

Building a Sustainable Sweetpotato Seed System in Malawi: Experiences from the “Rooting out Hunger in Malawi” Project

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Abstract

The project “Rooting out Hunger in Malawi with Nutritious Orange-Fleshed Sweetpotato (OFSP)” was launched in October 2009 for the benefit of women and children in the country. This 4.5-year effort targets 70,000 households to improve vitamin A and energy intake using improved sweetpotato varieties. It also seeks to boost yields by 50% and improve incomes by 20%. The project aligns with the Agriculture Sector Wide Approach to food and nutrition security and crop diversification. With Irish Aid support, CIP initially worked in partnership with government agencies and three NGOs as implementing partners (IPs) and targeted 4 districts. The project established a “1-2-3” seed multiplication system, with clean planting material produced at a primary multiplication site, and decentralized vine multiplication sites (DVMs) doing multiplication at the community level. DVMs run by individuals or groups of farmers with access to irrigation were established by the IPs and supervised by district Extension staff. Multiplication at the DVMs was termed secondary (vine production using rapid multiplication) or tertiary (production of both roots and vines, particularly during the hungry season). A subsidized voucher system was used by partners to allow at-risk households to purchase sweetpotato planting material from DVMs. Promotion and awareness campaigns were conducted in each district to stimulate demand for OFSP. By February 2012, the project had reached 34,903 households in 5 districts with subsidized vouchers, and an additional 27,522 beneficiaries through non-voucher sales. Seven IPs in 15 districts partnered in the effort. Lessons learned and sustainability of the system will be discussed.

Keywords: Orange-fleshed sweetpotato, Partnership, Malawi, seed system

I. INTRODUCTION

In Malawi, maize is the most important food crop, followed by cassava, sweetpotato, Irish potato, and sorghum. According to the 2011/2012 second-round national production estimate figures, sweetpotato production in Malawi was 3.6 million metric tons. In term of production, cassava was ranked 1 followed by maize and sweetpotato (Daily Times Newspaper 26 April, 2012). On the other hand, sweetpotato is currently one of the most widely grown crops. Maize is much more vulnerable to dry spells than sweetpotato. Dry spells are becoming increasingly common due to climate change, so there is great interest on the part of government and other partners in mitigating these risks with nutritious orange-fleshed sweetpotato (OFSP). As a result, many partners have joined the Irish Aid-funded project

“Rooting out Hunger in Malawi,” and farmers throughout the country are benefitting. Sweetpotato is becoming a major food source and increasingly contributes to the food basket, especially in the months where maize is scarce or the price is too high for poor people. This crop is also becoming a source of cash and employment to many farmers.

Malawi is one of the world’s 20 poorest countries. Over 40% of the population lives on less than a US \$1/day. The average Malawian can expect to live just 40 years due to high prevalence of HIV/AIDS, malaria, and malnutrition (USAID 2012). Malnutrition of children remains one of the biggest challenges in developing countries such as Malawi. Children aged 0–23 months are the most vulnerable group with a peak incidence of mortality and morbidity. The Government of Malawi is committed to poverty reduction and, since 2005, has been monitoring poverty annually with its Welfare Monitoring Survey, conducted by the National Statistical Office. On the basis of a sample of over 18,000 households (HH), the national percentage of persons falling below the poverty line is 39%, a marked improvement from the 50% found in 2005. However, rural poverty remains much higher (43%) than urban (14%) and poverty in the rural South (51%) significantly higher than in the center (41%) or the north (31%) of the country (NSO 2010). In spite of the gains made, levels of malnutrition remain high, with 47% of under-five children stunted, 59% having vitamin A deficiency (VAD), and 13% underweight. The infant mortality also remains high, with 112 deaths per 1,000 live births estimated for 2010 (DHS 2010). There is still a significant prevalence of HIV/AIDS, currently estimated at 12%.

In Malawi, the International Potato Center (CIP) launched a project “Rooting out Hunger in Malawi with Nutritious Orange-fleshed Sweetpotato” in October 2009. This project is under the umbrella of the Sweetpotato for Profit and Health Initiative (SPHI) for SSA, which has the goal of enhancing the lives of 10 million African families in 10 years, particularly by reducing child malnutrition and improving smallholder incomes through the effective production and expanded use of sweetpotato. Irish Aid became a founding partner in the SPHI through the present project, “Rooting out Hunger in Malawi.” This is a 4.5-year, multi-partner effort to improve vitamin A and energy intake for at least 70,000 households with young children (the group most vulnerable to vitamin A deficiency) using orange-fleshed sweetpotato (OFSP) and an innovative approach to scaling up planting material dissemination. The project also seeks to improve income-generating opportunities for some producers of OFSP and increase their average sweetpotato yields by 50%.

The Government of Malawi recognizes the need to invest in agriculture—especially the need to improve productivity—as over three quarters of its population depends on agriculture for survival. Moreover, the government explicitly recognizes the need to invest in nutrition and the potential synergies of improving links between the nutrition, health and agriculture sectors. This project is rooted in regional and national policies and programs aimed at sustainably improving the lives of people in Malawi and the region in line with the Millennium Development Goals (MDGs). The MDGs represent a policy shift from social consumption to sustainable economic growth and infrastructure development. They place emphasis on nine key priority areas including: (1) agriculture and food security, (2) irrigation and water development, (3) transport infrastructure development, (4) energy generation and supply, (5) integrated rural development, and (6) prevention and management of nutrition disorders and HIV/AIDS. The key priority areas are expected to accelerate the attainment of the MDGs in the areas of health, education, gender, environment, and governance (MoAFS 2008). Furthermore, there is good alignment between the project “Rooting out Hunger in Malawi” and the Agricultural Sector Wide Approach (ASWAp) of the government of

Malawi. The Rooting out Hunger with OFSP project is contributing towards the achievement of several strategic objectives, support services (including institutional strengthening and capacity building), and focus areas (including strengthening public-private partnership and improving sustainable production practices). Malawi launched the “Scaling up Nutrition (SUN) 1000 Special Days” initiative in July 2011. The project attempts to align with the National Nutrition Education and Communication Strategy described in the SUN 1000 Special Days movement. Furthermore, the project also attempts to seek a sustained seed system by linking to this scaling-up nutrition effort in Malawi.

2. SETTING UP OF STRATEGIES

2.1 Establishment of a 1-2-3 Sweetpotato Seed System

A 1 (“primary”), 2 (“secondary”), 3 (“tertiary”) vine multiplication system was built up. Figure 1 shows the 1-2-3 seed system model applied in Malawi. Primary multiplication provides clean planting material and is managed by researchers at the research station; secondary and tertiary multiplications are decentralized on farms and managed by farmers under the supervision of government and extension staff of nongovernmental organizations (NGOs). The 1-2-3 seed system fits with the sweetpotato growing calendar in Malawi which has a uni-modal rainfall pattern (Fig 2). Assuming this system goes well, we can expect to have clean OFSP planting material and produce sweetpotatoes throughout the year.

Primary multiplication is at Bvumbwe Research Station in Thyolo District Southern Region under the Department of Agricultural Research Services (DARS). The DARS has attempted to expand the primary multiplication sites to Central and Northern Malawi. Breeding activities on improving sweetpotato varieties take place at Bvumbwe Research Station. This research station is equipped with a tissue culture laboratory, screen house and fields with irrigation. Six OFSP varieties have been released through this station. One of these improved OFSP varieties, Zondeni, has been widely grown by farmers in Malawi. According to the yield estimate plots assessed in the five implementing districts of Dedza, Zomba, Phalombe, Mulanje, and Chikhwawa in 2011, the average yield was 18 metric ton/ha. This yield was significantly higher than the average yield of sweetpotato reported in Malawi, which was 6 metric ton/ha (CIP, 2012).

Out of 1 ha of beds covered by orange-fleshed sweetpotato Zondeni variety, planted using the rapid multiplication method (planted at 20 cm x 10 cm, 50 plants per m²) one can harvest 1.5 million vine cuttings 30 cm long after 2 months. We can harvest 6 time per year, thus 9 million vine cuttings can be harvested from 1 ha in a year. Because of a high demand, Bvumbwe Research Station has been able to generate income to sustain the program.

Secondary (“2”) and tertiary (“3”) vine multiplications were built up in the first year of the project. A decentralized vine multiplication (DVM) is a group of farmers or individual farmers who are multiplying OFSP within a radius of 9 km to avoid wilting of vine cuttings during the transportation by customers coming to the DVM on foot. In Malawi, DVMs fit into a Geographical Village Head or “Group Village Head.” The DVM is also a place where demonstration trials can be conducted. Thus, DVMs should be centers where people can learn more about sweetpotato. At the DVM, an extension officer plays an important role to supervise multipliers. The DVM should also work closely with the researchers from the primary seed multiplication. New techniques can be easily transferred to farmers through this type of network. Training is conducted at DVMs at each year in order to update knowledge and skills of farmers. Farmers use the demo trials as their “living” library. Monitoring on pest

and disease incidence at DVMs is also important. Good teamwork amongst relevant government departments, researchers, extension staff, and farmers/private sector actors is contributing to the success of the seed system. Currently, the attempt to achieve this success is still underway. The Rooting out Hunger in Malawi project has shown evidence of strong partnerships at all levels. Table 1 summarizes the principal differences between the secondary and tertiary DVMs. Table 2 provides information on the numbers of DVMs established in the first two years of the project.

2.2. Training, Awareness Creation Campaigns, Meetings and Sensitization

Training, sensitization, field days/open days, awareness creation campaigns, radio programs, demo trials, and visits were effective in building up the capacity of farmers and extension staff. A total of 4,075 lead farmers, government, and NGO extension staff have been trained since the project was launched in October 2009. After the training, an action plan was made. It was agreed that each trainer had to train another 5–10 people. During 2010 to 2012 this strategy was implemented in the five districts of Dedza, Zomba, Phalombe, Mulanje, and Chikhwawa. Three modules for the training of trainers (TOTs) were prepared. The first module is for crop production, multiplication, and crop pests and diseases. The second is for postharvest handling, and the third for OFSP processing. The content of training modules was developed in association with Information Education and Communication (IEC) materials of the “Scaling up Nutrition (SUN) 1000 Special Days” initiative in Malawi.

Each year, training, sensitization, field day/open day, awareness creation campaign, radio programs, and demo trials were conducted by the implanting partners. Training is expensive for rural poor farmers in a poor country like Malawi. The impact of the training was clearly met; farmers were motivated. They had confidence to participate in any field days to show their capability on what they gained from the training. For instance, during the special events, farmers participated and sold OFSP products, and high demand for the OFSP products was noted.

2.3 Voucher Scheme

By using a voucher scheme we aimed at ensuring the households with children under five, pregnant women, or were HIV/AIDS affected could access OFSP vines. Each household received 4 kg of vines which had 300 cuttings of 30cm long. The strategy of using the voucher scheme is outlined in Fig 3. The IPs reported the number of beneficiaries to receive vouchers and CIP delivered vouchers and funds to cover them to the IPs. The IPs would use this budget to redeem the vouchers from selling of vines by the multipliers to targeted beneficiaries. The beneficiaries who received the vouchers would approach the DVM to get the vines when their land was well prepared and the planting rains were steady. The value of the vouchers was calculated based on the basis of vine production cost, vine price in the free market and the government price. The value of a voucher was slightly above the government price and production cost.

3. RESULTS AND DISCUSSION

A voucher scheme was introduced to speed up distribution of OFSP planting material so that it would reach many Malawians in a short period of time. The objectives of using vouchers were (1) to easily monitor the distribution of OFSP vines, (2) to assist vulnerable people and poor families in getting benefit from the bio-fortified OFSP crop, and (3) to guarantee multipliers a market. In the 2010/2011 rainy season, because of the voucher scheme, 10,869

households (HH) received OFSP planting materials and grew OFSP. In the 2011/2012 rainy season, the numbers increased to 23,935 HH (220%) (Table 3). These beneficiaries were carefully selected by the IPs. Additionally, the beneficiaries were trained on OFSP crop production and multiplication, pests and diseases, and postharvest handling and processing. Most of beneficiaries became multipliers because they too wanted to earn some money from selling the OFSP vines as their neighbor did (Table 4). From 4 kg of vine cuttings, a beneficiary could plant an area of 67.5 m². From this, they, then, multiplied more OFSP vines and expanded the area of planting the OFSP for root and vine production. According to the baseline survey done in November–December 2010 (CIP 2011), average land utilization by each HH was 1.20 ha; 97.1% of household land were used for farming.

Year 1 of the project focused on setting up strategies and building capacity. There were only 1,000 beneficiaries targeted in the project proposal of this first year. No OFSP planting materials were available. The seed systems were unclear. A number of priorities were set up, including building up the 1-2-3 seed systems, capacity building on trainings, strengthening the capacity of Bvumbwe Research Station, sensitization, selection of multipliers, conducting awareness campaign on the importance of OFSP, and selection of beneficiaries to receive the OFSP planting material. By September 2010, 7,097 HH beneficiaries were interested in and registered to grow OFSP in the rainy season of 2010/2011. Eventually 10,968 beneficiaries received subsidized vouchers and all of them planted the OFSP (i.e., an increase of 3,871 HH above the initial number registered). The increasing numbers were due to an awareness creation campaign conducted in October 2010. In the rainy season of 2011/2012, this number was tremendously increased (Table 3 and Fig 4). Furthermore, multipliers were able to sell the OFSP planting materials to various organizations through the non-voucher scheme, and this contributed to the increase of the total number of households growing OFSP in the 2011/2012 rainy season. The increasing number of beneficiaries could be evidence of high adoption rate on OFSP in Malawi. Farmers, various government agencies and NGOs were willing to buy the OFSP vines from the existing OFSP multipliers. Figure 4 is illustrating this evidence clearly.

High stakeholder participation in the project generated high needs for training. In the beginning, we focused only on seed multiplication. Later, we included postharvest handling and OFSP processing. The diffusion of information was also broadened. This was done through radio programs, farmer-to-farmer talk, awareness campaign, and brochures. It resulted in more organizations wanting to join the project and implementing the OFSP program in Malawi (Fig 5). Thus, an increase in the numbers of DVMs and districts also occurred. For instance, the initial number of districts was 4 and is now 15 with a total of 146 DVMs (Table 2). The impact of larger numbers of DVMs and IPs has significantly accelerated progress toward achievement of the project's target to reach 70,000 HH beneficiaries to have grown OFSP. Despite, 89% of the project's target has been achieved just after 2 years of implementing the project. Farmers have been able to generate income from selling their OFSP vines (Table 4). These indicators knowingly contributed to the sustainable seed system effort in Malawi.

Figure 6 reports the increasing numbers and types of training, organizations and farmers, and DVMs as evidence of adoption of OFSP. Many farmers want to be OFSP multipliers as we can see from figure 6. In Year 1 (2009–2010), the graph is increasing sharply. This was due to the effort of IPs to speed up vine production to reach the target by the 2010/2011 rainy season. In Year 2 (2010–2011), the slope is slighter but shows the interest of many farmers to

be multipliers. In Year 3 (2011-2012), the slope rises again. This was due to having more partners who wanted to join the Rooting out Hunger OFSP project (CIP, 2012).

The OFSP processing training module includes the promotion of a small-scale business, and generating incomes from OFSP activities is one of the project's objectives. Participants were given simple bookkeeping skills by the end of the training. Assessment on selling the OFSP products was done by groups of farmers in Zomba, Phalombe, Mzimba, and Kasungu during a number of separate field days. The farmers were successful in selling their products. In Zomba and Phalombe, a number of people have started doing business by selling doughnuts, buns, OFSP juice, and others in the markets. Also, the female farmers' group from Zomba sold some OFSP products to various offices. A high demand was noted for OFSP products (CIP, 2012). This could be an indicative of the need on OFSP planting material increasingly.

4. CONCLUDING REMARKS

The project "Rooting out Hunger in Malawi with Nutritious Orange-Fleshed Sweetpotato" aims to respond to the critical challenges of both seasonality of supply and very low yield. Extending seasonal availability through storage, extending the production season using staggered planting and improved varieties potentially having a high yield and suitable to various agro-ecological zones as well as irrigation are key factors to be addressed. Innovative approaches to improving on-farm vine conservation, scaling-up planting material dissemination, multi-partners with relevant government departments and NGOs, nutrition education and communication materials, training and other capacity building were the tools for the success of reaching the sustainable seed system. Awareness and demand creation campaign on orange-fleshed sweetpotato and its importance for health has played a role to change the behavior of people in the community. In this way, a high demand on the OFSP planting material could be generated. Hence, farmers were willing to buy the OFSP planting material and this could sustain the seed multiplication through the sweetpotato multipliers.

Project activities are now in the 15 districts, more than 50% of 28 districts in Malawi. The project area has scattered in the 22 Extension Planning Areas. The 15 districts are situated in the three regions of Malawi (northern, central, and southern). Through a good partnership and proper project management, there is evidence in acceleration of the OFSP dissemination throughout the country. It means we can reach many Malawians to have grown OFSP. In the long run, it helps reduce the number of children under 5 struggling with VAD.

In the districts of Dedza, Zomba, Phalombe, Mulanje, and Chikhwawa, people have already realized the importance of eating OFSP and to include it in their daily diets. The same is reported from the lead farmers and local leaders came from Mzimba, Kasungu, Dowa, Salima, Lilongwe, and Dedza. Some started selling the products in the market, tea rooms, offices, and so on. The change of behavior from eating nsima (maize) thrice daily to eating OFSP in the daily diet might slowly occur.

Good communications among the IPs was one of the important tools in managing the project. Working in partnership has proved a success in managing the project. Furthermore, results from a number of meetings and sensitizations about the importance of OFSP for the health with local leaders, farmers, and Department of Agricultural Extension Services (DAES) contributed to the increase in numbers of people who became interested in growing OFSP.

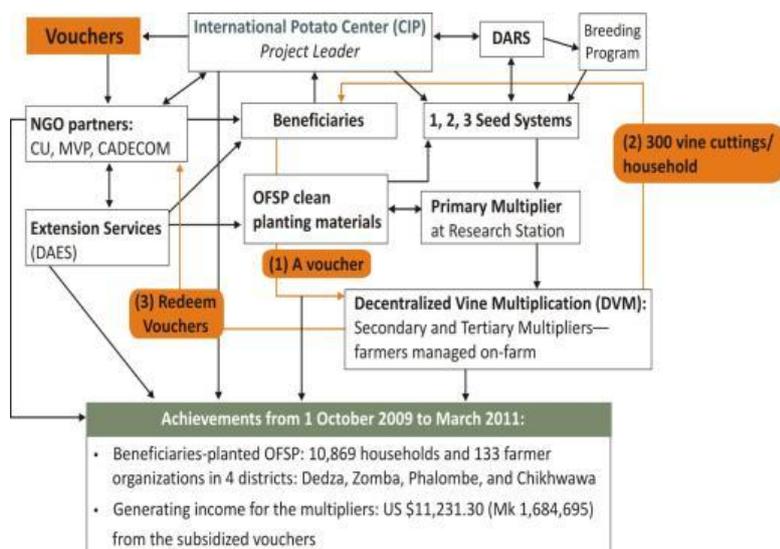


Figure 3. A Scheme showing a Voucher system used by the project “Rooting out Hunger in Malawi”

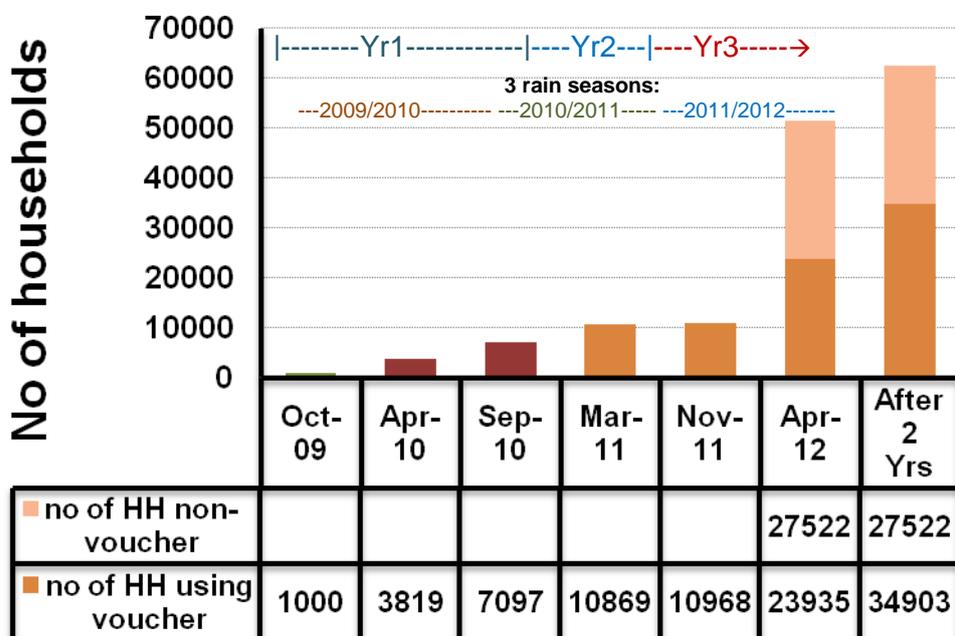


Figure 4. Number of HH beneficiaries projected in the proposal (green graph; ref: project proposal, Oct. 2009). Estimate of HH-based availability of OFSP planting material during the process of establishment of the 1-2-3 seed system (dark red graphs; ref: CIP reports in 2010—i.e., Apr. and Oct. 2010); achievement during the 2010/2011 and 2011/2012 rain seasons (dark orange graphs) (ref: CIP reports in 2011—i.e., Apr. and Nov. 2011); and the total beneficiaries after 2 years of project being implemented, including the numbers from the non-voucher scheme (light orange graphs; to date).

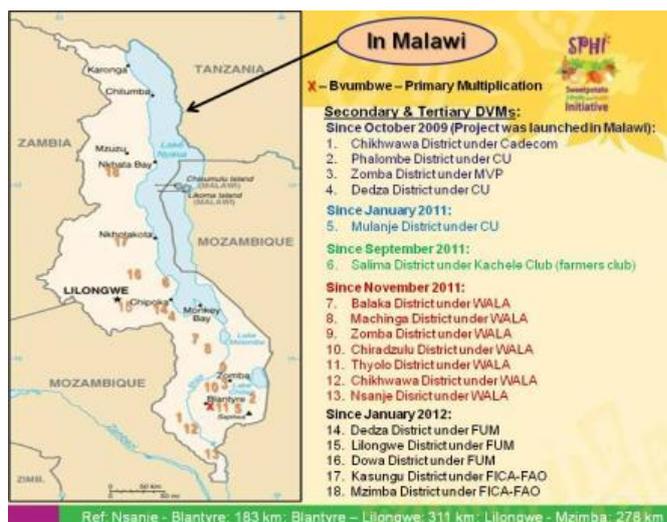


Figure 5. Increasing numbers of multiplication sites and partners over time.

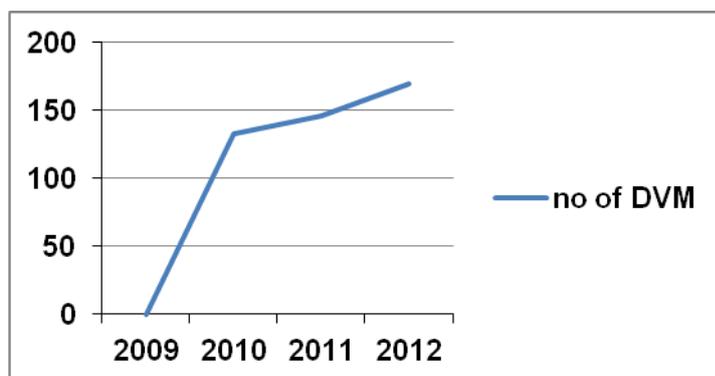


Figure 6. Increased numbers and types of training, organization, and lead farmers and DVMs over time.

Table 1. The Principal Differences between Secondary and Tertiary DVM

Planting	DVM	
	Secondary Vine Multiplier <i>Principal Goal: Vine Production</i>	Tertiary Vine Multiplier <i>Principal Goal: Dual Purpose</i> (roots + vines)
Period	Shortly after the main harvest for storage root production (last month of the rainy season)	Two months after the secondary multiplication, tertiary multipliers start (during the dry season)
Irrigation Method	Is needed Rapid multiplication. Multiplication rate of Zondeni. 1 cutting gives 30 cuttings/year after every 2 months	Is needed Adjusted conventional multiplication. Multiplication rate of Zondeni is 1:3/year and other varieties 1:2
Multiplication Technique	Two or three nodes are needed, and then plant them in a manageable-sized plot (i.e., 10 X 20 cm); planting distance of 10 X 20 cm. A plot size of 10 X 20 cm contains 10,000 plants. For Zondeni, 30,000 vine cuttings 30 cm long can be produced (50 bags of 50-kg volume—each 8 kg) for OFSP production.	Vine cuttings 30 cm long are planted in ridges. Planting distance within plants is 15 cm and between ridges is 75 or 90 cm, depending on the location.
Main Objective	Producing vine cuttings	Producing vine cuttings as well as storage roots for food and nutrition security when facing the hunger season

Table 2. Status of DVM after 3 years

IP/District	2010/2011 Rain Season (Y1)				2011/2012 Rain Season (Y2)				DVM in Y2 Continued in 2012/2013 Rain Season (Y3)*
	% Female at DVM	% Male at DVM	DVM	Area (ha)	% Female at DVM	% Male at DVM	DVM	Area (ha)	DVM/Area (ha)
CU-Dedza	48	52	17	3.4	68	32	26	16	26/16
MVPs-Zomba	47	53	44	0.9	64	36	16	2.5	16/2.5
CU-Phalombe	53	47	39	0.8	66	34	60	4	60/4
CU-Mulanje	-	-	-	-	41	59	32	1	32/1
Cadecom-Chikwawa	0	100	33	0.7	8	92	12	3	12/3
TOTAL	48	52	133	5.8	38	62	146	26.5	146/26.5

*This figure may develop over time, since the DVMs may be affected by the number of households by Nov. 2012. Since September 2011, an additional 23 DVMs from new implementing partners have been built up throughout 15 districts in Malawi. Thus, the total number of DVMs is 169 DVMs (28.04 ha), they are ready to disseminate clean OFSP planting material by this coming rain season of 2012/2013 starting in November 2012.

Table 3. Numbers of Beneficiaries Receiving OFSP Planting Materials through Vouchers during the 2010/2011 and 2011/2012 Rain Season and Being Budgeted in Project Y3

IP	District	2010/2011 Rain Season through Voucher Scheme (Y1)		2011/2012 Rain Season through Voucher Scheme (Y2)		Beneficiaries Planned in the 2012/2013 Rain Season through Voucher Scheme Budgeted from Y3 Project Budget
		No. of HH	Area of Production (ha)	No. of HH	Area of Production (ha)	
CU	Dedza	4,733	32.0	3,000	20.3	3,000
CU	Phalombe	859	5.8	3,235	21.8	3,000
CU	Mulanje	-	-	3,492	23.6	3,000
MVP	Zomba	3,250	21.9	8,000	54	3,000
CADECOM	Chikwawa	2,126	13.7	6,208	41.9	3,000
Total	5	10,968*	73.4	23,935[†]	161.6	15,000

*5,562 females (51%) and 5,406 male (49%) HH; [†] 15,168 females (63%) and 8,767 (37%) male HH.

Table 4. Incomes Generated by the DVMs from Vine Cutting Sales Using Voucher and Non-voucher Schemes after Two Years

Implementing Partners	District	Extension Planning Areas	No. of DVM	Area of DVM (ha)	Total No. of Multipliers	Total HH through Voucher Scheme	Income from Voucher Scheme (US \$)	Income from Non-voucher Scheme (US \$)	Total Income (US \$)
CU	Dedza	Kanyama, Bembeke, & Chafumbwa	26 ¹	16	823	7,733	7,198.9	366.37	7,565.3
	Phalombe	Waruma, Naminjiwa, & Nkhulambe	60 ²	4	60	4,094	3,811.2	3,778.67	7,589.9
	Mulanje	Thuchila, Mulanje Boma, & Milonde	32 ²	1	32	3,492	3,250.8	-	3,250.8
MVP	Zomba	Thondwe	16 ¹	2.5	310	11,250	10,472.97	19,475.68	29,948.7
CADECOM	Chikhwawa	Mbewe, Mitole, & Livunzu	12 ²	3	12	8,334	7,780.62	2,102.10	9,853
Total	5	14	146	26.5	2,132	34,903	32,514.49	25,722.82³	58,237.31

¹Group of farmers; ²individual farmers; ³Equal to 27,522 households (HH), in total = 62,425 HH have grown OFSP after 2 years of project implementation (note: price of each bundle was 93.36 cents).

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