ACTIVITY REPORT

Evaluation of multiplication fields and farmer training in production and management of cassava and sweetpotato crops in Kaabong and Kotido districts, Uganda

H.A. Okurut[1], S.N. Kayongo[1], V. Nsabiyera[1], G.Okao-Okuja[2], A. Alajo[2], B. Apio[3], G. Ocan[4], M. Adey[4]
[1]Nabuin Zonal Agricultural Research and Development Institute (NabuZARDI)
[2]National agricultural Crops Resources Research Institute (NaCRRI)
[3]Cooperation and Development (C&D-Kaabong)
[4]Food and Agricultural Organization (FAO-Kotido)

© **NabuZARDI- FAO Project**
OSRO/UGA/007/SPA
Jan 2012

1.0 Introduction

Food and Agriculture Organization (FAO - Uganda) has and continues to provide potential contribution towards general improvement of livelihood and achieving global food security. Financial support, inputs (planting materials) and knowledge are among the recognized support to the nation, Uganda in particular. In so doing FAO entered an agreement with Nabuin Zonal Agricultural Research and Development Institute (NabuZARDI) to train farmers in production and management of cassava and sweetpotato crops in the districts of Kaabong and Kotido.

NabuZARDI under National Agricultural Research Organization (NARO) is mandated to carry out sound agricultural research activities that are ecology based in Teso-Karamoja sub-region. However, research cannot be completely effective less of the supportive stakeholders. In collaboration with the private sector, local council, district, NGOs, advisory services, research has continued to be effective and beneficial to farmers in Uganda. However, more is desired to be bridged and positive impacts achieved.

In order to contribute towards improving the livelihoods of the communities, FAO spearheaded the initiative to build a strong capacity to help implement a sustainable programme of food production. Through provision of financial support, the services of stakeholders in collaboration with NabuZARDI were sought to provide the technical and operational services towards training other stakeholders in different aspects of producing cassava and orange fleshed sweet potato in the region. Productions were scheduled to start from two districts of Kaabong and Kotido at a rate of 80 hectares (200 acres) of cassava (biotic and abiotic stress tolerant varieties) and 20 hectares (50 acres) of sweetpotato (orange fleshed).

1.1 Background

The Cassava-Sweetpotato project (OSRO/UGA/007SPA) implemented in Kaabong and Kotido districts started in January 2011 and is due to end in July 2012. Actual project work was commenced in September, 2011 by FAO-Kotido after the contracted NGO (Cooperation and Development) had delayed to start the project due to lacked contracting agreement.

The crops established included cassava and sweetpotato in both farmer field schools and the nuclear sites. About 120 acres of cassava were established in Kaabong district and 25 acres in Kotido district. Cassava varieties such as MM/96/4271 and 2961 were planted. The cassava planting materials of variety MM/96/4271 were obtained from trusted out-grower farmer's fields in Apac district that are attached to Cassava Program of National agricultural Crop Resources Research Institute (NaCRRI). However, variety cuttings of MM/97/2961 were obtained from a re-known farmer fields school (FFS) from Otuboi village in Kaberamaido district.

The project also established 28 acres of sweet-potato in Kaabong District. Varieties that produce orange fleshed potatoes such as Ejumula and Kakamega (SPK004) were sourced from Namulonge research and therefore planted.

However, during the implementation of the project, stiff challenges were faced hence slowing down the project progress. The challenges included:

- Farmer's hesitation to grow cassava and sweet-potato since they were not the major staple crops.
- The methodology for implementation of the project sustainably.

As a result, a decision was taken to seek services of the area mandated research Institute (NabuZARDI) to take on the project and conduct the following functions:

- Facilitate comprehensive training in each of the two project districts (Kotido and Kaabong), NGO's extension staff on aspects including of establishing rapid and / multiplication fields, Agronomy, pest and disease management, handling and conservation of planting materials, early disease detection, pest and disease control in multiplication fields and hands on training on the quality control management protocol.
- Provide a detailed description of the services including technical and operational requirements, budget, work plan and time frame, performance indicators and means of verification, as well as inputs to be provided free- of charge by the service provider.

The essence of the project was to contribute towards improving the livelihoods of the communities through building a strong capacity in which farmers learn, implement and sustain a food production program. The success of the project therefore required implementing a comprehensive training of farmers, NGO and district staff in general aspects crop agronomy, methodology for establishment and management of multiplication fields, ways of conducting rapid multiplication for raising planting materials, handling, preservation and conservation of planting materials, integrated system of pest and disease management in multiplication fields and early disease detection. Other services include quality management protocol (QMP), monitoring and evaluation performance of the multiplication fields, conducting routine inspection and certification of the fields/cuttings prior to delivery and distribution of planting materials.

The NabuZARDI was entrusted to build capacity through provision of technical backstopping in project to farmers, NGO and district in Kaabong and Kotido districts.

2.0 Project Purpose:

- Enhanced training of stakeholders (farmers, NGOs and district extension staff in comprehensive production and management of cassava and sweet potato crops in Kaabong and Kotido Districts

2.1 Project Goal:

- Equip and Improve the knowledge of stakeholders in production and management of cassava and sweetpotato crops for sustainable productivity towards mitigating food insecurity

2.2 Project Objective

- To build capacity of key stakeholders and provision of backstopping services on integrated cassava and sweetpotato production, and pest and disease management in Kaabong and Kotido districts

Specifically:

- Conducting comprehensive training of district staff, NGO's extension staff on agronomic and integrated cassava and sweetpotato crop management.
- Design a season learning technique for the APFS.
- Providing adequate technical backstopping to all stakeholders.
- Establish multiplication gardens for source of planting materials.
- Operationalize the protocol for quality management.

3.0 General activities.

Activities and outputs	
Activity one:	- Training farmers on the best agronomic crop production and management practices
Output expected:	- At least 800 stakeholders (Farmers trained in cassava, sweet potato production and management techniques - Multiplication fields inspected and monitored for proper establishment
Activity: Two	- Training stakeholders in Integrated pest and diseases management on cassava and sweet potato crops
Output Expected:	- At least 500 farmers be in position to identify the major pests and diseases of cassava and sweet potato - Farmers ability to detect pest and disease outbreak in fields established fields
Activity: Three	- Inspect, monitor and evaluate the growth of crops in a conducive environment
Output:	- All production fields inspected and certified - Genetic purity of crop varieties ensured and maintained
Activity: Four	- Training stakeholders planting material handling and conservation techniques
Output:	- About 600 stakeholders trained on conservation of vines and cassava stems for next cropping season - Planting materials conserved on ridges around growers homesteads

4.0 Production and management of cassava crop

4.1 Inspection, monitoring and training of farmers in production and management of cassava crop

4.1.1 Introduction and Background

Cassava is an important food crop in Sub Saharan Africa and the second most important crop in Uganda in terms of production and consumption. It produces acceptable yields under sub optimum conditions and practices such as land preparation, selection of healthy planting materials, timely planting and correct weed management among others. FAO-Uganda sponsored cassava multiplication fields in Kotido and Kaabong districts with the aim of enhancing the livelihoods of rural farmers through boosting their cassava production.

In order to do this, FAO aims to control the two most important production constraints, which are the virus diseases: cassava mosaic disease (CMD) and cassava brown streak disease (CBSD). In 2011, FAO procured improved cassava planting materials of variety **MH96/4271** and **MM97/2961** which are tolerant to CBSD but resistant to CMD, and supplied to farmers in the Sub counties of Kathile, Kapedo, Karenga and Kamion sub counties in Kaabong and Panyangara sub county in Kotido district. To have fields with acceptable quality of materials, cassava field assessments are done 3 monthly to monitor progress and performance. To achieve this, the first field assessment was done in January 2012 by scientists from NARO-Nabuin and Namulonge with the assistance of FAO and C&D staff. We hereby report on the findings of the assessments and advise on the way forward.

4.2 Objectives

1) Determine the performance and management of cassava multiplication fields
2) Assess the crop health and purity in farmer fields
3) Improve farmers knowledge in agronomy, detection and management of pests and diseases.

4.3 Materials and methods

The assessment covered 23 multiplication sites in the three sub counties of Kathile, Kapedo and Karenga and Kamion in Kaabong District; Panyangara Sub county in Kotido. Agronomic methods were assessed basing the method of planting, mode of cropping and field management practices. Plants ranging from 30-100 depending on field size, were assessed randomly in each sampled field for variety purity, health status involving examining the presence of major pest and diseases on the foliar parts of the plants. In addition, vector population, off-type plants, field size distance to neighbouring fields of same crop were also assessed. Data were collected, processed and analysed. More details on the methodology can be obtained from the QMP document "*A guide to the assessment of Seed Quality and Plant Health within cassava multiplication schemes*" (citation).

5.0 Results and Discussion

5.1 Crop growth stage and management

Most cassava and sweet potato fields were under good management with weeding activity done on time and effectively though some fields in Karenga sub county require another cycle of weeding. The plant population density was sub-optimum in most fields assessed

showing that either affected crop germination or farmers did not use the correct spacing (1M X 1M) when planting and most fields were found to have spacing as wide as 1.5 meters between plants and 2 meters between rows thus giving less plant population compared to fields planted to the correct spacing. The optimum density of cassava plants in acre is 4000 plants. The average age of the fields assessed was 5 months, showing that the fields were not yet ready to be used as food and as source of planting materials.

5.1.1 Farmer sensitization in agronomic practices

Farmers were sensitized on good agronomic practices such as site identification, seed bed preparation, method and timing of planting, identification of clean planting materials, conservation and rapid multiplication of planting materials. Farmers also gained knowledge in detection and management major cassava diseases and pest in the field. They were also advised to report any unusual symptoms of disease or pests they encounter in their fields to their leaders of benefactors. Farmer attendance was greatly recommendable (Table1).

5.2 Health and purity status of cassava crop

Most fields inspected (30) were planted with variety MM97/2961 and other 5 fields planted with variety MH96/4271. Planting of the cassava fields during the short rain season (sept-Dec) affected the establishment hence spatial plant population. Most fields (90%) monitored and inspected were estimated at 60.0 acres (table xx). Other fields reported to be burn during the recent bush clearing especially in Murungole, Kamion sub county, while other farmer groups prepared the land but planting materials were not enough. Other materials dried up prior to planting hence failure to establish the fields.

During the inspection, high incidence of foliar CBSD on target varieties were found in fields of Itanya A (Atokenyuto FFS) and Kololo B (Emorikinos APFS) at 68 and 70% infection respectively (Table 1). However, most plants were clean from cassava mosaic disease (CMD) on the target than non target varieties (Table 1). Other pests (eg mealybugs and mites) and diseases (eg B.blight) were not encountered at all in any field in the entire assessment. Whitefly (*Bemisia tabaci)* populations were generally very low in all the fields. This showed that the vector populations were insignificant in the spread of infection in the inspected areas but rather the planting materials could have been sourced from fields with latent CBSD infections. The presence of the CBSD in the fields was mainly due to use of infected planting materials.

5.2.1 Varietal purity status

Varietal purity ranged from 53.7-100% in all the fields assessed. Most fields assessed had varietal purity ranging between 80 – 100 % (Table 2). There was a moderate varietal mixture in most fields assessed. The mix could have been due to indiscriminate cutting of stems where the suppliers did no sort out the off-types prior to stem cutting. The off-type varieties in the entire assessment were TME 14, 204, Akena and other local varieties and ranged from 1-46% (table 1). Importantly, the variety 'off-types', responsible for reductions in varietal purity, were of TME 14 most of which had high incidence of CBSD symptoms while the locals had very high incidence of CMD.

5.3 General quality assessment of cassava fields

Quality assessment data values and outcomes are provided in Table 1 for each of the multiplication sites inspected. Varietal purity was good at a number of sites, although this should not be used at this level to certify the sites. All the 35 fields examined had no CMD on target varieties but some had CBSD on target and off-type varieties. Although the outcome from these assessments considered the multiplication fields as **poor to very good**, more cautious approach would be to recommend rouging (removal) of the off-types and infected target variety plants soon to avoid spread of the virus from the infected plants to the healthy ones because vector population may build up and perpetuate the spread if favourable conditions prevail or uninformed curios farmers may pick the plantings and carry them to their fields miles away hence enhancing the spread.

5.3.1 General observations on the implementation of activities .

- High level of variety mixture was observed
- High level of CBSD and CMD on non target varieties
- Most fields monitored and inspected were well managed in terms of weeding.
- Generally, majority of farmer fields appear to be well managed and there is adequate protection from damage from both livestock and wild animals.

5.4 Conclusions and Recommendations.

In all the fields assessed, there are only two cassava varieties, MH96/4271 and MM97/2961 under multiplication

Following the inspection at the sites visited, the following general conclusions can be made:

I. Many of the sites had >80% pure stands of a single variety. Few, however, had low proportions of 'off-type' variety, TME 14 and other locals.
II. Incidence of CBSD in two of the multiplication fields visited was above the threshold (maximum tolerance level) for quality. Since CBSD is the most important production constraint to cassava production in East and central Africa today, twenty one fields would pass as source of seed for next planting if the few "off-types" are removed soon before any spread can occur.

5.4.1 Recommendations.

I. Two of the fields inspected i.e. Itanya, Atokenyuto and Kololo, Emorikinos (highlighted red) are disqualified and should be discarded and not used as seed source
II. Need improve crop health and purity status through uprooting all plants expressing symptoms of CBSD and CMD before harvesting of crop.
III. All off-types or non target varieties need to be rouged before new planting season
IV. Need to further inspect and monitor the fields to ensure qualification for pytosanitary certificates conforming the crop purity and health status of crop. No materials from the fields should be used as seed in the same area or supplied elsewhere without field certificate.
V. Other CBSD tolerant, high yielding and long term varieties such as **NASE 3** should be introduced in to farmers for production.

Way forward

- Stakeholders be sensitized on CBSD problem and management
- Planting materials be inspected and certified by technical staff

- Enhance collaboration with NARO/ZARDIs for better cassava production

Table1 Farmer attendance in training

District	Sub county	Total no. of farmers	Male	Female
Kaabong	Kapedo	608	280 (46%)	328 (54%)
	Karenga	213	90 (42%)	123 (58%)
	Kamion	150	95 (63%)	45 (30%)
Kotido	Panyangara	non	-	-

Table 2: Mean parameters per cassava field assessed, January 2012

Site	District	Sub county	Village	APFS/FFS	Variety	Acre	CMD (%) on target varieties	CBSD (%) on target varieties	Varietal purity (%)	Off-type (%)	CBSD (%) on off-types	Remarks
1	Kaabong	Kapedo	Itanya A	Atokenyuto	MM97/2961	5.0	0	68.0	86.6	13.4	83.4	Rejected field
2	Kaabong	Kapedo	Itanya B	Atokenyuto	MH96/4271	1.0	0	0.0	97.6	2.4	22.4	Need to rouge
3	Kaabong	Kapedo	Kololo A	Emorikinos	MH96/4271	0.5	0	0.0	99.0	1.0	11.0	Need to rouge
4	Kaabong	Kapedo	Kololo B	Emorikinos	MM97/2961	0.5	0	70.0	97.7	2.3	80.3	Rejected field
5	Kaabong	Karenga	Nakadir	Nakidir	MM97/2961	7.0	0	0	98.0	10.0	1.0	Need to rouge
6	Kaabong	Karenga	Nakadir	Nakidir	MH97/4271	3.0	0	0	83.3	16.7	16.7	Need to rouge
7	Kaabong	Karenga	Loyoronapore	Emorikinos	MM97/2961	1.0	0	0	76.7	23.3	73.3	Rejected field
8	Kaabong	Karenga	Napekat	Kalongat	MM97/2961	0.5	0	0	96.7	3.3	13.3	Need to rouge
9	Kaabong	Karenga	Nakatoit	Kagilgil	MM97/2961	1.0	0	0	53.7	46.3	90.3	Need to rouge
10	Kaabong	Karenga	Loyoro south	Kaikole	MM97/2961	2.0	0	0	70.0	30.0	80.0	Need to rouge
11	Kaabong	Karenga	Lorubolem	Lorubolem	MH96/4271	2.0	0	0	83.3	16.7	66.7	Need to rouge
12	Kaabong	Karenga	Lorwama	lorubulem	MM97/2961	2.0	0	0	95.5	5.5	6.0	Need to rouge
13	Kaabong	Karenga	Lorwama	Natede A	MM97/2961	2.0	0	0	75.5	20	26.7	Need to rouge
14	Kaabong	Karenga	Lorwama	Natede B	MM97/2961	2.0	0	0	93.3	6.7	26.7	Need to rouge
15	Kaabong	Karenga	Kanachomin	Kanachomin	MM97/2961	2.0	0	4.0	92.0	8.0	38.0	Need to rouge
16	Kaabong	Karenga	Kangole south	Lorwama	MM97/2961	4.0	0	0	92.0	8.0	38.0	Need to rouge
17	Kaabong	Kamion.Timu	Kaikoba A	Riamriam	MM97/2961	0.5	0	0	93.3	6.7	36.7	Need to rouge
18	Kaabong	Kamion.Timu	Kaikoba B	Imakoyot	MM97/2961	0.5	0	0	93.0	7.0	26.5	Need to rouge
19	Kaabong	Kamion.Timu	Domoko	Nakwabuin	MM97/2961	0.5	0	0	90.0	7.0	26.5	Need to rouge
20	Kaabong	Kamion.Timu	Napongo	Napongo	MM97/2961	0.5	0	0	90.0	7.0	26.5	Need to rouge
21	Kaabong	Kamion.Timu	Kapam	Seitir kokor	MM97/2961	0.5	0	0	90.0	7.0	26.5	Need to rouge
22	Kaabong	Kamion.Timu	Kapam	Lokile	MM97/2961	0.5	0	0	90.0	7.0	26.5	Need to rouge
23	Kaabong	Kamion.TIMU	Koloko	Nakwanga	MM97/2961	0.5	0	0	97.6	2.4	12.4	Need to rouge
24	Kaabong	Kamion.TIMU	Lopokok	Sogogwasi	MM97/2961	1.0	0	0	97.6	2.4	12.4	Need to rouge
25	Kaabong	Kamion.TIMU	Tulutul	Kaitebu	MM97/2961	2.5	0	0	90.0	10.0	60.0	Need to rouge
26	Kaabong	Kamion.TIMU	Lodoi	Telek	MM97/2961	0.5	0	0	98.0	2.0	10.0	Need to rouge
27	Kaabong	Kamion.TIMU	Lokinenek	Akisiakinet	MM97/2961	0.5	0	0	86.7	13.3	63.3	Need to rouge
28	Kaabong	K. Morungole	Lomil	Lomil	MM97/2961	1.5	0	0	90.0	10.0	60.0	Need to rouge
29	Kaabong	K. Morungole	Usake	Usake ´B´	MM97/2961	1.0	0	0	70.0	20.0	80.0	Need to rouge
30	Kaabong	K. Morungole	Usake	Usake ´A´	MM97/2961	1.0	0	0	70.0	20.0	80.0	Need to rouge
31	Kaabong	K. Morungole	Puta	Puta	MM97/2961	1.0	0	0	70.0	20.0	80.0	Need to rouge
32	Kaabong	K. Morungole	LoSolia	LoSolia	MM97/2961	0.5	0	0	70.0	30.0	80.0	Need to rouge
33	Kaabong	K. Morungole	Naoyagum	Naoyagum	MM97/2961	0.5	0	0	70.0	20.0	80.0	Need to rouge
34	Kaabong	K. Morungole	Pire	Pire	MM97/2961	1.0	0	0	70.0	30.0	80.0	Need to rouge
35	Kotido	Panyangara	Kangorok	xxxxxxxx	MM97/2961	10.0	0	0	88.0	32.0	82.0	Need to rouge

6.0 SWEET POTATO PRODUCTION

6.1 Introduction

The people of Karamoja live in chronic food insecurity due to drought prone environmental conditions. The Food and Agricultural Organization of the United Nations (FAO) intervened to provide planting materials of sweet potatos, one of the hardy crops that are nutritious and drought tolerant. The fields were established by FAO in partnership with a non-governmental organization, Cooperation and Development (CD). The project targeted the people of Kaabong and Kotido as beneficiaries. However, these can act as the nucleus for the source of planting materials to the rest of the people in Karamoja when the project succeeds. Even though the crop is hardy, it needs proper and conducive growth conditions during development if the yields are to be realized. Sweet potato plants are also attacked by a wide variety of pests at any stage of the crop development that compromise on its yield and quality. They attack and feed on any part of the plant including the foliage, the stem, the roots and the economic part of the plant the root tubers. Such pests include weeds, insect pests, mites, pathogens that cause diseases, rodents and others. In order to avert the crop losses caused by these pests, proper identification is necessary for proper management.

Therefore, to ensure the success of this project, FAO asked Nabuin Zonal Agricultural Research and Development Institute (NabuZARDI), an institute that overseas agricultural research and training in North-Eastern zone part of the country to intervene.
Scientists from the institute made a trip to visit farmers and the established fields with the following objectives, to:

- Monitor the work being done and to inspect the established fields for quality control.
- Train farmers on:
    - Agronomic aspects of sweet potato production
    - Sweet potato pest and disease identification
    - Vine preservation, conservation, rapid multiplication and establishment of multiplication fields and,
    - Quality management of the provided sweet potato cultivars.

6.2 Methodology

Through the Agro Pastoral Field School facilitators, scientists visited the established fields for inspections. Farmers were also mobilized and offered hands on training at the fields. Where there were many farmers groups like in Karenga sub-county, farmers from various farmer groups convened in one place for the training at an agreed agro-pastoral field school (APFS). Training was done through practical demonstration with insect infested or diseased plants where possible. During inspection, an “X” transect in the field was followed with 30 randomly picked plants inspected for both foliar and stem pests and diseases. For root pests and diseases destructive sampling of 10 plants (5 from each diagonal of the “X” transect) from each field was

done and roots inspected. Additional observations related to the field establishment, field management and other observed pests were noted.

6.3 RESULTS

6.3.1 Sweet Potato Agro-Pastoral Farmer Field Schools (APFFS)

In Kaboong district, there were a total of 14 APFFS, 10 from Karenga sub-county, 2 from Kathile sub-county and 2 from Kapedo sub-county. In Karenga sub-county, out the 10 APFFS, we managed to inspect only five of them viz:- Kagiligil, Kalongat, Emorikinos-united, Kaikole APFFS in the North and only Lorwama APFS in the south. The remaining fields were not visited because they were very far and there was limited time in the schedule. It was agreed that they be visited in the next trip. The inspected and uninspected sweetpotato APFFs in Kaboong district are shown (Table 3). In Kotido district, sweetpotato vines were given to individual farmers and not groups. Fields were not inspected as it was not possible to visit each farmer field. Training was not equally done due to failure of farmer mobilization. The Kotido sweet potato Farmer Training and inspection will be done in the next visit.

6.3.2 General status of the Sweet Potatoes in the field.

Different sweet potato fields visited were at different maturity stages. Most of the fields in Karenga sub-county were mature (Table 3). Fields in Kathile and Kapedo Sub-counties were young apart for that of Lobatou APFS in Kathile sub-county that about to mature, respectively. In all fields, all seedbeds were properly prepared as ridges and proper spacing was used. Most fields were kept weed free and the bushes around cleaned except that of Emolikinos-united in Karenga sub-county and Lemugete in Kathile sub-county.

6.3.3 Variety purity and mixtures

A part from Lemugete APFFs whose field had an additional off type of a local variety, all other fields were planted with the intended varieties (Naspot 8 and SPK 002 (Kakamega). During planting, there were no variety mixtures in the ridges. However, in most APFFS fields where both Naspot 8 and SPK 002 were grown, there were no clear cut boundaries between the two varieties. This can easily lead to variety mix up at vine harvesting by farmers given that the two varieties almost look the same morphologically. Therefore a technical person is needed at this time to avoid compromise with variety purity.

6.3.4 Health status of the crops in the fields

Although sweet potato is known to be attacked by many pests and diseases, not many pests and diseases were observed among the farmer fields. The foliar pests observed were the sweet potato leaf folders and mites. Leaf folders were found in all fields (Table 4) but their damage

appeared to be of little economic importance. Farmer field schools found infected with mites were Naporokolong (16.7%), Emolikinos-united (88%) (Table 4). Sweet potato weevils were found in all fields and the percentage infestation was high in fields planted with SPK 004 compared with those having Naspot 8. The fields were least infected with diseases probably because of the dry environmental condition we found the plants in. Sweet potato virus disease was observed on only 2 plants (7%) on Naspot 8 variety in Napolokolong APFFs (Kathile S/C). However, most vines from Emorikinos-united APFS had none severe numerous lesions on the stems suspected to be of anthracnose disease.

6.3.5 Training of farmers

Farmers were trained on several aspects of sweet potato production including, agronomic practices, pests and disease identification and management, sweet potato vine preservation and rapid multiplication and varietal quality control. In Kathile North, two groups (Lobatou 1 and 2) were trained (42 members) at Labatou 1 APFS. Labatou 2 APFS was given Cassava that failed due to drought. In Kathile south (Lemugete APFFS) 30 farmers were trained. In Kapedo sub-county, a total of 58 farmers were trained 28 and 30 for Nangolekuma and Naporokolong APFS, respectively. Fewer farmers were trained in Karenga S/C even though it had the highest number of APFS (10). In Karenga south, a total of 60 farmers from 5 APFFS were trained each represented by at least 10 members at Emolikimos-united APFFS. Only 25 farmers from 5 APFFS in Karenga north were trained with at least 2 from each APFFS. Training here was conducted in the afternoon and most farmers had left the convening place (Lorwoma APFFS)

6.3.5.1 Agronomic practices of sweet potato production

Farmers were trained on how select suitable site for sweet potato planting, the environmental conditions that favor sweet potato production, seed bed preparing and planting including spacing specifications and planting depth for sweet potato vines, keeping fields weed free, cultivar selection and choice of clean planting materials from the selected variety.

6.3.5.2 Pests and disease identification and management

6.3.5.2.1 Pest and disease identification

Pests including insect pests, mites, pathogens, weeds and other vine like rodents hinder sweet potato production. Farmers were taught on the damage caused by the pests that attack the foliage, stem, roots and root tubers of the crop and how to identify them visually and using the damage symptoms (insect pests and mites). Farmers were also taught how to identify diseases caused by pathogens, nutrient deficiency and toxicity (excess of nutrients, environmental causes such as drought, too much rainfall and water logging among others based on symptoms on the affected plant part (s). Farmers were however, cautioned to keep involving their extension workers for proper identification since most disease causing agents display similar symptoms that can often be confused with each other. Where identification seemingly difficult even when extension officers are involved, farmers were advised to contact the Nabuin-ZARDI pathologist through their respective sub-county extension officers.

6.3.5.2.2 Pest and disease management

Farmers were taught how to effectively manage both pests and diseases in their fields. Emphasis was on the integrated management (IP-DM) control strategy with minimal use of pesticides since they are expensive to farmers and harmful to human beings, their animals and their environment. Cultural and sanitation methods including crop rotation, use of clean planting materials from certified sources, use of resistant verities, rouging and burning of infected/infested planting materials, regular weeding of fields to avoid volunteer and host weeds or pests and diseases, timely planting, amending the soils using animal or poultry manure among others.

6.3.5.3 Preservation and rapid multiplication of planting materials

Even though sweet potato is a hardy crop that is tolerant to drought, the dry periods of Karamoja cannot spare the crop. Sweet potato cultivars can also be lost due pests and disease attack. To avoid losing the given cultivars to drying during drought and to save some remnant cultivars after heavy pest and disease attack and to avoid some pest and disease transmission, farmers wear trained on their preservation and rapid multiplication to be ready for planting when conditions are favorable i.e. when the rains begin. A rapid multiplication technique using sweet potato vines through a sweet potato nursery were demonstrated among all farmer groups in Kaabong district. Rapid multiplication from tubers was not demonstrated because there were no tubers in most farmer fields.

During demonstration process, farmers were taught and shown how to:

- Prepare and manage the sweet potato nursery
- Select vigorous and health planting materials for rapid multiplication from mother plant
- Prepare the vine mini set for planting.
- Plant the vine mini set in the nursery both for preservation and multiplication.
- Transplant the vine mini sets to the main field and when.

7.0 Challenges and recommendation

- Some farmers were not willing to learn reasoning that they will not get a degree especially from Emolikimos-united. However, some individuals were committed to gaining knowledge and it is hoped that others will benefit from them.
  Recommendation: In future, well focused and committed farmers should be mobilized for the trainings.
- Most farmers expect logistics especially money, field boots, and inputs such as hoes and Pangas at the training:
  Recommendation: Farmers should be well informed and assured by the project leaders and facilitators that what they have received if managed well for sustainability will earn them what they want.
- Farmers constantly asked the intervention to provide the planting materials timely, conduct regular extensions services, provide inputs including pesticides, animal traction oxen and their implements among others:

Recommendation: Farmers need to sensitized about the roles played by the different government agencies under the ministry of Agriculture that deal with farmers (extension officers, NAADS and researchers) and NGOs such as FAO, C&D and other developmental partners for farmers.

- Some farmer fields were poorly managed citing lack of cooperation of some members in terms of monetary contribution and availability when it is time to work.
  Recommendation: Farmers should be trained on group dynamics so that each is responsible for his or her working group.
- A lot of training material was given to farmers in a short time. There is doubted that farmers understood everything they were taught.
  Recommendation: Farmers need such regular trainings from their extension servants. Unfortunately, they were lacking at the time of training and need to be trained as well on the trained aspects.

7.1 Conclusion

As previously noted, in Kotido district, sweet potato vines were given to farmers individually. Thus, inspection of the fields and training farmers was not possible. The C&D and FAO did a commendable work in establishing sweet potato APFFS in Kaabong that will act as the nucleus supply to other farmers in the district. The farmers were so grateful with intervention to alleviate food insecurity in their region. With proper monitoring and follow up, the project will succeed. Of all the farmer fields inspected, the Emorikinos-united APFFS was the one doing worst and if planting materials are to be sourced from this field, it has to be under inspection of the qualified personnel.

Table 3: Inspected and uninspected APFFS in Kaboong district, January 2012

Field	District	Sub-county	APFFs (group)	Inspected	Variety (ies)	Acreage	Field status
1	Kaabong	**Kathile**	Lobatou	YES	SPK 004 & Naspot8	≈1.5	Clean and about to mature, few rodent infestations
2	Kaabong	**Kathile**	Lemugete	YES	SPK 004, Naspot8 & unidentified local variety	≈1.5	Young, weedy and heavily infested with rodents
3	Kaabong	**Kapedo**	Nalemukuma	YES	SPK 004 & Naspot8	≈2.5	Very Clean and young field
4	Kaabong	**Kapedo**	Naporukolong	YES	SPK 004 & Naspot8	≈2.5	Very Clean and young field
5	Kaabong	**Karenga**	Kaicul	NO	SPK 004 & Naspot8	≈ 0.5	Clean mature field
6	Kaabong	**Karenga**	Kagiligil	YES	SPK 004 & Naspot8	≈0.5	Clean mature field
7	Kaabong	**Karenga**	Kalongat	YES	SPK 004 & Naspot8	≈0.5	Clean mature field
8	Kaabong	**Karenga**	Emolikinos-united	YES	SPK 004 & Naspot8	≈0.5	Very weedy, young field, poorly and heavily destroyed by pigs
9	Kaabong	**Karenga**	Kaikole	YES	SPK 004 & Naspot8	≈0.5	Clean mature field
10	Kaabong	**Karenga**	Lorwoma	YES	SPK 004 & Naspot8	≈0.5	Mature field ready for harvest.
11	Kaabong	**Karenga**	Lorubolem	NO	SPK 004 & Naspot8	-	-
12	Kaabong	**Karenga**	Natede	NO	SPK 004 & Naspot8	-	-
13	Kaabong	**Karenga**	Kanachomin	NO	SPK 004 & Naspot8	-	-
14	Kaabong	**Karenga**	Purber	NO	SPK 004 & Naspot8	-	-

[a] = Not known since field was not visited

≈an approximate, not actual size

Table 4. Incidence of observed pests and diseases among APFFS in Kaboong District January, 2012

Site	Sub county	APFFs (group)	Variety	SPVD (%)	Mites (%)	Leaffolder (%)	SP weevil (%)	Remarks
1	**Kathile**	Lobatou	SPK 004	0	0	33	50	Good field
			Naspot 8	0	0	27	20	Good field
2	**Kathile**	Lemugete	SPK 004	0	0	27	40	Good field
			Naspot 8	0	0	7	20	Good field
3	**Kapedo**	Nangolekuma	SPK 004	0	3	17	30	Good field
			Naspot 8	0	10	20	10	Good field
4	**Kapedo**	Naporukolong	SPK 004	0	**17**	27	60	Good field
			Naspot 8	7	13	37	30	Good field
5	**Karenga**	Kaicul	SPK 004	0	30	47	50	Good field
			Naspot 8	0	20	17	0	Good field
6	**Karenga**	Kagiligil	SPK 004	0	13	23	30	Good field
			Naspot 8	0	27	43	20	Good field
7	**Karenga**	Kalongat	SPK 004	0	37	13	10	Good field
			Naspot 8	0	**88**	27	0	Good field
8	**Karenga**	Emolikinos-united	SPK 004	0	0	33	40	Very poor field
			Naspot 8	0	0	20	20	Very poor field
9	**Karenga**	Kaikole	SPK 004	0	0	30	40	Good field
			Naspot 8	0	7	23	30	Good field
10	**Karenga**	Lorwoma	SPK 004	0	0	13	50	Good field
			Naspot 8	0	0	40	40	Good field
11	**Karenga**	Lorubolem	SPK 004	-[a]	-	-	-	-
			Naspot 8	-	-	-	-	-
12	**Karenga**	Natete	SPK 004	-	-	-	-	-
			Naspot 8	-	-	-	-	-
13	**Karenga**	Kanachomin	SPK 004	-	-	-	-	-
			Naspot 8	-	-	-	-	-
14	**Karenga**	Purber	SPK 004	-	-	-	-	-
			Naspot 8	-	-	-	-	-





Figure 1.APFS Coordinator delivering an introductory brief to members of Lobatou APFS prior to Training.



Figure 2. Hands on Training at Lobatou APFS Sweet Potatoe Multiplication Garden Kaile Sub County Kaabong District.