GOING-TO-SCALE WITH SWEETPOTATO VINES DISTRIBUTION IN TANZANIA

Marando Bora Baseline Study

Milestone Report OB3BMS2.1C1

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Abstract

Marando Bora (quality vines) is a sweetpotato seed system project based in the Lake region of Tanzania. The project's purpose is to address the main problems associated with sweetpotato vine availability and distribution by developing a sustainable seed system for sweetpotato. It uses voucher and mass distribution strategies to address these problems. Using decentralized vine multipliers in the communities and mass distribution, the project solves the problem by ensuring timely access to planting vines at the beginning of the rain season. From the analysis, we find that sweetpotato is one of the top four most important crops in the Lake region. It is also considered among the top two crops that farmers rely on for food security together with cassava. The most widely grown variety is Polista. The average production of sweetpotato is about 3.5 tons per ha against a potential of 30 tons. Lack of planting material was identified as a constraint that limits the farmers from planting the crop at the onset of the rains. The survey further finds that households in the Lake region consume sweetpotato regularly and consider it an important part of their diet. However, its consumption reduces with increased income. As incomes increase, a big percentage of the respondents do not serve it to an important visitor. Women play a key role in the production of the crop and are involved in all the activities of production. The most important traits for the farmer when selecting the variety to grow are high yields and resistance to both diseases and drought. On 24-hour recall food diversity, we find that 47% of the households and 53% of the children between 6 and 23 months did not meet the WHO 4 group's minimum food diversity score. Analysis of the 7 days food frequency consumption shows that most of the households did not consume dairy products, eggs, or vegetables at least once a week. About 58% of the households do not meet the WFP food security score. We find that 51% of the households consumed white-fleshed sweetpotato at least once a week, only 2%consumed orange-fleshed sweetpotato. We also find that the wealth index is positively correlated with the sales of crops as well as consumption of food according to the WHO categorization.

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Abbreviation and acronyms

BMGF	Bill and Melinda Gates Foundation
BRAC	Buhemba Rural Agricultural Center (Tanzania)
CIP	International Potato Center
CRS	Catholic Relief Services
DOS	Diocese of Shinyanga
DONATA	Dissemination of New Agricultural Technologies in Africa
DVM	Decentralized Vine Multiplier
GLCI	Greater Lakes Cassava Initiative
KIMKUMAKA	Kituo cha MafunzoyaKuboreshaMazingiranaKilimoAdilifu (Tanzania)
LZARDI	Lake Zone Agricultural Research and Development Institute (Tanzania)
MFEC	Mogabiri Farm Extension Centre
MRHP	Mwanza Rural Housing Program
NGO	Nongovernmental Organization
OFSP	Orange Fleshed Sweetpotato
RUDDO	Rulenge Diocesan Development Office (Tanzania)
SASHA	Sweetpotato Action for Security and Health in Africa
SILC	Savings and Internal Leading Communities
SSA	Sub-Saharan Africa
TAHEA	Tanzania Home Economics Association
UN-WFP	United Nations World Food Program
FCS	Food Consumption Score

GOING-TO-SCALE WITH SWEETPOTATO VINES DISTRIBUTION IN TANZANIA

1.0 Introduction

Sweetpotato is the second most important crop in the lake region after cassava and in particular the six regions making up the lake region with a population of about 15 million. It has a short growing season and hence tends to do well even when the rains are not enough or reliable(Kapinga, et al., 1995). Therefore, it is considered a reserve crop that families turn to in times of famine and drought. Households mainly grow the crop for home consumption though there are some areas that have good climate where sweetpotato is grown as a cash crop. A recent increase in the importance of brown streak virus disease affecting cassava in the region is reducing the availability of cassava. Therefore, sweetpotato will become an even more important source of energy for many rural households.

However, farmers have difficulties getting quality-planting material and over time, the quality of the planting vines deteriorates. Also the viral load in some varieties becomes too high leading to marked decrease in the yields(Gibson, et al., 2009, Kapinga, et al., 1995). In other areas, the diversity of varieties decreases to a point of having only one variety being grown. This is risky because in the event that a disease attacks the only variety in an area, farmers have no other types to grow, risking their food security. It is in the light of this that the Marando Bora project was initiated.

Marando Bora (quality vines) is a sweetpotato seed system project based in the Lake region of Tanzania. The project's purpose is to address the main problems associated with sweetpotato vine availability and distribution by developing a sustainable seed system for sweetpotato. The aim is to improve the food security for subsistence farmers who rely on sweetpotato as a staple food and to enhance the incomes of a more commercially oriented group who produce cuttings or sell roots to generate income. In achieving the project's objectives, three aspects were critical. First, farmers need timely access to vines at the beginning of the planting season. Usually, vines availability is limited because of their inability to maintain vine production through the dry season. Second, planting of high quality vines with low virus load is essential to producing a high yielding crop and strategies to ensure quality of the material are essential. Finally, the success of any breeding program is dependent on the ability to multiply and distribute seed effectively to farmers. Specialized vine multipliers are being trained and linked to the national research program at Lake Zone Agricultural Research and Development Institute (LZARDI) to ensure future access to new materials as they become available. In addition, promotion and

advocacy activities are being implemented to stimulate interest in sweetpotato amongst different stakeholder groups and increase knowledge of the nutritional value of orange-fleshed sweetpotato in particular, and the productivity gains from using virus-free planting materials. This should stimulate more demand for sweetpotato (white, yellow, and orange-fleshed) amongst rural and urban consumers, as well as more demand for quality seed.

The project will increase the number of varieties available to the communities in the targeted rural households and will provide higher yielding quality vines. As part of nutritional intervention, it will also distribute Orange-Fleshed Sweetpotato (OFSP) varieties with sufficiently high levels of beta-carotene to improve Vitamin A status of the consumers. The project strategy is to ensure that the sweetpotato vines provided have low viral load and are delivered early in the growing season when the farmers need them most. Farmers will be trained on how to maintain seed quality for longer periods through positive and negative selection and conserve vines during the dry season or use other methods to generate vines from roots using the new triple-S method. Trained Decentralized Vine Multipliers (DVMs)are expected to be the residual sources of quality material in the project intervention areas.

Marando Bora was to use the already existing Greater Lakes Cassava Initiative (GLCI) cassava dissemination system developed by the Catholic Relief Services (CRS) in the lake region through the voucher system. However, in the initial seed system research, it was found that the GLCI delivery infrastructure was not well developed in some areas and the envisioned voucher system had not been implemented. Therefore, the project had to do more work to develop working voucher and mass delivery systems.

Catholic Relief Services is the main in-country implementing partner and works with other local non-governmental organizations who implement the activities on the ground. In the Mara region, the activities are in Musoma and Bunda districts and are implemented by Buhemba Rural Agricultural Center (BRAC). In Mwanza region, two NGOs are implementing the activities. Tanzania Home Economics Association (TAHEA) is working in Sengerema, Geita, and Ukerewe districts. Kituo cha MafunzoyaKuboreshaMazingiranaKilimoAdilifu (KIMKUMAKA) is working in Mwanza and Magu districts. Later on, CRS Tanzania identified and included the Rulenge Diocesan Development Office (RUDDO) as an additional partner because of their experience and performance implementing GLCI through strong farmer groups in two regions: Kagera (in Chato, Biharamulo, Ngara, Karagwe, Muleba districts) and Shinyanga (Bukombe district). CRS also worked on the development of additional DVMs to meet the required number of households. From the previous experience with the DVM models and implementing partners' capacities, an additional model of mass multiplication for mass distribution was developed and the Diocese of Shinyanga (DOS), Mogabiri Farm Extension Centre (MFEC) and Mwanza Rural Housing Program (MRHP) were identified for mass dissemination

activities. However, the baseline survey did not cover the mass dissemination areas as well as Kagera and Shinyanga regions since they were not in the original target areas.

2.0 Data and sampling

The baseline survey targeted two regions in the lake region of Tanzania; Mara and Mwanza. The two regions were purposively selected because the development partners implementing the project work in these areas. The selected districts correspond to the ones where the development partners were implementing the GLCI project. A list of wards was then drawn in each district where GLCI was being implemented, and wards were randomly selected. Also at the ward level, a list of villages was drawn and using random sampling, villages were selected. A list of households that were members of either GLCI or Savings and Internal Leading Communities (SILC) in these villages was drawn. From this list, households were selected through random sampling. A similar procedure was applied for the control villages that were chosen due to proximity to the villages with SILK and GLCI. Care was taken to make sure that at least 30% of the selected households were female-headed. Therefore, if in a village, random sampling did not meet the required gender composition, a list of female-headed households was drawn and using random sampling, additional female-headed households were chosen to meet the required number. Using this procedure, 621 households spread in 9 districts were selected and interviewed.

3.0 Results and discussion

3.1 Household's demographic characteristics and assets ownership

The study targeted 621 households across nine districts in Tanzania. The sample was composed predominantly of small scale farming households with land ownership of 6.7 acres on average. Almost all of the households grew sweetpotato, with the exception of 0.6% of the sample who were female-headed households and 1% who were male-headed households. Agricultural production is the households' core business with 97% of the respondents indicating it as their primary activity. Agricultural income was supplemented by other sources and economic activities like remittances, casual labor and livestock sales. The average number of adults and children above 5 years in the households was seven, while the average number of children under two years in the sample was two. The sample comprised more male-headed households (78%) than female-headed households (22%). However, the respondents were53% women and 47% men. The average age of the household head was 48 years, with female heads being51 years and male heads,47 years. Female heads had lower literacy levels compared to the male heads. Half of the female heads had a pre-school level of education, and the highest educated female heads had only one year of secondary school education(2.2%). However, the female and male respondents

had on average,4 and 6 years of education, respectively. This is in part because some of the female household heads were widows, and were more likely to be older and hence have less education. On the other hand, 66.7% of the male heads completed their primary education (standard 7), and the highest level of education reached by a male head of household was year three of college, as reported by 0.2% of the sample. These trends were similar across the districts.

As mentioned earlier, agriculture was the principal activity of the households as reported by 94% of household heads in the sample. This is expected because the survey targeted households in the rural areas who are usually farmers. On the other hand, 5.2% of the heads and 3% of respondents reported that agriculture was a secondary activity. The households' cash income activities by order of importance are shown in Table 1 sale of agriculture products was the highest income earner for 71% of the sample. On the other hand, over 90% of the sample did not receive any income from salaried work and remittances/pension. This is a clear indication that majority of the households were not in any formal employment, and relied heavily on farming for income. So a project like Marando Bora that seeks to increase production of sweetpotato in these rural areas, thereby, increasing surplus for sale will have a big impact on the rural communities in the targeted areas.

Table 1: Order of importance of the household cash income activities (% of cases)

Cash income activity	Highest income earner (%)	Second highest income earner (%)	Zero income (%)
Sale of agriculture products	71	14	13
Self-employed activity outside agriculture	10	15	66
Horticultural crops and fruits	4.5	5	87
Casual labor	5	11	73
Animal sales	3	25	61
Fish sales	3	4	89
Sale of products like milk, eggs	2	4	88
Salaried work	2	1	95
Remittances or pension	.8	.6	97

Analysis on the household assets value shows that households in the Mara region had asset value ofTshs.401,594 (US $ 268), while those in the Mwanza region had assets valued at Tshs. 229,299 (US $ 153). Overall, the mean asset value was Tshs. 285,434 (US $ 191) see Table 2 below.

Table 2: Mean value of household assets by region

Region	Total asset value (Tshs)
Mara	401,594.80 (US $ 268[1])
Mwanza	229,299.05 (US $ 152)
Total	285434.11

3.2 Rural infrastructure and means of transport

Rural infrastructure such as roads, water resources and social amenities are vital for agricultural and market development and general well-being of the population. Rural infrastructure development can also make a significant and sustainable contribution to poverty reduction. In the current study, secondary earth roads were the main type of roads to access the villages in both Mara and Mwanza regions. Only 9% of the sample reported to be served by a tarmac road to the villages (Table 3).

Table 3: Type of road that provides the main access to the village

Type of road	Mara(%)	Mwanza(%)	Total(%)
Foot paths	3.5	1.7	2.3
Secondary earth road	52.5	58.2	56.4
Primary earth or murram (laterite) road	34.7	31.0	32.2
Tarmac road	9.4	9.1	9.2

Marando Bora project uses local vine multipliers to grow and supply quality-planting materials to the surrounding villages. Therefore, farmers in need of planting materials have to access the planting materials from these multipliers. There is also hope that with clean planting material, there will be increased sweetpotato yields. With time, the households will have enough for their family and take the surplus to the market. Knowing the prevalent mode of transport in the study area is, therefore, important in understanding how it will affect access to the vines and markets. The results show that cycling was the main mode of transport to the nearest market followed by walking, as reported by 58% and 36% of the respondents, respectively. Therefore, access to markets will also be through cycling and walking. Vine multipliers will need to be located in areas that are easy to access through walking and cycling.

[1] The US $ is converted at an exchange of TShs. 1500 for 1 US dollar.

Table 4: Main mode of transport to the nearest market in the lake region In Tanzania

Mode of transport	Mara(%)	Mwanza(%)	Total(%)
Walking	39.6	33.9	35.7
Bicycle	46.0	63.5	57.8
Motorbike	2.5	1.2	1.6
Bus / small van	11.4	1.4	4.7
Car/ truck	.5		.2

Distance to both inputs and output markets has a direct effect on agricultural production and marketing through transport and other transaction costs, which in return affect marketing margins for all the value chain players. Distance to the inputs markets has a direct effect on agricultural production as its affects access to inputs and their costs. The study looked at the distance to both the output and input markets. The distances in the two regions are very similar in terms of minutes taken or actual kilometers reported. In the overall study area, the respondents take about 45 minutes to travel to the output market, which is an average distance of 4 km. The respondents indicated that they travel a distance of 5 km to the input market, which takes a mean of 65minutes (Table 5). It shows that inputs like fertilizer are found in markets slightly further away from where producers sell their agricultural outputs.

Table 5: Mean distance by minutes and Km to the nearest output and input markets

Region		Distance to the output market (Km)	Minutes to the output market	Distance to the input market (Km)	Minutes to the input market
Mara	Mean	6.4	56	8.7	63
	Median	4.5	45	6.0	55
Mwanza	Mean	5.7	57	7.3	66
	Median	3.0	45	4.0	60
Overall sample	Mean	6.0	57	7.6	65
	Median	4.0	45	5.0	60

Unless agriculture uses rain-fed production system, agricultural production requires a lot of water and in particular in countries having a large area of arid and semi-arid climate. With the changing climate, we expect that agriculture will increasingly need more water from other sources other than rains. The study looked at the main sources of domestic water. However, this has a bearing on the overall water availability in the study area. The study finds that the households' sources of water changes with the seasons. Roof catchment of the rainwater is the main source of water for domestic use during the rainy season, as reported by 36% of the respondents. Wells are on the other hand, are the main sources of domestic water in the dry season as reported by 42% of the sample (Tables 6 and 7). As expected, the distance to the main water sources increased in the dry season. On average,

the distance to the main water source in the dry season was about 1.7km or 27 minutes, compared to an average distance of 0.8km or 12 minutes in the wet season (Table 8).

Table 6: Main sources of water during the wet season

Source of water	Mara(%)	Mwanza(%)	Total(%)
Pond	4.0	5.0	4.7
Dam/ Sand dam	6.4	6.7	6.6
Lake	3.0	2.1	2.4
Stream/ river	2.5	.2	1.0
Unprotected spring	7.4	5.5	6.1
Protected spring	2.0	6.9	5.3
Well	22.8	29.8	27.5
Borehole	4.0	4.8	4.5
Roof catchment	41.1	33.4	35.9
Piped water into the compound	1.0	1.2	1.1
Piped water outside the compound	5.9	4.3	4.8

Table 7: Main sources of water during the dry season

Source of water	Mara (%)	Mwanza (%)	Total (%)
Pond	7.4	7.2	7.2
Dam/ Sand dam	9.9	8.1	8.7
Lake	7.4	5.3	6.0
Stream/ river	3.5	.2	1.3
Unprotected spring	11.4	8.8	9.7
Protected spring	3.5	10.3	8.1
Well	36.6	45.1	42.4
Borehole	8.9	7.9	8.2
Water tank	.0	.2	.2
Roof catchment	.0	.5	.3
Piped water into the compound	1.0	1.0	1.0
Piped water outside the compound	8.9	5.5	6.6
Other	1.5	.0	.5

Table 8: Average distance in Km/minutes to main domestic water sources during wet and dry seasons

Region	Distance in km during wet seasons		Distance in minutes during wet seasons		Distance in km during dry seasons		Distance in minutes during dry seasons	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Mara	.93	.25	13	5	1.96	1.00	32	25
Mwanza	.60	.20	11	5	1.32	.70	21	15
Average	.76	.23	12.1	5	1.64	.85	26.6	20

3.3 Land ownership and utilization

Land is the main production resource among farming households. During the cropping year 2008/2009, the average land owned was 6.6 acres, whereas 4.4 acres was utilized in the same cropping season (Table 9). This indicates that households do not put all their land resource under crops. The Lake region farming system uses very little organic manure. Therefore, they have to leave some of their land fallow for soil to rejuvenate.

Table 9: Average quantity of land owned in acres, in the 2008/2009 cropping year, by regions

Region	Land owned in the 2008/2009 cropping seasons	Land used in the 2008/2009 cropping seasons	difference	% Land utilization
Mara	8.46	4.99	3.47	59
Mwanza	5.76	4.10	1.66	71
Overall	6.63	4.39	2.24	66

Across the regions, households in the Mara region owned an average of8.5 acres compared to 6.7 acres in Mwanza. The land utilization differs across the regions as Mara households utilized more land than those in Mwanza (Table 9).

Gender categorization of the household head indicated that on average, male-headed households owned and hence utilized more land than female-headed households. The mean land owned by male-headed households was approximately 7 acres, against the 5 acres owned by female-headed households. However, female-headed households utilized a higher percentage of their land leaving approximately 1.3 acres (26%) unutilized, whereas male-headed households had approximately 2.5 acres (36%) unutilized.

Table 10: Average quantity of land owned in acres, in the 2008/2009 cropping year, by gender of household head

Region	Land owned in the 2008/2009 cropping seasons (acres)	Land used in the 2008/2009 cropping seasons (acres)	Difference (acres)	% Land utilization
Female	4.94	3.64	1.31	74
Male	7.11	4.60	2.50	65
Sample average	6.63	4.39	2.24	66

On average, the households had three separate plots during the 2008/2009 cropping season and two of them had fertile soils. Since sweetpotato has in the past been viewed as a woman crop, the study sought to know the extent of control over production land in the household. The results show that a woman had the control of the crops grown in one plot out of the three. Therefore, women can have about 33% of the land and decide the crop mix in it including putting it into sweetpotato production.

3.4 Crop production

Crop production was a principal agricultural activity for the sampled households. The percentage of households that reported to grow some of the important food crops during the 2008/2009 cropping year is shown in Table 11. The food crops are ranked by the proportion of farmers that were producing, and further categorized by their relative importance. Results in Table 11 b indicate that among the commonly grown food crops, sweetpotato, maize, cassava and beans were the most dominant. Further, cassava was regarded as a very important crop by 46% of the households that grew the crop followed by maize, rice and sweetpotato in that order.

Table 11: Food crops grown and their relative importance ranked by percent of cases producing

Food crops	% of farmers who grew the crop	Importance of the food crop	
		Most important (%)	Second most important (%)
Sweet potato	99	9	27
Maize	95	34	30
Cassava	89	46	23
Beans	70	1.4	4
Rice	58	23	21
Groundnuts	34	4	6
Sorghum	29	6	13
Bananas	16	7	5

Cassava is an important food security crop and most preferred due to its tolerance to drought. Tanzania is one of the largest cassava producers in Africa. About 655,700 ha of land are under cassava with a total annual production of about 1,795,400 tons. Cassava is a staple food crop in most of the semi-arid and the frequently drought stricken areas. For this reason, cassava has traditionally been considered a famine reserve crop. Maize and rice on the other hand are major cereals consumed in Tanzania. Maize is not only a staple crop in surplus regions but a cash crop as well. Sweetpotato on the other hand is a subsistence crop grown in all agro-ecological zones in Tanzania. It is mainly grown for home consumption, but in some areas, it is grown for the markets. Though 99 % of the sample produced sweetpotato, only 9% considered it as a very important food crop. However, sweetpotato is mentioned as the second in rank in terms of the second most important crop. This shows that it is a supplementary crop to cassava in the Lake region. Indeed, a visit to farms in the region reveals that the two crops are grown side by side. Sweetpotato just like cassava does not require special growing conditions compared to other crops like rice. Hence, farmers are able to rely on the two crops for their daily energy needs and in times of drought.

We asked the respondents to state the three most productive food crops during the 2008/2009 cropping season. Cassava was ranked first as reported by 29.3% of the sample, followed by maize, rice and sweetpotato (Table 12). For the second most productive crop, maize was ranked first and sweetpotato second, whereas sweetpotato was ranked first among the third most productive crops, followed by maize and cassava. In the face of climate change, sweetpotato and cassava production are likely to become even more important. With the prediction of reduced and erratic rain falling in the region, maize and rice production are likely to decrease or be less productive.

Table 12: Ranking of crops by productivity, percent of sample responses

Crop	% of respondent responses		
	Most productive crop	Second most productive crop	Third most productive crop
Cassava	29.3	21.7	19.4
Maize	28.3	27.4	20.4
Rice	22.9	13.2	8
Sweet potato	13.4	23.3	32.5
Others	6.1	14.4	19.7

3.4.1 Sweet potatoes and cassava production

Sweetpotato and cassava are both drought-tolerant crops. Therefore, these crops are important for food security and in the diet of the households in the Lake region. The government extension services usually do not pay a lot of attention to these crops since they are not considered as cash crops. However, in their production, farmers face many constraints which include pests, diseases, continuous use of varieties despite yield degeneration, poor storage capacity, inadequate utilization of the crop, and lack of access to improved and clean planting material at the start of the rain season.

In the current study, 99% of the households interviewed were growing sweetpotato, while 89% grew cassava (Table 11). The Marando Bora project is introducing Orange Fleshed Sweet Potato (OFSP) to the intervention areas. However, since there have been other projects like DONATA and McKnight working in the Lake region with OFSP, the study wanted to find the rate of adoption of the varieties. Only 7% of the respondents were growing OFSP varieties.

When asked, "What is the main reason for growing sweetpotato?",about 93% of the respondents said that they grew the crop for food, 6% grew the crop for sale, while 1% reported that the main reason for growing the crop was because it could tolerate drought. To assist the project in planning for the intervention, the study sought to know if the respondents had received any technical training on sweetpotato production. The results show that 90% of the households growing sweetpotato had never received any training on production and management. The Marando Bora project was to be implemented in the same areas as the cassava project, the Greater Lakes Cassava Initiative. The project design was to utilize the same delivery institutions built for GLCI, thereby, creating synergy for the two projects. However, since cassava in the Lake region is affected by the brown streak virus, sweetpotato would become a more important reserve crop, as the disease is not yet under control. Therefore, the study asked the respondents if the cassava brown streak virus had affected their crop. About 92% of the respondents said that the disease was a

major challenge, with 43%of them reporting high degree of virus severity on their cassava crop. This shows that they had decreased yields from their most important crop.

Sweetpotato productivity, that is kilogram of harvest per acre, during the 2008/2009 cropping season was estimated at an average of 1,374kg/acre (3,394kg/ha) see Table 13 below. Highest productivity was reported in Ukerewe district with an annual production of 1,641kg/acre (4,053kg/ha). The average production in the Lake region is about 3.5 tons per hectare against a potential of 40 to 50 tons per hectare(Oswald, et al., 2009).Cassava productivity on the other hand was 1,669 kg/acre (4123 kg/ha) per annum. Across the districts, the highest productivity was in Nyamagana district with 2,622 kg/acre (6,476 kg/ha).Sweetpotato production by regions indicated marginally higher production in the Mwanza region where mean production was 1,397kg/acre (3,451 kg/ha) against 1,326kg/acre (3,275 kg/ha) in the Mara region. Mean sweetpotato productivity was higher in the male-headed households, who reported 1,411kg/acre (3,485 kg/ha), whereas the female-headed households produced on average 1,243kg/ acre (3,070 kg/ha). This translates to about 14% difference in productivity. The study further sought to find out if there was a difference in production between GLCI project members and the non-members. The results show that sweetpotato and cassava productivity was higher among GLCI members. GLCI members produced 1,405 kg/acre (3,470 kg/ha) of sweetpotato annually compared to 1,212 kg/acre (2,994 kg/ha) among the non-GLCI members, a 16% difference in yields (Table 14). Productivity of cassava on the other hand was 1,712 kg/acre (4,119 kg/ha) among members and 1,658 kg/acre (4,095 kg/ha) among non-members, a difference of about 3%. The difference in cassava productivity was therefore negligible.

Table 13: Sweetpotato and cassava productivity by district (kg/acre/annum)

District	Sweetpotato (kg)	Cassava (kg)
Bunda	1225	1201
Musoma	1426	1925
Misungwi	1284	2064
Nyamagana	1478	2623
Ilemela	3117	1426
Magu	1481	1539
Sengerema	1047	1557
Geita	1072	1663
Ukerewe	1641	1608
Total	1374	1669

Contrary to our expectations, productivity among the SILC members for both sweet potatoes and cassava was lower as compared to non-members. Among the SILC members, productivity for sweetpotato was 1,262 kg/acre (3,117 kg/ha) compared to non-members 1,235 kg/acre (3,050 kg/ha). We observe a similar trend in cassava with members having an average productivity of 1,634 kg/acre (4,036 kg/ha) and non-members, 1,689kg/acre

(4,172 kg/ha). As observed above, the difference in productivity of cassava among members and non-members of those two organizations was negligible. The lack of differences among the GLCI members and non-members shows that the project was not very effective due to virus problems in the varieties distributed. However, we find that that GLCI member had higher sweetpotato yields leading to credence to the project hypothesis that the social network among the members of a group improves their ability to produce more by sharing technology. Hence, for Marando Bora project, riding on this social capital might increase its success rate. We also expected that the SILC membership had the same positive social capital effect. However, we find that members have less production compared to the non-members. SILC members were more likely to be involved in other off-farm business activities hence less emphasis on crop production.

Table 14: Sweetpotato productivity

		Productivity (kg/acre)	Kg/ha
Region	Mara	1,224	3,023
	Mwanza	1,265	3,125
GLCI member	No	1,212	2,994
	Yes	1,405	3,470
SILC member	No	1,262	3,117
	Yes	1,235	3,050
Member of a farmer group	No	1,108	2,737
	Yes	1,476	3,646

Households who had membership in farmer groups reported higher productivity for sweetpotato at 3,646kg/ha compared to 2,737 kg/ha reported by those without membership to farmer groups. On cassava, farmer group members produced 1,830 kg/acre, whereas those not in groups produced 1,569kg/acre. This clearly indicates the importance of farmer groups as a form of social capital that promotes agricultural production. There is a growing body of literature that states that social networks are a basis for economic activity (Berry, 1997, Fafchamps, 1996, Lyon, 2000, Rijn, et al., 2012, Woolcock, 1998). In developing countries, social networks in agricultural production and marketing are important since both traders and farmers face a high risk of poor harvests due to reliance on rain-fed agriculture, wide price fluctuation, lack of formal insurance against most risks, and high transaction costs. Social networks help farmers acquire production technology more easily and this could explain the higher productivity. Therefore, it will be important for the project to put an emphasis in working with the group members and in particular for decentralized vine multipliers.

3.4.2 Labor requirements in sweetpotato production

Labor is a key factor in production. Producers sometimes use family labor, and where need be, they hire farm workers. In the sample, 51% of the households did not use casual or salaried labor, 19% used both casual and salaried labor, while 0.8% and 30% reported use of salaried labor only, and casual labor only, respectively. The results indicate that farming households mostly relied on family labor, only supplementing it with casual labor where necessary. Further, among those who reported to have hired casual or salaried labor, 96% reported that hired labor was readily available when needed. In the same way, 63% reported to have hired labor for sweetpotato production. Table 15 shows sweetpotato production activities and the percent of households that hired labor for these activities, among those who reported to be using hired labor. The findings show that households mainly hired labor for land preparation (89%)and weeding (55%).

Table 15: Percentage hired labor for various sweetpotato activities

Sweetpotato production activities	Percentage that hired labor
Land preparation	89
Planting	14
Weeding	55
Harvesting	10
Processing	12
marketing	1

Various reasons were enumerated by the 37% of the respondents who reported never to have hired labor for sweetpotato production. The main reason for not using hired labor was the availability of adequate family labor as reported by 52% of the respondents. Financial constraints and small land pieces were the other reasons reported by 22% and 14%,respectively.

3.4.3 Methods of producing sweetpotato

Most sweetpotato growers produce their own vines from conserved material selected from the previous year's crop. Farmers in the Lake region use various methods of producing their roots. These are raised beds, flat beds, ridges, and mounds. The various methods used in growing sweetpotato, and the percent of households using those methods in different regions are presented in Table 16. Ridges were the most popular method in both regions, followed by raised beds. Virtually no one indicated that they grew the sweetpotato in moulds in Mara with only 7% using the practice in Mwanza. Only 6% and 2% grew sweetpotato without raising the soils in any way in Mara and Mwanza, respectively. We also wanted to find out if they planted the crop in a mixed system or not. And about half of all the respondents planted sweetpotato mixed with other varieties.

Table 16: Methods of growing sweet potatoes, percent of cases within regions

		Region	
		Mara	Mwanza
		Column N %	Column N %
Grow SP on raised beds	No	74	83
	Yes	26	17
Grow SP on flat beds	No	86	94
	Yes	14	6
Grow SP in ridges	No	34	21
	Yes	66	79
Grow SP on Mounds	No	100	93
	Yes	0	7
Grow SP on fields without raising the soil	No	94	98
	Yes	6	2
Do you grow SP on its own or mixed with other crop	Pure stand	37	42
	Mixed crop	51	50
	Both	12	9

A further analysis into farmer practices is shown in Table 17. In most cases farmers are not able to keep quality planting material because they mix many varieties in the same field that becomes a problem when harvesting vines for planting. Also different varieties have varied maturing period. The project hopes to encourage farmers to keep variety in separate plots to solve these problems. Only 25% of the farmers do not mix varieties of roots on the same plot. Sweetpotato is considered to be a low input crop. The survey shows that92% of the farmers did not use manure or fertilizer to grow sweetpotato. To get optimal harvest it is important to plant sweetpotato crop within the first week of the rains. The survey finds that about 60% of the farmers planted sweetpotato within a week of the start of the rains. However, due to lack of planting material in many farmers are forced to plant several times within a season. About83% of the respondents planted several times in a single season. However, we did not ask the quantities planted.

Table 17: Sweetpotato growing practices

Sweetpotato growing practices		% responses
Do you grow all varieties of SP mixed together or do you separate them in different plots	Separate varieties	24.8
	Mix varieties	75.2
Do you normally plant more than one cutting in one hole	Yes	23.2
Do you use manure, fertilizer or both to produce SP	Neither	92.1
	Manure only	7.7
	Fertilizer only	.0
	Both fertilizer and manure	.2
Do you use any manure, fertilizer or both to increase the number of vines you produce for planting materials	Neither	96.3
	Manure only	3.5
	Fertilizer only	.2
	Both fertilizer and manure	.0
Do you plant SP within one week of start of rains	Yes	59.6
Do you plant SP several times during one season	Yes	83.9

Farmers intercropped sweetpotato with other crops. Cassava is the main intercrop followed by maize and beans(Table 18). Maize and cassava do not compete with sweetpotato whereas beans have different growing period that makes them compatible with sweetpotato

Table 18: Main sweetpotato intercrops, percent of responses among those intercropping

Main crops intercropped with sweetpotato	Region	
	Mara(%)	Mwanza (%)
Maize	30.5	33.8
Sorghum	.8	2.2
Cassava	36.1	32.5
Beans	27.4	20.1
Groundnuts	1.9	5.3
Sesame	.8	.0
Millet/finger millet	.4	.4
Bambara nuts	1.9	2.0
Cow peas	0	2.6
Pigeon peas	.4	.7
Green grams	0	.4

3.4.4 Timing of planting

While weather patterns can be unpredictable, farmers more often benefit from earlier planting dates. One of the biggest advantages of early planting is that it extends the planting window for attaining maximum yields. In the current analysis, 60% of the sample reported that they planted within one week of start of rain. Across the districts, 63% and 58% of farmers in Mara and Mwanza regions, respectively, reported that they planted within one week of start of rains. On the other hand, the 40% of the sample who do not normally plant at the onset of rains gave various reasons for failing to do so. About 34% of households did not plant at the rains' onset to wait for enough rains to get better soil moisture (Table 19). Lack of planting material was the second most important reason for late planting as reported by 20% of the households.

Table 19: Reasons for not planting sweetpotato at the onset of rains

Reasons for not planting at the onset of rains	Percent of responses
Lack of planting materials	19.9
They do land preparation within the first week of the start of the rains	7.2
Waiting for the vines to grow so that they can be in good health and wilting of vines due to the heat of the sun	10.0
To get better yields	6.8
Start with the major crops like maize/sweetpotato is not a first priority	12.4
Waiting for enough rains for better soil moisture	33.9
They do not trust the first rains	2.4
Lack of enough farm tools	1.2
They need more time to prepare land	2.8
They have specific time for planting	2.0
They do not depend on rains	.4

3.4.5 Vine conservation

Conservation of seed material is essential in ensuring continuity in production in the subsequent seasons. Farmers usually select the seed from the harvested crop, which they then plant in the coming seasons. In other instances, where seed conservation is not practiced, farmers opt to buy, or in some cases, they obtain it at no fee from other sources. The analysis shows that 63% of the sample conserved vines during the long dry period(Table 20). This included 73.8% from Mara region and 57% in the Mwanza region. There are various methods of vine conservation that farmers used depending on the suitability of the methods to the farmers' needs. The most popular method is to leave part

of the crop un-harvested and wait for the rains, followed by planting in an unfenced swamp area, and leaving the vines under the shade of other crops.

Table 20: Vine conservation methods during the dry period

	% of positive responses
Do you conserve SP vines during the long dry period	62.5
Plant vines in fenced lowlands area or swamp	4.6
Plant vines in lowlands/ swamp area not fenced	29.6
Keep vines in a small plot near the house & water them	1.5
Keep the vines under the shade of other crops and water them	2.6
Keep vines under shade of other crop and do not water	25.4
Do not harvest part of the existing field	56.3
Plant near a bathroom	.3
Buried roots	13.4

About 38% of the sample did not practice vine conservation. They acquired vines material after a long dry period from various sources. Among them, buying vines was the most popular, followed by acquiring from either a relative or neighbor, and then left over roots that re-sprout in the field.

Table 21: Other methods of acquiring sweetpotato vines

	% of positive responses
Buy vines	60.7
Ask relatives for vines	39.9
Borrow from neighbors	52.4
Left over roots re-sprout in the field	21.9

3.4.6 Gender roles in sweetpotato production activities

Table 22 shows sweetpotato production activities and the most responsible gender for each of the activities. The results are reported as the percent of the whole sample. The findings show that women are involved in all the sweetpotato activities while women, men and children are involved in four of the activities. Women dominate activities such as cutting of vines, carrying of vines to the plot, and planting vines. They also make decisions pertaining to sale of sweetpotato products.

Table 22: Gender roles in sweetpotato production

Activity	Most responsible gender	Percent of households
Plowing the plot	Women, men and children	32
Ridging the plot	Women, men and children	38
Preparing the bed	Women, men and children	36
Cutting the vines	Women	71
Carrying the vines to the plot	Women	53
Planting the vines	Women	62
Weeding	Women, men and children	33
Harvesting	Women	46
Bagging	Women	27
Transporting to the market	Women	16
Selling in the market	Women	25
Deciding how the funds will be spent	Women	23

Women alone participate in 38% of the activities compared men alone only featuring 7% of the time(Table 23).

Table 23: Overall responses on the gender roles in sweetpotato production

Gender Roles in SP Production	Percent of Responses
Women	37.5
Women and children	16.0
Men	7.0
Men with all children	0.2
Women and men equally	12.4
Women, men and children	18.0
Women with girls	6.9
Women with boys	0.4
Men with girls	0.0
Men with boys	0.1
Children	0.8
Girls	0.2
Boys	0.4

3.4.7 Sweetpotato sales

In the study, we wanted to know the value of sales of sweetpotato roots. By disaggregating them further into gender differences, we find that male-headed household members sold more roots than female-headed households, with a difference in value of 66% (Table 24).

Table 24: Total sweetpotato sale amount by gender and region

Sex of head	Total sale amount (Tshs)	% difference	Region	Total sale amount (Tshs)	% difference
Female	53,872.34	66	Mara	143,532.00	63
Male	89,427.09		Mwanza	53,516.45	
Total	81,899.73		Total	81,899.73	

For the households that reported sales, we sought to know the gender of the people who made decision on when to sell and the quantities to be sold. Women made 61% of decisions to sell, with 31% of the responses showing that men and women made the decision jointly (Table 24).

Table 25: Decisions on sales of sweetpotato roots

Who decides how much/when to sell the crop	% of responses
Husband	7.7
Wife	60.8
Both	30.6
Other	.9
Total	100.0

We analyzed this further seeking to know if the women or men actually sold the crop. Women made most of the sales, with the percentage being higher in Mwanza region (83%) see Table 26 below.

Table 26: Gender of individual who sold sweetpotato

Who sold the crop	Region		Total(%)
	Mara(%)	Mwanza(%)	
Woman	61.4	82.9	76.1
Man	38.6	17.1	23.9
Total	100.0	100.0	100.0

The study also sought to investigate the point of sale of the roots. The results show that the sale points did not differ across the gender of household head. Local market was the most commonly mentioned point of sale (65%), followed by farm gate (Table 27). However, there is a difference when we analyze across the regions. While households in Mara sold at the local market and farm-gate with the same frequency, those in Mwanza sold mainly through the local markets (Table 28).

Table 27: Where the sweetpotato crop was sold

		Sex		Total (%)
		Female (%)	Male (%)	
Where did you sell the crop produce	Farm gate	27.7	28.0	27.9
	Local market	63.8	65.7	65.3
	Big town market	8.5	6.3	6.8
Total		100.0	100.0	100.0

Table 28: Location where the sweetpotato is sold by region

		Region		Total (%)
		Mara (%)	Mwanza (%)	
Where did you sell the crop produce	Farm gate	47.1	19.1	27.9
	Local market	45.7	74.3	65.3
	Big town market	7.1	6.6	6.8
Total		100.0	100.0	100.0

We also wanted to know the buyers of the sweetpotato roots. Local traders were the main buyers across gender of household head and regions. Local consumer was the second most frequently mentioned buyer followed by farmer (Tables 29 and 30).

Table 29: Buyers of sweetpotato by gender of household head

		Sex		Total (%)
		Female (%)	Male (%)	
Who bought the crop produce	Farmer	12.8	3.4	5.4
	Local trader	68.1	71.4	70.7
	NGO		1.7	1.4
	Consumer at local market	19.1	23.4	22.5
Total		100.0	100.0	100.0

Table 30: Buyers of sweetpotato by region

		Region		Total (%)
		Mara (%)	Mwanza (%)	
Who bought the crop produce	Farmer	4.3	5.9	5.4
	Local trader	82.9	65.1	70.7
	NGO		2.0	1.4
	Consumer at local market	12.9	27.0	22.5
Total		100.0	100.0	100.0

3.5 Sweet potato varieties, knowledge and practices

3.5.1 Sweet potato varieties and traits

The International Potato Center (CIP) in Peru holds the largest sweetpotato gene bank in the world with more than 6,500 wild, traditional, and improved varieties. Many of these are unique to a particular country or region. In Tanzania, majority of popular varieties are either white or yellow-fleshed. Several factors determine the choices of the variety that farmers and consumers prefer to grow or buy in the market. These include skin color, flesh color, taste, dry matter content, resistance to pest and disease, productivity potential, and marketability. In the current study, we asked the respondents to mention the top two varieties they grow. About 42%mentioned Polista as their top variety, while *Kilihona* was the second (7.5%), *Ushashini*variety was third (5.1%), while *Chaka la* wazinzi was mentioned fourth by 4.7% of the respondents .We gave the respondents a list of improved varieties that were likely to be grown in the region. From the findings, Polista again was the most dominant variety being grown by 72% of the total sample (Table 31). None of the respondents grew SP2001/261 and SP2001/264, while 3.2% of the respondents grew Jewel and 1% grew Ejumula. Jewel and Ejumulaare two OFSP varieties introduced through the DONATA project. The last three varieties had not been introduced to the farmers by the time of the survey, so we did not expect farmers to be growing them.

Table 31: Percent of households growing specified sweet potato varieties

Variety	% of households growing
Polista	72
Beritha	19.6
Ukurewe	5.5
Jewel	3.2
Ejumula	1
Nasport	0.3
SP2001/261	0
SP2001/264	0
Kabode	0

Most varieties have both desirable and undesirable attributes that may not satisfy all the farmers. Consequently, farmers may adopt some varieties and then drop them over time. In the current study, farmers were asked to state if there was any sweetpotato variety, they had dropped over the last 5 years. Seventy two percent (72%) of the sample had dropped at least one variety in the last 5 years (Table 32). Four of the varieties that were commonly dropped, and the reasons for dropping them are shown in Table 32. *Simama* and *Mwezigumo* varieties were dropped by 16% of the respondents, while *Sinia* and *Berita* varieties were each dropped by 7% of the sample. The major reason for dropping the

varieties was poor yields. This is a very significant result for the Marando Bora project. If the project has to have a sustainable impact, then there is need to introduce high yielding varieties. Another reason for discontinuing mentioned is unavailability or inexistence of the variety. This is important because there is a possibility that the varieties quickly degenerated due to virus pressure. However, if there was a seed system in existence in the region to replenish the varieties with clean vines, then there would be a decent chance that farmers would still be growing them. Looking at the reasons for discontinuing a variety, being watery is not ranking high in the traits that caused any variety discontinuation. This could be because most varieties have high dry matter content already so it is not a major problem or farmers will tolerate the shortcoming if a variety has other desirable traits.

Table 32: Percentage of responses for the reasons of dropping specified sweet potato varieties

Reasons	Variety discontinued			
	Simama/Simatha/ Suguti/Sugute/Skute/ Simamanikwambie (%)	Sinia (%)	Berita/ Bertha/ Belli (%)	Mwezigumo/ Mwejigumo/ Mwezimmoja/ Mwejikomo (%)
Poor yields	53	55	54	52
Takes long time to mature/late maturity	7	16		17
Not Available/does not exist	8	13	14	10
Low sugar	7	3	6	9
Susceptible to pests and diseases	8	7	6	1
Not good for marketing	3			1
Availability of new varieties	3	3	3	
Rots easily	4		3	7
Watery	1	3	9	3
Causes yellow fever to people			3	
Less resistance to drought	4			
More fibrous	1			
Needs a lot of rain to grow well	3		3	

Respondents were further asked to state the relative importance they attached to a specified list of desirable sweetpotato traits, which were read to them.

Table 33: Desirable attributes of sweetpotato

Desirable attributes	% of households reporting liking for an attribute
High yielding	99.7
Easy to establish when there is little rain	99
Once it is grown, it is easy to keep if the rains stop in the middle of the rain season	98.7
Easy to conserve vines during the long dry period	94.9
Not watery	94.5
Easy to store in the ground	91
Roots taste good	91
Early maturing, that is the variety has some roots in less than four months	90.6
Gives lots of roots and lots of vines at the same time	87.8
Red skin	79.7
Yellow flesh	73.6
Very sugary	72
Orange flesh	67.5

From the responses, high yielding, easy to establish in little rain, and ability to keep when rains stops mid-season (drought resistant) were the three most liked attributes(Table 33). These results show that a likeable variety has to combine two critical traits, high yields (suggesting some level of virus resistance) and drought tolerance. The preference for early maturing variety is ranked seventh. A visit to the market and discussions with consumers and farmers revealed that they prefer roots that are red in color. However, this trait does not rank very high in order of preferences (10th in rank).

3.6 Sweet potato knowledge and practices

A wide variety of insects feed on sweet potato foliage, but treatment to control foliar damage is rarely necessary. This is because sweet potato plants grow vigorously, and damage to the foliage must be extensive before root growth is affected, particularly after the "root-swell" stage. However, the larvae of some foliar-feeding beetles live in the soil and occasionally do damage sweetpotato roots. Damage caused by these root-feeding larvae, or grubs as they are sometimes called, may be reduced by targeting control against the adult stage that develops on the foliage. In most cases, these controls should be applied only when adults or signs of their foliar feeding are observed. One of the most problematic pests in sweetpotato is the weevil, while the sweetpotato virus is the most common disease.

Sweetpotato weevil adults feed on any portion of the plant, but they prefer the roots. Larvae make feeding tunnels that begin just under the skin of the root. The tunnels

frequently contain larvae, pupae, or newly transformed adults. Sweetpotato weevil infestations may be found in the field, in storage sheds, and in vine conservation fields. To prevent the spread of weevil infestation, farmers use clean planting material and plant away from the area where the past year's crop was. When weevils are in seedbeds, the recommendation is to spray the field with a recommended insecticide. Some farmers also practice hilling up where they cover the cracks at the base of the plant with soil to prevent weevils reaching the roots. Using clean planting material, crop rotation, and resistant varieties controls sweetpotato virus disease. A major challenge, however, in the control of pests and diseases is the lack of knowledge on the pests and diseases among farmers, and lack of knowledge on the control methods.

The study sought to understand the knowledge levels of the respondents regarding weevil's infection and control. We showed each respondent an A4 size laminated picture of a weevil-infested root and asked him or her to state the causes of the holes in the root. The results are shown in Table 34.Only 27% of the sample positively identified the sweetpotato weevil as the cause of the damage on the roots shown. Therefore, there is evidence of lack of appreciation of sweetpotato weevil by name as a major problem in the Lake region.

Table 34: Percent responses on the causes of holes on sweet potato roots

Cause of holes in sweet potato root	% of responses
Insect kind not specified	34
Sweetpotato weevil	27
Lack of rain	17
Infection/ rot	9
Animal/ pest	1
Do not know	12
Late harvesting	1

We asked all the respondents if their crop normally suffered from a similar problem as shown in the picture. About 93% reported that their crop had suffered the damage. Among those who reported weevil infestation, 66% indicated that it was a major problem, and 86% of them reported that the weevil problem forced them to harvest earlier than they would have wished.

Respondents were then asked what measures they took to avoid the damage from weevils on their crop. Results showed that early harvesting was the most dominant control method, mentioned by 83% of the respondents followed by hilling up, used by about 13%(Table 35).

Table 35: Methods used in the control of weevil problem

Weevil control method	Frequency (%)
Harvest early	83.2
Hilling up	13
Weeding	10
Use rotation	4.5
Selection of clean planting material	1.6
Disinfect the vines	1

Each respondent was shown a healthy plant and a medium virus infected sweetpotato plant, laminated in an A4 poster, and asked to identify if the plant was healthy or sick. The findings showed that 72% of the sample positively identified the healthy plant, and 54% positively identified the sick plant. They were then shown a poster with the leaves that had medium virus infestation and asked the cause of the problem. Interestingly, Only 2% of the respondents identified virus as the reason for the unhealthy plant (Table 36).

Table 36: Causes of virus attack on plants

Cause of infection on the plant	Percent of respondents
Disease (general)	34
Insect damage	32
Drought	28
Virus	2
N/A	2
Do not know	2
Lack of nutrients	1
Total	100

Majority of the respondents said it was diseased in general and the rest said that it was either having insect damage or affected by drought. Diseases and pest damage is minimized by farmers practicing crop rotation. We therefore, asked the producers the number of times they produced sweetpotato on the same plot before moving to another plot. The results showed that about 21% of the respondents were not practicing crop rotation. Among those who rotate their sweetpotato, they plant sweetpotato on the same plot twice at different times before leaving the land fallow.

3.7 Post harvest handling and storage

Careful harvesting and post-harvest handling of sweet potatoes is important to preserve the quality of the roots and extend their storage life. The study sought to find out various methods producers employ to store and preserve the roots before utilization. We find that 90% of the respondents stored fresh and whole sweetpotato root after harvest, for an

average of 6 days. Also 50% of the respondents dried sweetpotato before storage and stored it for an average of 123 days (about 4 months). Respondents who reported drying their crop before storage used various methods of drying. Chipping and drying was the most common method used by 99%, while 0.3% first boiled, and then chipped the roots before drying, and another 0.3 % used other methods of drying.

3.8 Credit access

In most of the developing countries, credit constraint is identified as a major limiting factor to smallholder farmer's development. Access to credit is one of the most common ways of improving farmers' access to inputs. In developing countries, small-scale farmers with little resources to purchase inputs dominate farming activities. Improved access to credit is, therefore, vital in improving agriculture production. We asked the farmers if they ever applied for any credit and if yes, if they received credit. About 67% of the households did not apply for credit, an indication of difficulties in accessing credit(Table 37). In most cases, farmers were unable to access credit due to lack of collateral, high interest rates, limited or lack of financial institutions within their reach, or credit unworthiness due to poor debt history. Among those who applied for credit, 95% received credit in each of the regions.

Table 37: Percent of households that applied for credit by region

If the household applied for credit	Region		Total (%)
	Mara (%)	Mwanza (%)	
No	69	66	67

Table 38: Source of credit

Source of credit	Percent of households
Savings and credit group	78.7
Relative	6.3
Friend	5.3
Microfinance organization	3.9
Commercial bank	1
Other	0.5

It is interesting to note that majority of those seeking credit sourced it from credit groups (see Table 38). This indicates the importance of savings and credit groups for rural financing. Rural households need access to financial institutions that can provide them with credit at lower interest rates and at reasonable terms than the traditional moneylender.

3.9 Food security, shocks, and coping mechanisms

Achieving food security in its totality continues to be a challenge not only for the developing nations, but also for the developed world. The difference lies in the magnitude of the problem in terms of its severity and proportion of the population affected. Some of the food security interventions, including food aid in the form of direct food relief have helped reduce severe food shortages in the affected regions. Agricultural productivity can improve food security through use of science and technology (using new improved crop varieties, etc.) and lowering of production costs. Also, food security can be improved through enhanced food storage, processing, packaging and efficient marketing. Improved crop varieties developed using traditional plant breeding methods and occasionally biotechnologies can achieve higher yields, increased nutritional content, more tolerance to drought and pests, and/or more efficient use of water and soil nutrients.

In the survey, we asked respondents the number of months in a year they consumed sweetpotato in their meals at least twice a week. The findings indicated that on average, households consumed sweetpotato in their meals at least twice a week for six months. This shows that sweetpotato is an important food security crop in the Lake region of Tanzania. Therefore, any improvement in sweetpotato productivity will improve the food security situation of the population. However, to know the extent of food insecurity, respondents were asked how many months in a year they consumed less than two meals a day from their own resources. About 10% of the respondents indicated that they had less than two meals a day from the month of September to December. This corresponds to the onset of the dry period up to the second month after the rains start.

Households often face shocks that affect their livelihoods and comprise their food security position. The major shocks experienced by households were loss of crops due to drought and floods (56%), pests and disease (56%), followed by loss of income due to illness or injury (53%) see Table 39 below.

Table 39: Sources of shock

Shock variable	Yes (%)
Major loss of crops due to drought or floods	56.3
Major loss of crop due to pest and diseases	56.4
Major loss of income due to illness or injury	52.7
Death of a family member	27.2
Loss of livestock	23.0
Loss of productive assets	11.9
Lack of markets	9.8

When households face various shocks which affect their food security, they resort to various mechanisms to cope with the shocks. From the survey, the major coping mechanisms reported were taking smaller meals (46%) followed by consuming immature crops (43%), skipping some meals in a day (40%) and relief aid (39%)see Table 40 below.

Table 40: Food insecurity coping mechanisms

Coping mechanism	Percent of households
Take smaller meals	46
Consume immature crops	43
Skip some meals in a day	40
Food relief	39
Eat meals that are less preferred	31

4.0 Nutrition, knowledge, dietary habits, and practices

4.1 Attitude, perceptions and practices on sweetpotato consumption

As a baseline point, we wanted to find out the perceptions about sweetpotato on nutrition and other dietary usage. We then developed some statements that we posed to the respondents to gauge their reaction that would reveal their perception and knowledge. Forty percent (40%)of the respondents agreed that sweetpotato leaves are good for human consumption, and 90% disagreed with the view that sweetpotato is food for women and children (Table 41).Many respondents agreed that sweetpotato is a food security crop (73%) and that even with plenty of other staple foods they eat sweetpotato regularly (86%).

Table 41: Attitude, practice, and practice opinion on sweetpotato consumption

Opinion	Strongly agree (%)	Agree (%)	Don't know (%)	Disagree (%)	Strongly disagree (%)
Sweetpotato leaves are good for human consumption	20	20	40	10	10
Sweetpotato is food for women and children		10		40	50
OFSP are healthier than WFSP	10	30	50	10	
SP is the most reliable crop in times of food shortage	23	50	1	21	5
Even with plenty or cassava/maize/rice we still have SP in our diet	26	60	1	12	1
You cannot grow SP and be considered a man	9	30	2	34	25
You cannot eat too much SP because you will have stomach problems	5	11	6	36	43
	Yes always	Yes sometimes	Rarely	No	
If an important person visits your house, you serve them a meal with sweetpotato	13	27	13	47	
			Less	More	
If you got richer you will eat more or less SP			53	47	

We asked respondents about their perception regarding the view that one cannot grow sweetpotato and be considered a man. This was to gauge the notion often stated that sweetpotato is woman's crop. Fifty nine percent (59%) of the respondents disagreed. On the feeding habits, we asked if the respondent would serve an important person sweetpotato as part of the meal. About 60% of the respondents said "rarely" or "no." This suggests that the crop has some negative image. To probe the sweetpotato crop image further, we posed the question "if you got richer would you eat more or less sweetpotato?" Fifty three percent (53%) of the sample said they would eat less. This confirms that there is the perception that sweetpotato is not a very preferred food in the rural areas.

In the survey, we sought to know if the households took any breakfast. For those who said yes, we further asked what type of meal was preferred for breakfast. Table 42 shows that majority took porridge (68%), followed by tea (22%) and sweetpotato is a distant third (9%). We further asked the respondents what was healthier to eat for breakfast, between sweetpotato and bread. The question was to probe further the belief that sweetpotato is an inferior food compared to bread. About 78% of the respondent said sweetpotato was healthier.

Table 42: Preferred food items for breakfast

Food type	Preferred breakfast food (percent responses)
Rice	.8
Cassava	0
Sweetpotato	8.8
Bananas	0
Milk	.3
Porridge	68.0
Tea/Colored Tea	21.7
Chapati	0
Mandazi	0
Water	.3

4.2 Household knowledge about Vitamin A

One of the purposes of Marando Bora project is to promote the use of OFSP. These sweetpotato if consumed by the targeted population has the potential of improving the community's vitamin A status. Participants will be educated on the importance of consuming foods rich in vitamin A among them being OFSP. Therefore, the survey asked the respondents if they have ever heard of vitamin A. About 77% of the respondents replied "Yes". For those who said "Yes" we then asked them a further question on the importance of vitamin A. About 34% said it protects the body or the skin, 15% said that it improves vision, 5% mentioned that it enhances health and just below 1% said that it increases body immunity. Cumulatively, 55% of the respondents mentioned a correct purpose as their first answer (Table 43).

Table 43: Importance of vitamin A

Importance of vitamin A	Percent responses
Protect the body/Skin	34.2
Do not know	18.5
Build the body	17.0
Improves vision	14.5
Gives energy	8.8
Enhances health	4.5
Increases body immunity	.6
Increases blood	.6
Helps to grow	.6
Increases appetite	.3

We further probed to find out if they knew some vitamin A rich foods. The top five crops mentioned have a total cumulative percentage of 54% and they are all rich in vitamin A showing that the households were knowledgeable (Table 44).

Table 44: Foods mentioned as rich in vitamin A

Examples of foods rich in vitamin A	Percent of responses	Cumulative Percent
Vegetables	13.4	13.4
Eggs	12.5	25.8
Sweet potato	9.7	35.6
Pawpaw	9.7	45.3
Amaranth	9.1	54.4
Milk	7.6	62.0
Beans	6.4	68.4
Maize	6.1	74.5
Meat	4.9	79.3
Oranges	4.3	83.6
Mangoes	2.4	86.0
N/A	2.4	88.4
OFSP	1.8	90.3
Fish	1.8	92.1
Cassava	1.5	93.6
Bananas	1.2	94.8
Pineapple	1.2	96.0
Others	4	100.0
Total	100.0	

We then wanted to know their sources of vitamin A knowledge. This gives us information on best avenues for passing out nutritional messages in the planned awareness campaign. The three most important sources of knowledge about vitamin A rich foods are schools (49%), radio program in local language (17%) and health centers (10%). All three sources of knowledge account for 76% of the sources mentioned. In addition, the most popular radio stations are RFA (43%), TBC (15%) and Radio one (13%) as shown in Table 46.

Table 45: Source of information on Vitamin A rich foods

Where the names of Vitamin A rich foods were learned	Valid %	Cumulative &
School	48.6	48.6
Radio program in local language	16.7	65.3
Health unit	10.3	75.7
Radio program in Kiswahili	7.0	82.7
Health extension/volunteer	6.7	89.4
Relative	4.6	93.9
Others	6.1	100

Table 45: The most popular radio stations

Name of the radio stations usually listened to	Percent responses
RFA	43.1
TBC/TBC Taifa	14.7
Radio one	12.7
Other	29.4

To help in targeting the most likely time the rural households listen to the radio, we asked them options on when they usually listen. The respondents could choose multiple options from the list given. The most popular time-period for listening to the radio was after dinner (50%), followed by the first thing in the morning (32%) and then afternoon (32%) see Table 47 below

Table 46: When the respondents listen to the radio

Time of the day	Yes(%)
Listen to the radio first thing in the morning	32.1
Listen to the radio later in the morning	5.2
Listen to the radio in the afternoon	31.8
Listen to the radio in the evening	26.6
Listen to the radio after dinner	49.8
Listen to the radio at no specific time	35.8

4.3 Household food diversity

According to the World Health Organization, infant and young child feeding practices directly affect the nutritional status of children under two years of age and, ultimately impact child survival. Therefore, improving infant and young child feeding practices in children 0–23 months of age is critical to improved nutrition, health and development of children. In the survey, we asked all the respondents if they consumed a minimum of 25 grams of foods based on 12 food groups. We then regrouped them into WHO 24 hour recall for 7 food groups. The seven food groups used for tabulation of this indicator are: i) grains, roots and tubers, ii) legumes and nuts, iii) dairy products (milk, yogurt, cheese), iv) flesh foods (meat, fish, poultry and liver/organ meats), v) eggs, vi) vitamin-A rich fruits and vegetables, and vii) other fruits and vegetables. The cut-off of at least 4 of the above 7 food groups was selected because it is associated with better quality diets for both breastfed and non-breastfed children. Consumption of foods from at least four food groups on the previous day would mean that in most populations, the child had a high likelihood of consuming at least one animal-source food and at least one fruit or vegetable that day, in addition to a staple food (grain, root or tuber).

We then calculated a 24-hour-recall food diversity index based on the number of foods each household consumed and did the same for the reference child between 6 and 23 months. Results show that 47% of the households and 53% of the reference children did not meet the minimum food diversity index score of at least four groups (Tables 48 and 49)

Table 47: 24-hour recall household food diversity

Food groups met	Valid %	Cumulative %
1	1.3	1.3
2	13.6	15.0
3	32.1	47.1
4	26.6	73.6
5	14.6	88.2
6	7.6	95.8
7	4.2	100.0

Table 48: 24-hour recall child food diversity

Food groups met	Valid %	Cumulative %
1	7.2	7.2
2	19.4	26.6
3	26.6	53.2
4	21.6	74.8
5	16.2	91.0
6	6.1	97.1
7	2.9	100.0

In the survey, we asked the respondents the frequency of consumption of certain food types commonly found in the Lake region. We then grouped the food items to the WHO 7 food groups, and asked if the household consumed any of the food groups at least once in the past 7 days.

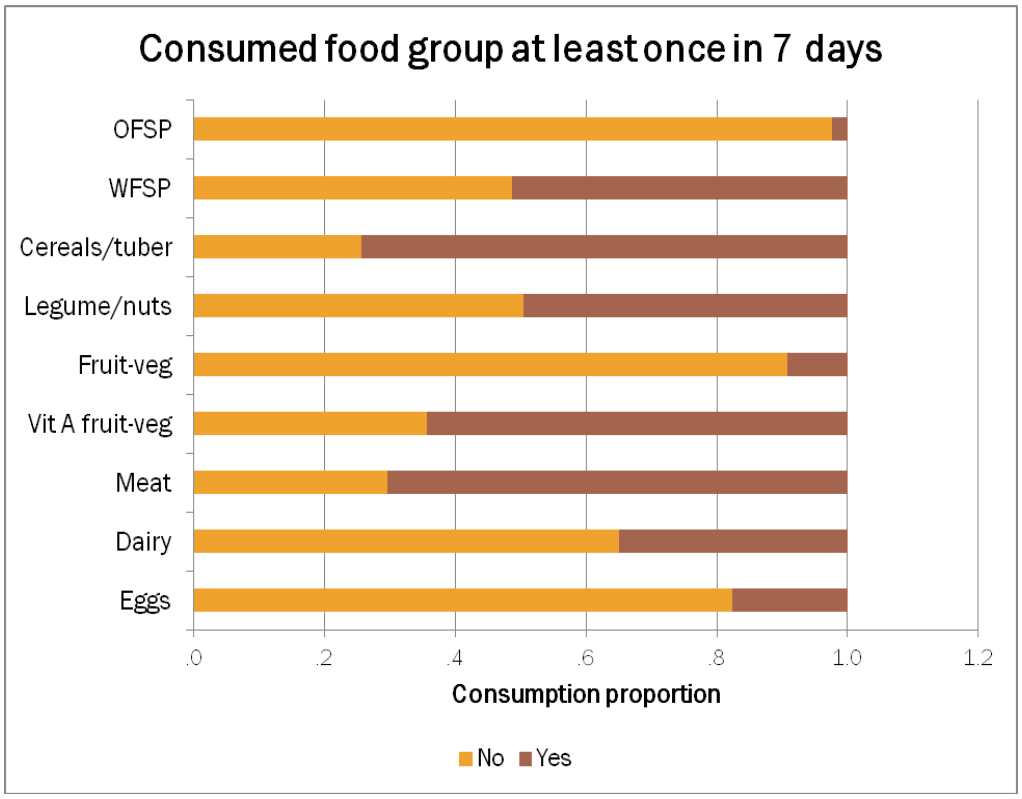

Figure 1: Consumption of various foods in the 7 food groups in the past 7 days

The surveyed households consumed the following food groups at least once in the seven days: meat (70%), vitamin rich fruits and vegetable (64%), cereal, roots and tubers (74%), legumes and pulses (50%), dairy products (35%), eggs (18%), and other fruits and vegetables (9%) see Figure 1. We find that in four of the food groups, we had at least 50% of the households indicating that they consumed them at least once in the last 7 days. WFSP consumption stood at 51%, whereas that for OFSP stood at 2% in the same period.

Table 49: Number of time each of the food group was consumed in the past 7 days

	Dairy	Meat	Vitamin A rich food	Fruits and vegetables	Legumes	Cereals and Tubers
N	621	621	621	621	621	621
Mean	1.28	2.81	1.92	.16	1.08	4.66
Median	.00	3.00	2.00	.00	.00	7.00
Mode	.00	.00	.00	.00	.00	7.00
Std Deviation	2.28	2.44	2.01	.672	1.48	2.94

The households on average consumed cereals and tubers about five days a week with a mean of 4.7 days. However, for all the other food groups the consumption was below the required 4 days a week with dairy 1.3 days, meat 2.8 days, vitamin A rich food 1.9 days, fruits and vegetables 0.16 days and legumes 1.08 days (see table 49).

Table 50: Food groups weights

Food groups	Weight	Justification
Main staples	2	Energy dense, protein content lower and poorer quality than legumes, micronutrients (bound by phytates)
Pulses	3	Energy dense, high amounts of protein but of lower quality than meats, micronutrients (inhibited by phytates), low fat
Vegetables	1	Low energy, low protein, no fat, micronutrients
Fruit	1	Low energy, low protein, no fat, micronutrients
Meat and fish	4	Highest quality protein, easily absorbable micronutrients (no phytates), energy dense, fat. Even when consumed in small quantities, improvements to the quality of diet are large.
Milk	4	Highest quality protein, micronutrients, Vitamin A, energy. However, milk may be consumed in small quantities as a condiment; reclassification in such cases is needed.
Sugar	0.5	Empty calories. Usually consumed in small quantities

We also calculated the food consumption score (FCS) according to the World Food Program scoring system. This is a composite score that is used as a proxy of food consumption and hence food access. The score is based on the dietary diversity, food frequency, food frequency and nutritional importance of each food group consumed. Each of the food group is then given a score based on its nutritional density to the household(UN-WFP, 2001).

After calculating the FCS, we classify it to indicate the food security condition. According to WFP a higher FCS indicates better food consumption in terms of dietary intake (food frequency) and the dietary diversity, whereas a lower FCS indicates poor household food consumption. We then classified the score into three categories as per WFP classification(UN-WFP, 2001).

Table 51: Food Consumption Score threshold

	Frequency	Percent	Cumulative Percent
Poor food consumption	193	31.1	31.1
Borderline consumption	167	26.9	58.0
Acceptable food consumption	261	42.0	100.0
Total	621	100.0	

We find that 31% of the households had poor food consumption score with 27% having borderline consumption and only 42% having acceptable food consumption. We can say that 58% of the households did not have an acceptable food security situation.

5.0 Wealth index

The concept of socioeconomic position (SEP) usually incorporates physical resources, social resources, and status within a social hierarchy. It is important to measure SEP because it is likely to confound many relationships we tend to investigate. The traditional way of measuring SEP is through estimation of income, or consumption expenditure based on the assumptions that material living standards determine well-being (Deaton and Grosh, 2000, Howe, et al., 2008). Consumption expenditure data is preferred to income because it is less variable and sometimes easier to collect in developing countries. However, in low-income countries like Sub Saharan Africa, measurement of consumption expenditure is very difficult. The major problem is that we have to rely on recall data and many respondents are usually reluctant to divulge information. Prices usually fluctuate across times and areas, necessitating complex adjustment of expenditure figures to reflect these price differences. Furthermore, collecting consumption expenditure data requires lengthy questionnaires that must be completed by skilled and trained interviewers and are very expensive. In this survey, we decided to use an asset based approach to measure SEP. This is an approach that has been used by Demographic and Health Surveys (DHS) which usually do not have the incomes and expenditure data. In theory, an asset-based wealth index represent long-term SEP in a similar way to consumption expenditure; asset ownership is likely to be based at least partially on economic wealth, and household assets are unlikely to change in response to short-term economic shocks (Howe, et al., 2008). However, there is a continued debate about the appropriateness of an asset based index. Since in our study we did not collect the expenditure data, this is the best way to assess SEP (Rutstein, 2008).

Various methods have been used to generate the asset based wealth index. Currently, the most commonly used method is the Principal Component Analysis (PCA). The method determines weights for components of a wealth index. PCA is a 'data reduction' procedure. It involves replacing a set of correlated variables with a set of uncorrelated 'principal components' which represent unobserved characteristics of the population. The principal

components are linear combinations of the original variables; the weights are derived from the correlation matrix of the data or the covariance matrix if the data have been standardized prior to PCA. However, this method is designed to use continuous, normally-distributed data. Its application to the predominantly discrete data in a wealth index is not appropriate. The use of binary dummy variables for each category of categorical is fraught with problems. The linear dependence between the dummy variables may lead to incorrect estimates of the wealth index; the PCA method is affected by collinearity, with variation in the data arising both from the underlying concept of wealth and from the linear dependence between dummy variables of categorical variables. The other problem with this method is that it is not possible to compare the wealth index created across countries or even between the rural areas and the urban areas in the same data set. We, therefore, decided to create our own wealth index. We used ordinal variables. Although this method is preferred to PCA (in terms of the data assumptions of PCA), it also requires a stronger assumption about the ordinal nature of the data. For instance, when ranking the nature of the roofing material used in the main house, we assume that the rankings are equally spaced from each other in terms of their relationships with SEP.

In this report, we use similar indicators as those used by Rustein and Johnson (2004). The component indicators used include, possession of assets such as a television, radio, telephone/mobile phone, and variables related to the dwelling, such as the type of flooring, roof and walls in the main house, water supply and distances to the supply, sanitation facilities cooking fuel, and source of lighting (Pozzi and Robinson, 2007, Rutstein and Kiersten., 2004). In this study, we ranked roof materials in order from tiles, iron sheets and grass in that order. So the highest roofing material, tiles, was given an ordinal value of three and the lowest, grass, was given a value of 1. Then, to normalize it, we divided by the highest value to get a range of 0 to 1. The wall material was divided into five, brick/stones (5), plastered (4), wood (3), iron sheet (2) and mud (1). Floor material had four options and we coded them as earth (1), cement (2), wood (3), and tiles (4). We asked if the household had a toilet and the response was coded as 0 or 1. If there was a toilet, we further asked the type of the toilet. This had four categories and we gave them four ordinal values with outdoor un-walled (1), pit latrine (2), compost or eco-toilet (3), and flush toilet (4). For sources of water in dry periods we had 14 categories. These were further aggregated into 7 categories as follows: piped water into the compound (7), piped water outside the compound (6), water hawker-cart or *bodaboda* (5), water tank and roof catchment (4), well and borehole (3), unprotected spring and protected spring (2),and pond dam/ sand dams lake, and stream/river (1). At the same time, we asked the distances to the sources of water during the dry period in minutes. We then took the inverse of the distance with the lowest distance having a value of 1. The respondents were also asked about the type of cooking fuel used in the household. This was divided into 8 categories in the questionnaire and then aggregated into 6 categories as follows: animal dug (1), firewood (2), charcoal (3), paraffin (4), solar power, biogas (5), LPG gas and electricity (6).

We asked about the types of lighting used in the main house and these were categorized as: wood fuel (1), tin lamp (2), lantern (3), pressure lamp (4), rechargeable lamps (5), solar power (6), and electricity (7). All these variables were normalized from 0 to 1. We then added modern household assets that are not considered as means of production. Each of the assets was coded as 0 or 1 depending on whether the household had it or not. The assets used in the wealth index are radio/cassette player, TV, telephone/mobile, solar panels, gas cooker, bicycle, motorized water pump, motor cycle, car, truck, tractor, and generator. We then added the cattle index. To normalize the number, we divided the total number by the highest number of animals owned. We created an index that included land per capita owned, dependency ratio and goat owned index. An index that included all the last three or any of them did not perform well in the testing. We, therefore, dropped them all together from the wealth index. The calculated index was then divided into quartiles and analysis was done according to these categories.

Table 52: Cross tabulation of the wealth index and various characteristics of the household

Quartile of wealth index		Total crop sales (US $)	Total SP sales (US $)	Sweetpotato production kgs/ha	Food frequency	Child food diversity	Household food diversity
1	Mean	134	24	3314	3.97	2.96	3.36
	Median	66	12	1245	4.00	3.00	3.00
	N	84	47	155	117	73	149
	Std deviation	160	28	5540	1.23	1.33	1.16
2	Mean	197	41	3474	4.19	3.64	3.75
	Median	93	21	1857	4.00	4.00	4.00
	N	105	46	154	110	75	148
	Std deviation	274	59	4933	1.14	1.25	1.20
3	Mean	170	60	3398	4.38	3.94	4.01
	Median	69	17	1467	4.00	4.00	4.00
	N	116	46	155	125	70	148
	Std deviation	243	178	4861	1.30	1.66	1.50
4	Mean	416	98	3664	4.70	3.47	4.04
	Median	187	32	1867	5.00	3.00	4.00
	N	104	61	155	110	60	150
	Std deviation	735	172	4714	1.21	1.41	1.34
Total	Mean	232	58	3463	4.31	3.50	3.79
	Median	90	21	1581	4.00	3.00	4.00
	N	409	200	619	462	278	595
	Std deviation	435	134	5011	1.25	1.45	1.33

We tested the created wealth index against the sweetpotato production, seven day food consumption frequencies, 24-hour recall food diversity index for the household and children between 6 and 23 months, and crop production and sales. For the sweetpotato

production per acre, the first quartile had a mean of 3.3 tons per ha, second 3.5 tons, the third had 3.4 and the fourth about 3.7, with an overall mean of 3.5 tons per ha (Table 52).

However, the correlation with the index is not significant as shown in the Anova analysis (Table 53). Looking at the Eta squared tells us that the wealth index category explains only 0.1% of the variance in production (Table 52). The sweetpotato sales column shows that the mean sales for the first quartile were US $ 24, US $ 41 for the second, US $ 60 for the third, US $ 98 for the fourth, with an overall mean of US $ 58 (Table 50). The difference in the means of sales between the quartiles is significant at 5% significance level. The Eta squared value is 5%. This value measure the percentages of variance associated with each of the main effects, the interaction, and error. Hence it tells us that a mere 5% of the variance is accounted for by wealth category. The same trend is shown in the sales of all the other crops with quartile one having US $ 134, second US $ 197, third US $ 170, and fourth US $ 416, and an overall mean of US $ 232. The differences in the means were significant at 1% significance level. For the 7 day food consumption frequencies, there was a slight increase of the means from quartile one to two then to three and then to four. The same scenario is repeated in 24-hour recall food diversity for children and adults. However, for the child food diversity, the third quartile had a slight higher diversity than the fourth. All the means were significant at 1% significant level.

Table 53: ANOVA Table of correlation of various measurements with wealth index

			Sum of squares	df	Mean square	F	Sig.
Total crop sales * Quartiles of wealth index	Between Groups	(Combined)	1.176E13	3	3.919E12	9.120	.000
	Within Groups		1.740E14	405	4.297E11		
	Total		1.858E14	408			
Total Sp sales * Quartiles of wealth index	Between Groups	(Combined)	3.943E11	3	1.314E11	3.157	.026
	Within Groups		8.160E12	196	4.163E10		
	Total		8.554E12	199			
Sp production per hectare* Quartiles of wealth index	Between Groups	(Combined)	1707588.958	3	569196.319	.138	.937
	Within Groups		2.542E9	615	4133896.277		
	Total		2.544E9	618			
Food frequency * Quartiles of wealth index	Between Groups	(Combined)	32.156	3	10.719	7.171	.000
	Within Groups		684.582	458	1.495		
	Total		716.738	461			
Child food diversity * Quartiles of wealth index	Between Groups	(Combined)	36.639	3	12.213	6.097	.000
	Within Groups		548.861	274	2.003		
	Total		585.500	277			
Household food diversity * Quartiles of wealth index	Between Groups	(Combined)	45.109	3	15.036	8.819	.000
	Within Groups		1007.631	591	1.705		
	Total		1052.739	594			

Table 54: Measures of association

	Eta	Eta Squared
Total crop sales * Quartiles of wealth index	.252	.063
Total sweetpotato sales * Quartiles of wealth index	.215	.046
Sweetpotato production per ha * Quartiles of wealth index	.026	.001
Food frequency * Quartiles of wealth index	.212	.045
Child food diversity * Quartiles of wealth index	.250	.063
Household food diversity * Quartiles of wealth index	.207	.043

6.0 Summary and conclusion

From the analysis, we find that the average travel for the respondents to the market is between 3 and 8 km. The ideal distances farmers should travel to a DVM to get sweetpotato vines should then be within this range. The average household own 7 acres of land and uses 4 acres for active farming. Therefore, land is not a constraint in the Lake region. We also found that 93% of the households interviewed grew sweetpotato and the crop was ranked among the top four most important crops. However, the production per hectare was 3.5 t/ha against a potential of above 30 t/ha. There is the potential to both increase productivity as well as the area covered with sweetpotato. Forty percent (40%) of the farmers did not plant sweetpotato in the first week after onset of rains and 30% indicated that they lacked planting materials for planting, and hence they failed to plant early. About 63% of the households conserved their own vines, with the most popular method used being leaving a part of the roots' production plot unharvested until the next rains, planting on used rice paddy areas and planting under the shade of other crops For those who did not conserve planting vines, they acquired through purchases.. This indicates that there is some potential for vine marketing in areas where it is difficult to conserve vines. Looking at the popularity of different varieties in the Lake region, we find that Polista is the most widely grown variety, far outdistancing the second most popular by a wide margin. We also found that farmers value most the high yielding and drought tolerant traits in sweetpotato varieties. On sweetpotato roots conservation, we found that 50% of the households chipped and dried roots harvested for storage that last an average of four months.

On attitudes and perception about sweetpotato as a food crop, we found that the households valued the crop as an important food crop and used it two times a week on average. However, the crop is viewed as an inferior good, with many respondents indicating that they would reduce its consumption if their incomes improved.

On vitamin A knowledge, we found that 77% of the respondents had heard about vitamin A and 55% could identify at least one food that is rich in it. In addition, when asked where they learnt about vitamin A, vast majority mentioned the school followed by local language radio stations and then health centers. This is very interesting because many of the respondents had minimal years of school. Maybe they got the information from their children who learn about vitamin A in school. However, it shows that investing in nutrition in school can be worthwhile. We sought to find out about food diversity and frequency of consumption. The results revealed that 47% of the households and 53% of the children between 6 and 23 years did not meet the minimum WHO food diversity score based on the 24-hour recall period. Looking at the 7-day food frequency consumption, eggs, dairy products, and vegetables group were the least consumed. About 58% of the households in the Lake Zone have either poor or borderline WFP food consumption score. This shows that a large percentage of the population have unacceptable food security situation.

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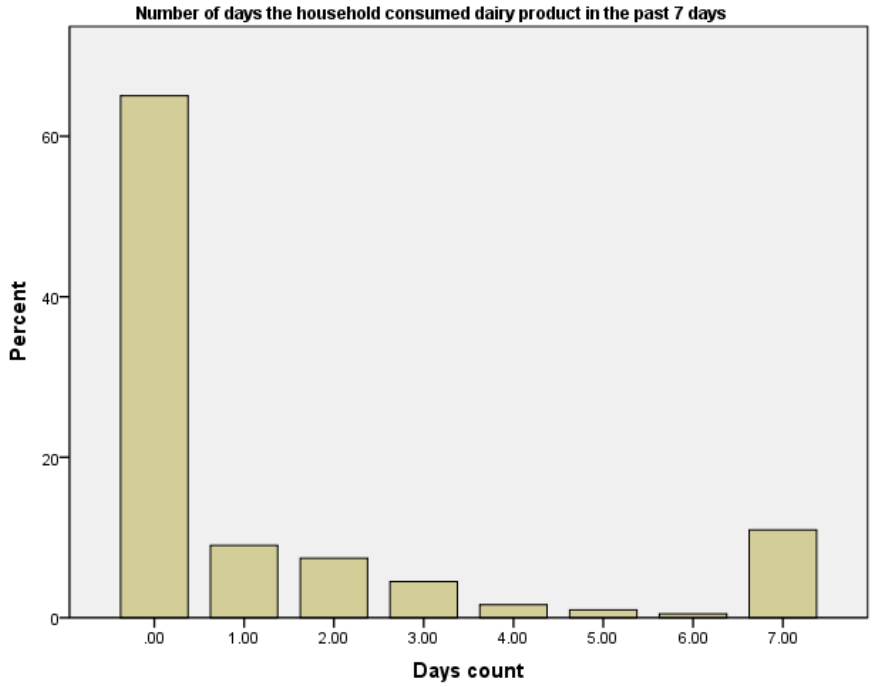
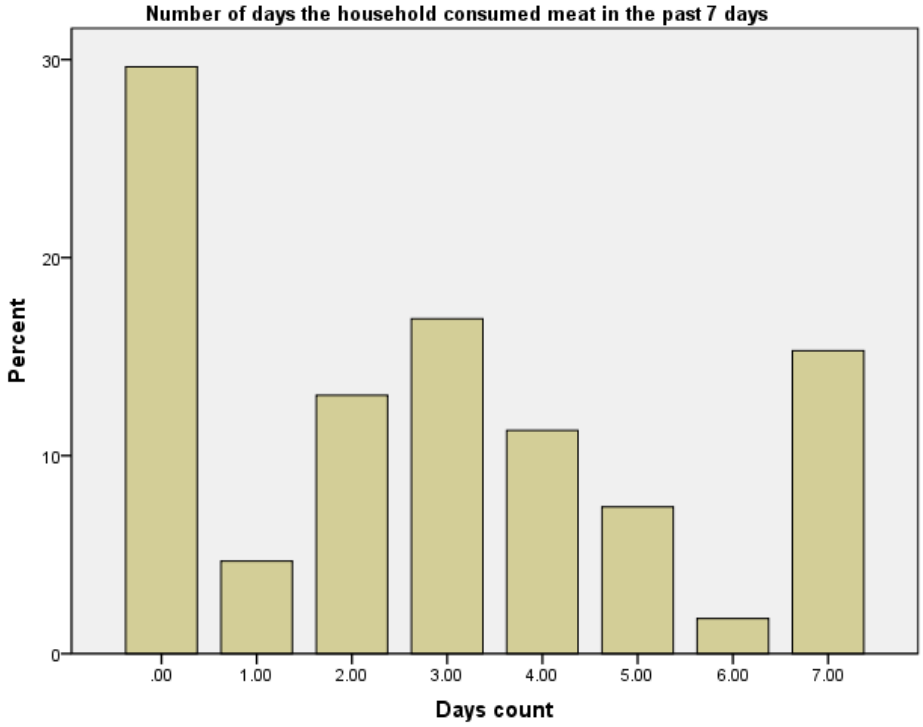
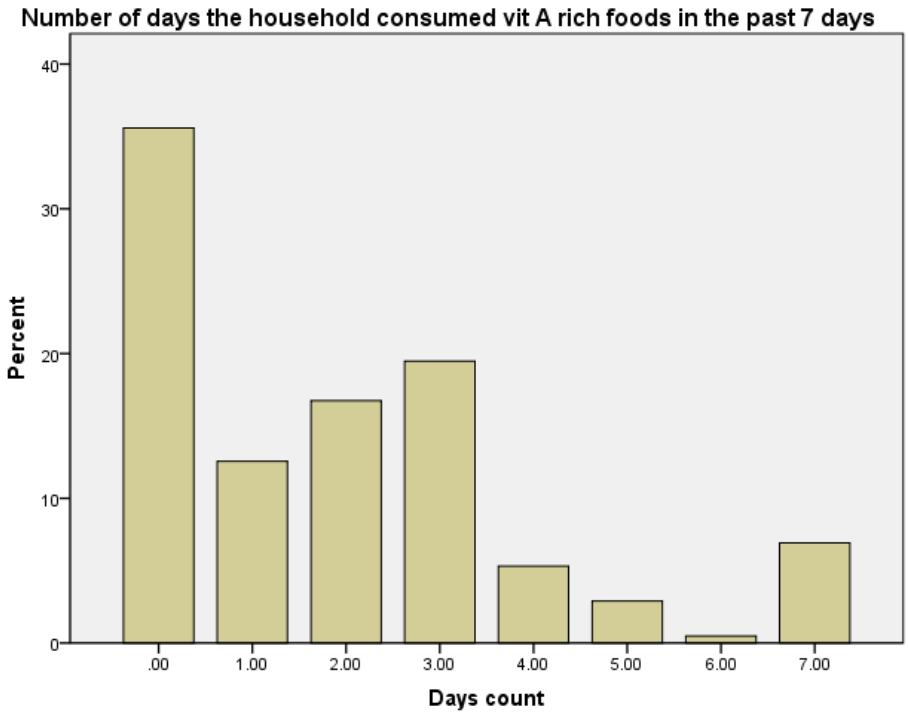
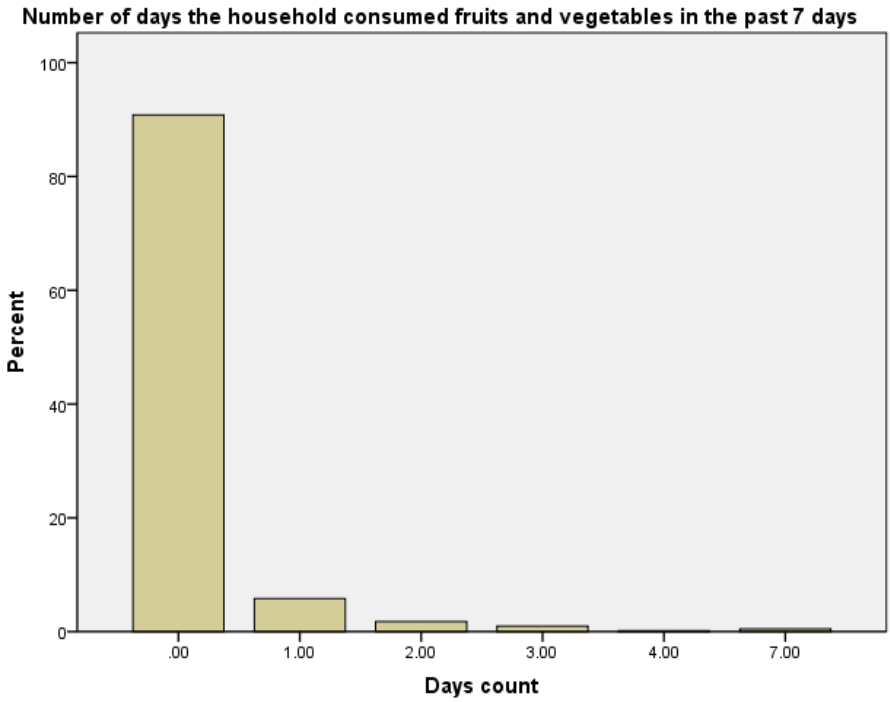
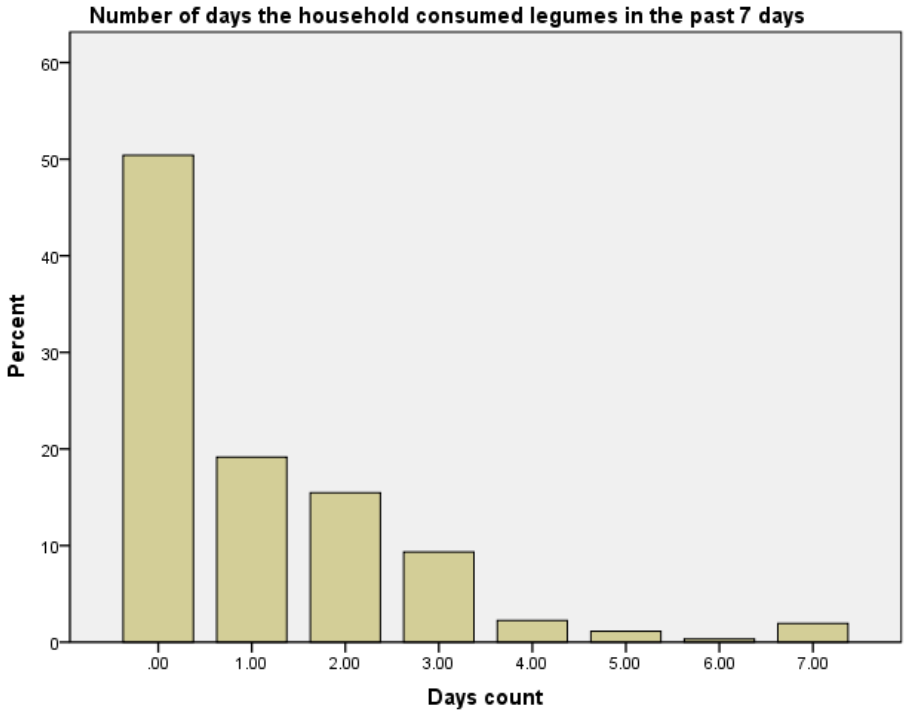
Appendix

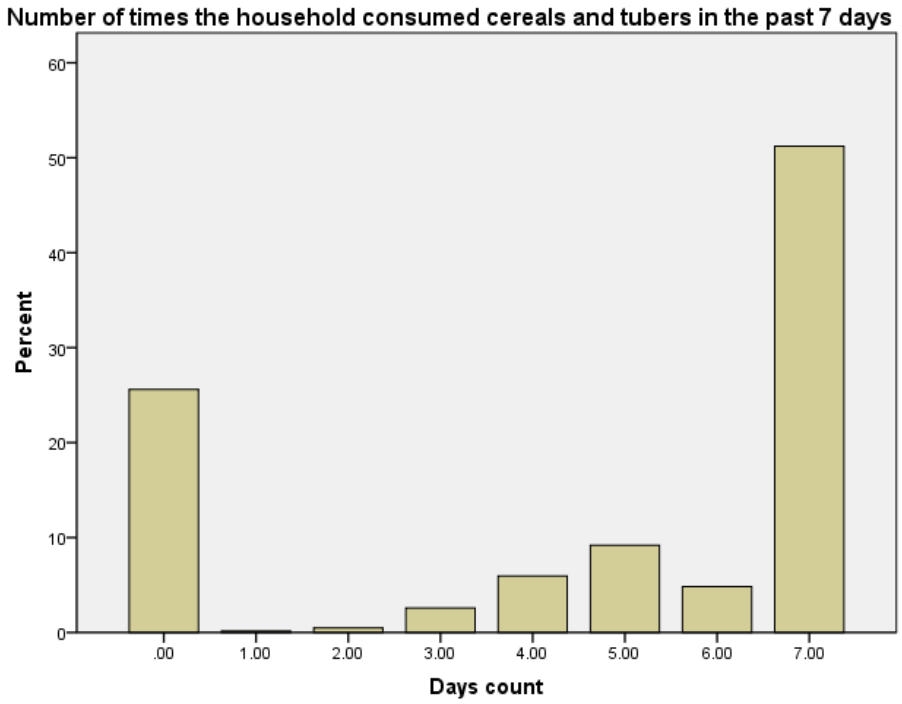

Number of days the household consumed dairy product in the past 7 days
Percent
60
40
20
0
.00
1.00
2.00
3.00
4.00
5.00
6.00
7.00
Days count


Number of days the household consumed meat in the past 7 days
Percent
30
20
10
0
.00
1.00
2.00
3.00
4.00
5.00
6.00
7.00
Days count


Number of days the household consumed vit A rich foods in the past 7 days
Percent
40
30
20
10
0
.00
1.00
2.00
3.00
4.00
5.00
6.00
7.00
Days count


Number of days the household consumed fruits and vegetables in the past 7 days
Percent
100
80
60
40
20
0
.00
1.00
2.00
3.00
4.00
7.00
Days count


Number of days the household consumed legumes in the past 7 days
Percent
60
50
40
30
20
10
0
.00
1.00
2.00
3.00
4.00
5.00
6.00
7.00
Days count


Number of times the household consumed cereals and tubers in the past 7 days
Percent
60
50
40
30
20
10
0
.00
1.00
2.00
3.00
4.00
5.00
6.00
7.00
Days count