

Strengthening The Sweetpotato Seed System: Planting Materials Retention, Sharing and Loss in Mass Vine Dissemination in Western Kenya

Review Article

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Abstract

To meet the increasing demand for bio-fortified crops, research centers and organizations have been working hard to create access to improved seed by establishing seed multiplication sites and bulking centers. However, maintaining seed supply to meet rising demand particularly for vegetatively propagated crops is challenging. Mass seed dissemination approach is used by projects to reach farmers with seed/vines of improved crop varieties at community level. We conducted a study on sweet potato value chain in western Kenya region to track planting materials once farmers leave the mass vine dissemination centers. Baseline data was collected in August 2016 while endline data was collected in August 2018. Multi-stage sampling was used to draw survey participant. Baseline involved 814 households from 7 randomly selected wards while endline involved 380 household supported by the Accelerated Value Chain Development (AVCD) Program-Sweet potato component in counties of HomaBay, Bungoma, Busia and Migori.

Results: Nearly all (96%) of the sampled households planted the vines received during mass vine dissemination. Of the 200 cuttings provided to each household, an average of 31% were lost. The loss was mainly from drying up of vines for those who had not prepared land prior to dissemination. Notably, 13% of those who received vines shared with their neighbors, friends, and relatives. For those who shared, a proportion of 25%, or 50 vines, were given out. Overall, 80% of households planted on mounds and 31% intercropped. Regarding condition of the plots, 66% had well maintained plots, 20% were fair while 10% had withered crop. The 2018 endline survey for the AVCD sweetpotato value chain revealed that 13% of households still had vines received in 2016, while 27% and 52% had vines received in 2017 and 2018 respectively. Major vine conservation methods were leaving a portion of un-harvested plot (38%) and staggered plantings (29%). The results show that mass vine dissemination is effective in reaching many people at a go. However, a substantive loss of planting materials prior to planting could be minimized by providing timely information prior to dissemination. OFSP diffusion after dissemination occurs through informal sharing networks. Additionally, successive mass dissemination leads to a higher retention of vines. Training /messages highlighting improved vine conservation can minimize losses and transfer of pests and diseases as planting material is recycled over seasons.

Keywords: Dissemination; Sweetpotato; Diffusion; Retention; Vines

Background

Sweetpotato is increasingly gaining popularity as food security crop in Sub Saharan Africa because of its low cost of production, does not require intensive care and has flexibility in planting, short cropping season and does well in a range of Agro-ecological zones. Globally sweetpotato is considered 6th most important food crop [1]. To increase the benefits of this important crop sweetpotato breeders have developed varieties that are nutrient dense, high yielding and tolerant to pest, diseases and drought. Specifically, Orange fleshed sweetpotato varieties have been developed to address vitamin A deficiency and to

improve small holder farmers income from sale of surplus production [2-5]. Extensive evidence has shown that orange-fleshed sweetpotato (OFSP) varieties effectively reduce vitamin A deficiency (VAD) in women and young children [4-11]. Several varieties of orange fleshed sweetpotato that are disease resistant, high yielding, climate friendly and more nutrient rich have been introduced and availed for farmers. Awareness level of the crop has increased significantly in addition to the need for healthy diets which has contributed to increase in demand for OFSP vine by small holder farmers. Decentralized vine multiplication (DVM) approach has been adopted by many



sweetpotato projects which create access to new improved varieties of OFSP by bulking up vines and disseminate/se to communities to meet the increasing demand [12,13]. However access to OFSP vines remains a big constraint to adoption of this value chain [14,15]. Seasonal variability affects the quantities and quality of planting material available at onset of rains [14]. Maintaining vine supply through seasons remains challenging, not all vine multipliers expand at same pace. Consequently, mass vine dissemination approach has been used to reach farmers with large quantities of vines. Project mobilized farmers to converge at a central place where they would be sensitized on nutrition and sweetpotato Good Agronomic practices (GAP) before receiving a bundle of vines. The AVCD -OFSP value chain used mass vine dissemination through its 3 years period lifetime to enhance adoption of new sweetpotato varieties.

The objective of this study was to explore the effectiveness of mass vine dissemination approach in western Kenya to draw lessons that would help strengthen the sweetpotato seed system. This was done by checking on how farmers utilized vine cuttings during mass vine dissemination. This study therefore aimed to; find out what happens to sweetpotato vines received during mass vine dissemination, proportion of cuttings received that were planted, to find out how farmers planted the received vines, and how farmers retain, and conserve planting materials received through mass vine dissemination.

Methods

A multi-stage cluster sampling was used to arrive at the household to participate in the study. The AVCD-sweetpotato Value chain was implemented in 23 wards spread across 4 counties (Homabay 7, Migori, 4, Bungoma 7 and Busia 5). The first stage involved sampling of the wards followed by sampling of Community Units (CU) in each ward at the last stage was sampling of the villages in the community unit. A community Unit has 10 villages, and each village is headed by CHV overseeing 100 households. In the first Mass vine dissemination AVCD Sweetpotato component disseminated vines in 23 wards at 69 centers (mostly health facilities) reaching 8,447 households. Out of the 23 wards 7 wards were randomly selected. Two community units were randomly selected from each ward making total of 14 CUs. One CU from Homa Bay from county did submit the completed checklist due to transfer of in-charge-Community Health Assistant (CHA), 13 community units submitted completed observation checklist. All CHVs from the selected villages went to respective villages to observe plots of households who had received vines from the project. A total of 814 households were surveyed. The questionnaire had an observation section on status of the plot, source of vines, how the vines were planted, counting number of cuttings available on the ground and checking if the vines were intercropped. Baseline data was collected between 13th and 25th September 2017 while endline survey data on the same participants was collected during AVCD August 2018 end-line household survey. In this short field report where we present findings. Data was cleaned and analyzed using SPSS vs16.

Results and Discussion

What Happened to the Vines Received at Mass Vine Dissemination

Sweetpotato is an important crop in western Kenya, 80% of each household cultivate the crop each year. Baseline results reveal that 96% of the households who received vines through mass vine dissemination planted what they received and so were the endline results where 92% of the sampled respondents confirmed to have planted all that was received. This shows the importance farmers in western Kenya place on sweetpotato crop and value the planting materials received. Lack of disease and pest free planting materials (vines) was the main constraint to commercial sweetpotato production of Kenya and farmers seemed to be searching for varieties that has both nutritional value and food security attributes

that OFSP has [16]. For those who did not, cited vines drying up of vines due to delay in preparing plots before for planting. Overall, the results confirm that mass vine dissemination could be effective in reaching high numbers in shortest time similar to experience in Nepal that also confirmed that seed distribution was an effective way to address food insecurity [17]. The study further showed that farmers were comfortable planting seed for food crop they are well familiar with at 97% compared to new crops which they have to experiment in small plots. Another study by [18] also confirmed that mass vine dissemination through agricultural activities schools, CBOs and NGOs was effective in the development of OFSP varieties in western Kenya.

What Proportion of What was Received was Planted

Even though 96% planted the cuttings received, not all quantity received was planted, the mean number of cuttings observed on the ground was 138 cuttings per household out of the 200 cuttings received. An average of 31% of vines were lost per household. The loss was mainly from drying up of vines for those who had not prepared land prior to dissemination.

Sharing of Vines

Notably, 13% of those who received vines shared with their neighbors, friends and relatives which was consistent with 12.6% who did not participate in the mass vine dissemination but borrowed material from their neighbors who had participated in vine dissemination. During endline survey, 5% of households that had cultivated OFSP acquired planting materials by sharing from friends and relatives. For those who shared, a proportion of 25% was given out. Endline survey results showed that 88.3% received OFSP vines from the project through mass vine dissemination with only 6.7% of the sample that cultivated OFSP acquiring materials from DVM. The remaining acquired planting materials through sharing with a neighbor within the village. This shows that farmers were comfortable waiting for free vines rather than purchasing from DVM. Endline results show that 29.1% knew where to find DVM which was not the case at baseline. Despite the farmers knowing existence of the vine multipliers (DVM) less than 10% sourced materials from them. Sweetpotato planting material (vines) are traditionally shared through informal networks and this study confirmed that diffusion starts right after mass vine dissemination. Sharing of vines among farmers could be a way of conserving planting material from season to season which enhance conservation of biodiversity including the OFSP varieties, which provides an avenue for continued presence of OFSP even in the absence of project-based support. However, this approach allows for spread of pest and diseases from one farm to the other which reduces the yield. A study by [19] revealed that the main constrained in sweetpotato production in Kenya as pest and pest free planting material. More DVM should be established to allow multiplication of disease-free planting materials for farmers to benefit from the value chain.

Method of planting the cuttings received: At baseline, 80% of households planted on mounds, 14.5% planted on ridges while 4% planted on flat bed while at endline, 79% of the respondents planted on mounds and additional 20% planted on ridges. Planting sweetpotato on ridges promotes easy mechanization. Labor used to make ridges is less compared to making mounds, however most people have still not embraced the practice. Traditionally, sweetpotato is planted on mounds because they plant on small parcel of land. With promotion of commercialization of sweetpotato, farmers need to understand the cost effectiveness of using ridges as compared to mounds as it relates to labor for various activities [Table 1]. A study by [20] recommends ridging over mounding for easier mechanization and for better shape of the roots. This shows that it takes a while to change behavior and in this case three years were not enough to influence [Table 2]. Regarding the status of the plot, 65% had good, weeded plots, 20% had weeded while 10% had withered crops.



Table 1: The Method of planting sweetpotato among sampled respondents.

Method of Planting	Freq= 786	Percentage
Mounds	631	80.1
Ridges	114	14.5
Flat bed	35	4.5
Missing	6	0.9

Table 2: Status of sweetpotato plot of sweetpotato crop.

Status of Sweetpotato Plot	Freq	Percentage
Good, weeded plants	532	66
Fair plot/Not weeded	160	20
Planted but the crop weathered	80	10
Received vines but no crop on the ground	32	4
Total	n=804	100

Vine Retention and Conservation: Endling survey results showed that 13% of the sample had vines received in 2016, about 27.4% still had vines received in 2017 while 52% still had vines received April 2018. Major vine conservation methods were leaving a portion of unharvested plot (38%) and staggered plantings (29%), 14.7% preserved their vines by keeping them in a small plot near the house where they can easily water them, 10.5% planted vines in the low land and burred roots. Information in Table 3 show farmers understanding the need to conserve vines however this works for small plots that is for subsistence, it might be difficult to get vines that would be enough for large commercial acreage through these avenues of vine conservation. In addition, the vine retention can also be a point of pest and disease

spread where farmers infected planting material from one plot to the other and from one season to the other as found. A study by Mbewe et al. [21] non incidence distribution of sweetpotato viruses and their implication on sweetpotato seed system in Malawi confirm this addition, farmers will need knowledge and information on the yield per Hectare of sprouted roots vine vs vine from multiplication plots. Thus, during the project implementation period, sufficient experience has been gathered that support the need to diversify methods of vine conservation, including Triple S technology, where roots are used to sprout new planting materials [22,23].

Table 3: How Household conserve sweetpotato vines.

Method of Vine Conservation	Freq n=95	Percent
Plant vines in fenced lowlands area or swamp	10	10.53
Keep vines in a small plot near the house and water them	14	14.74
Keep vines under shade and do not water	11	11.58
Keep the vines under shade of other crops and water them	9	9.47
Do not harvest part of the existing field	36	37.89
Burred roots	10	10.53
Plant near bathroom	2	2.11
Other	3	3.16

Conclusion

The mass vine dissemination approach in Western Kenya Proved effective in distributing orange-fleshed sweetpotato (OFSP) planting materials to a large number of households swiftly. The high planting rate of received vines (96%) underscores the importance farmers place on sweetpotato as a staple crop and their appreciation for receiving disease-resistant, high-yielding, and nutrient-rich OFSP varieties. However, the study revealed significant losses (31%) of planting materials due to delays in land preparation prior to dissemination, highlighting a critical area for improvement. Informal sharing networks play a crucial role in the diffusion of OFSP vines, with a notable proportion of households sharing received vines with neighbors and relatives. Despite knowing the existence of decentralized vine multipliers (DVMs), most farmers Preferred waiting for free vines from mass dissemination rather than purchasing them, suggesting the need for better engagement with and support for DVMs.

Retention and conservation of vines are essential for sustaining the OFSP value chain. While methods such as staggered planting and leaving a portion of the plot unharvested are commonly practiced, these methods are limited in scale and may contribute to the spread of pests and diseases. Enhanced conservation techniques and improved training are necessary to maintain vine health and availability. While mass vine dissemination is an effective way to reach many farmers with improved sweetpotato vines, pre-dissemination preparation should be properly done to provide farmers with timely information and training on land preparation before vine dissemination to reduce the loss of planting materials. Secondly increased awareness and accessibility of DVMs to farmers, possibly through subsidized or incentivized programs to encourage the purchase of healthy planting materials. There is need to improved vine conservation techniques by promote advanced vine conservation methods, to benefit commercial farmers, as the current practices were only able to conserve few vines not enough for the season. Training farmers on effective and scalable



vine conservation methods to ensure sufficient supply for larger commercial acreages alongside with training materials highlighting best practices for vine conservation, pest and disease management, and the benefits of different planting methods (e.g., ridges vs. mounds) would enhance adoption of these OFSP. By addressing these key areas, the sweetpotato seed system in Western Kenya can be strengthened, ensuring the sustained availability and quality of OFSP vines, enhancing food security, and improving the livelihoods of smallholder farmers.

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