounds. Farmers therefore prepared land using conventional method of hand clearing. Mounding and ridging were done by hand using locally manufactured hoe. According to the Sweetpotato Production Guide published in 2011 by Agriculture, Forestry and Fisheries department in South Africa, Mounds for optimum yield should be 30 cm high and 40 cm wide with a spacing ranging from 1.5 m to 2 m but measurement was not employed in the study area. Mounding was executed per farmer's choice.

Planting: Planting is done by hand and hoe throughout the study areas. The vines that are cut at 3 to 4 nodes are placed into the soil on mounds or ridges. Farmers do not have specific planting distances or distances between mounds and ridges. The vines are obtained from other sweetpotato farmers or from farmers own field (previous season's reserve). The major cropping systems were mono cropping (67%), crop rotation (21%) and mixed cropping (12%). In the few cases where mixed cropping was practiced, other crops in the mixture were cassava, maize and plantain.

Fertilizer Application: Due to the continuous cropping of arable land in Ghana, the need for fertilizer application has increased over the years. This is to help supplement the soil nutrients to ensure proper plant growth in order to achieve desired yields. To this end the sampled respondents had knowledge of inorganic fertilizer (65%) and manure (80%). Over 50 percent of sweetpotato farmers in Akatsi and Twifo do not use any kind of fertilizer on their farm. 9.5% across the study area used organic fertilizer (chicken dropping and cow dung) whereas 36.7% used inorganic fertilizer (NPK, Sulphate of Ammonia, Urea). Inorganic fertilizer is either incorporated into the soil or broadcasted whereas the organic manure was spread on the field and then a tractor driven plough was used to mix it up with the soil before planting is undertaken.

Pest and Disease Management: Farmers were saddled with pest and diseases in sweetpotato production. Common disease and pest were the Sweetpotato Viral Disease (SPVD) and Cylas Sp. (Weevil) respectively. They were however controlled either mechanically (removing affected plants and burning them), cropping (planting at an early period to escape high infestation) and by chemical (applying insecticides, pesticides and other relevant chemicals). Actellic50EC pesticides was well known across the study areas but was used mostly in Twifo (33.3%). This is an indication of low patronage of insecticides and the restricting factor was high cost.

Harvesting: Harvesting which is done using hoes is undertaken 3-4 months after planting. After harvesting the produce is heaped and covered with vines (see figure) until a buyer is found. The highest output per hectare is recorded in Akatsi where farmers obtain 2.6 tons and Twifo recorded the lowest at 0.8 tons for the 2014 planting season.

Storage/Marketing: After harvesting, farmers either sell to traders at farmgate or transported them to market centres. In Akatsi, Kwahu East and Twifo, farmers hardly stored because of poor storage facilities and the perishable nature of the roots but where the need be they were placed in rooms or left in the fields and covered with fresh sweetpotato leaves. However in the Bawku municipality, sweetpotato produce were stored on floors of rooms built with mud and roofed with straw un-cemented floors. Roots after harvesting were kept until the sun went down, packed into the storage room and then covered with straw. Occasionally cold water was sprinkled on the straw. This method was able to store roots for 2-3 months after harvest. Alternatively where the floor was already cemented, the floor was first covered with sand and the room disinfected with insecticides/pesticides (Actellic 50EC). Roots were then placed on the sand and covered with straw. Water was sprinkled occasionally on the straw. In Akatsi, Kwahu and Twifo the storage methods were obtained from other farmers and through their own initiatives. In Bawku however, 14.3% were from own initiatives, 57.2%, fellow farmers and 28.6% Extension services. The methods used in Bawku were more effective than those used in the other study areas. Heat and pest infestation led to rotten produce during storage. In Bawku, respondents outlined that the cost of putting together an appropriate storage facility was high.

Storage is vital in trading because the ability to store gives traders opportunity to control the price of their products in the market. Aside Akatsi, traders in the other districts were using containers as storage facilities. It was realized that perishability was high due to the heat produced in the container.

The outlined processes as found in the field had intersections with production guides on sweetpotato put out by Department of Agriculture, Forestry and Fisheries, Sweetpotato Action for Security and Health in Africa and Traynor [18-20]. The outlined processes meet international standards and are effect to ensure maximum yield except the case where farmers have to depend on rains for cultivation and success of crop yield.

Gender Distribution: This section looks at the various gender distribution components in sweetpotato production in the study area across land preparation, planting, weed control, fertilizer application, harvesting/packaging and marketing.

Land preparation as identified earlier is a vital element and a pre-requisite for sweetpotato production. A mean distribution of 86.1% in favour of males indicate that land preparation is heavily dominated by the males as indicated in Table 3. Consistently across location, males dominance ranged from 80.4% to 88.9%. The main reason being that, it was tedious and required a lot of energy which women are perceived not to have.

Planting was also dominated by males (69.7%) as indicated in Table 3. With a 30.3% representation, female presence when it comes to planting was significant. This was attributed to the fact that, during the planting period, some of the males were preparing other fields for other commodities hence by implication, both sexes depending on prevailing conditions could undertake the planting of vines. It was perceived to be less tedious and less time consuming as compared to land preparation.

Across location, weed control was also dominated by females (56.5%). However Bawku showed male dominance(61.4%) because in Bawku the land loses water quickly due to the high temperatures. Weed management therefore become quite difficult as the soil hardened. The males therefore took charge to finish it quickly. The female dominance across location is due to the fact that weed growth in sweetpotato production was minimal because the vines cover most part of the soil hence reducing the ability of weed to sprout. Females were therefore able to manage the few weeds by removing them by hand.

Table 3: Percent distribution of gender in sweetpotato production in 4 districts in Ghana

	Akatsi		*Twifo*		*Kwahu*		*Bawku*		*Mean*	
Variables	*Male (%)*	*Female (%)*	*Male (%)*	*Female (%)*	*Male (%)*	*Female (%)*	*Male (%)*	*Female (%)*	*Male (%)*	*Female (%)*
Land preparation	88.4	11.6	80.4	19.6	86.7	13.3	88.9	11.1	86.1	13.9
Planting	75.8	24.2	58.4	41.6	73.3	26.7	71.4	28.6	69.7	30.3
Weeding	45	55	41	59	26.7	73.3	61.4	38.6	43.5	56.5
Fertilizer Application	50	50	45	55	41.8	58.2	60.5	39.5	49.3	50.7
Harvesting/Packaging	28.5	71.5	40.7	59.3	34.1	65.9	56.4	43.6	39.9	60.1
Marketing	20.9	79.1	15	85	20.4	79.6	24	76	20.1	79.9
Total percentage distribution									51.4	48.6

Fertilizer application was dominated by the females (58.2%) across location but in Akatsi it was undertaken by both sexes (50% at peace). Female dominance was due to the fact that the activity was less labourous and less time consuming. In Bawku however the males who mostly purchased the fertilizer more often chose to administer it in order to ensure efficient utilization. The males were of the view the females might waste some of the fertilizer hence a male dominance of 60.5%. Refer to Table 3 [21].

Harvesting was undertaken by both sexes with a slight female dominance (60.1%). The highest occured in Akatsi (71,5%) and the lowest in Kwahu (34.1%) as indicated in Table 5. Women slightly dominated the harvesting of sweetpotato partly because women are more meticulous in harvesting hence they hardly damage the sweetpotato roots during harvest. This prolongs the shelf life of the produce.

Marketing as the Ghanaian traditional system portrays has always been the preserve of women. In line with that, Akatsi recoded 79.1% as the minimum in favour of women and 85% as the maximum in Twifo. See Table 3. This reaffirms the old traditional assertion of marketing being the preserve of women it was mostly undertaken by the wives of the sweetpotato farmers.

In as much as both sexes partook in every stage of the production process outlined, it was clear that the dominance level of the various sexes vary at each stage of sweetpotato farming. As can be seen in Table 3, males dominated in land preparation and planting, whereas females dominated in weed control, fertilizer application, harvesting and marketing of sweetpotato produce as in accordance with the findings of Harun [14] except for planting. He postulated that women controlled planting, weeding, harvesting and marketing. Across the processes outlined, males and females contributed 51.4% and 48.6% respectively which had near resemblance to the conclusion drawn by Ogato [21] where they were of the view that both males and females had equal roles in agriculture. Though results indicate slight male dominance, a female contribution of 48.6% is highly commendable and an indication that female participation in sweetpotato production has increased and almost at the same level as male participation. A difference of 2.8% is negligible at an error level of 5%. Therefore, one can concluded that gender participation in sweetpotato production is almost equal for males and females.

Awareness and Adoption of Improved Sweetpotato Varieties: Sweetpotato improvement programmes (RTIP/WAAPP) in Ghana over the last decade have focused on providing varieties that were drought, pest and disease tolerant. Some varieties released were Apomuden, Faara, Okumkom, Santompona, Sauti, Otoo (RTIP) Tek Santom (KNUST), Patron, Ligri, Dadanyuie and Bohye (WAAPP). In a study on agricultural technology, It has been emphasized that awareness of a technology was premier in adoption and it was a period in which the existence of a technology is made known to the farmer [22]. In relation to the awareness of improved sweetpotato varieties, 61.9% of sampled respondents were aware of the existence of one or more of the varieties outlined. This was an indication that knowledge on improved sweetpotato varieties was widespread and this would be attributed to the demonstration fields and farmer schools that improvement programmes put in place to promote the commodity. Out of the farmers who were aware of improved sweetpotato varieties, a mean of 21% were growing one or more of improved varieties, an indication of low adoption of improved sweetpotato varieties. The lowest adoption rate occurred in Kwahu East and in Twifo. This was due to the fact that, though the areas were major producer of sweetpotato, recent research activities had not been extended to such areas. The few farmers who had access to the improved varieties got them from fellow farmers in other districts where research activities were concentrated.

Table 4: Awareness and Adoption of Improved sweetpotato varieties

	Akatsi		Twifo		Kwahu East		Bawku	
Variables	*Males*	*Females*	*Males*	*Females*	*Males*	*Females*	*Males*	*Females*
N	15	15	20	10	22	8	26	4
Awareness	80	93.3	70	55	72.7	50	80.8	0
Adoption	60	73.3	15	0	4.5	0	15.4	0

Recent research activities were evident in Akatsi (33.3%) hence the rate of adoption was far above the mean adoption rate. Low adoption was due to unavailability of sweetpotato vines, high cost of vines at initial acquisition, preference for the local variety and little or no technical information on improved sweetpotato at all.

Disaggregating awareness and adoption based on sex; adoption rate in males (23.7%) was higher than the adoption rate in females (18.3%). It was observed that there was no female adoption of improved varieties in Twifo, Kwahu and Bawku. The reason being that most of the women do not interact with the extension agents when they are available. They rather seek for information from fellow farmers who in most cases are not concerned about the name of the varieties but how well it establish in the field and total yields. Akatsi however showed a high female adoption rate of 73.3%. It is worth noting that adoption rates quoted are in relation to the number of farmers who are aware of the existence of these improved sweetpotato varieties Table 4.

CONCLUSION

Sweetpotato is the second most important after cassava and in Sub Saharan Africa, the crop is grown on some 13.37 million hectares of land. Africa produces about 15 % of the world's sweetpotato. In Ghana and parts of West Africa it is referred to as a secondary crop because it complements the major root crops like cassava and yam. Gender issues in agricultural production have become an important subject of investigation, ever since questions were raised on whether women and men benefit equally from economic development.

Sweetpotato production in Ghana involves six major activities namely land preparation, planting, weed control, fertilizer application, harvesting/packaging/ carting, storage and marketing. Males dominated in land preparation and planting whereas females dominated in weed control, fertilizer application, harvesting and marketing of sweetpotato produce. Taking the overall percentages, in sweetpotato production, males and females contributed 51.4% and 48.6% respectively. Sweetpotato production is slightly a male dominated venture. However a female contribution of 48.6% is highly commendable and an indication that female participation in sweetpotato production had increased.

In this light the following recommendations are therefore worth considering;

- There should be a deliberate attempt by policy to mechanize sweetpotato farming. This would give a level platform for male-female participation.
- Subsidies in the form of fertilizer and other agro inputs should be given to female farmers who engage in sweetpotato production as an incentive for more female participation.
- There should be a regulatory body to regulate the prices of sweetpotato products as the case is with cocoa. This would encourage more farmers to go into sweetpotato production because the price of their product is guaranteed hence an increase in female farmers as well.
- Sweetpotato farmers should be taken through modern and good agricultural practices to enhance production out and make the venture profitable.

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