

**Sweetpotato for Profit and Health Initiative (SPHI)**

**Sweetpotato Seed System and crop management Community of Practice (SSS-CoP)**

**Summary of online Discussion**

**TOPIC 15: Potential use of barrier crops and isolation distances in QDS systems**

**Lead discussant: Robert Mwanga, International Potato Center (CIP) - Rwanda**

**Introduction**

Barrier crops and isolation distances are important factors in protecting crops against insects and diseases and are therefore important in sweetpotato quality declared seed (QDS) systems. For example, it is advisable, though not always possible, to try to separate new sweetpotato fields from recently harvested or existing fields, particularly in environments where weevils and viruses are a problem. A barrier crop between old and new plants or a gap of >120 m can help prevent weevils from reaching the new crop.

Using a barrier crop such as cassava, maize, banana or sorghum in strips of at least 3-5 m wide between existing sweetpotato fields and newly planted sweetpotato field, can reduce the number of weevils migrating to the new crop. In addition, several kinds of crops like wheat, maize, sorghum and pearl millet have been tried as barrier crops in crops like chilli, pepper, potato, French beans, soybean, lupines etc., and found effective in reducing non-persistent aphid-borne viruses under field conditions.

Despite the potential of isolation distances and barrier crops in controlling pests and diseases in sweetpotato, their application is still limited. Use of isolation distances face land-related constraints. Increasing population is putting pressure on land suitable for cultivation hence most farmers might not have enough land to allow sufficient isolation. On the other hand, use of barrier crops is not well studied. Barrier crops are also more effective in protecting crops from the stylet-borne/non-persistent viruses therefore leaving them exposed to persistent viruses. The two strategies have been incorporated in the standards for production of sweetpotato seed in most countries. As countries move towards approval and implementation of these standards we need to provide more information on the following:

1. What would be the most appropriate isolation distances in sweetpotato quality declared seed (QDS) systems to sufficiently limit spread of pests and diseases?
2. Which crops are suitable for use as barrier crops in sweetpotato seed production?
3. What management practices would a small farmer (on average in SSA, less than 2 ha) interested in engaging in commercial sweetpotato seed production (QDS system) need to combine with barrier crops and isolation distances to be competitive?

The Sweetpotato Seed Systems and Crop Management Community of Practice (SSS-CoP) held an online discussion on February 13 – March 4, 2018 to address the above questions. The summary of the one-month discussion led by Dr. Robert Mwanga of CIP – Uganda is captured below.

**Why isolation distances and barrier crops?**

Isolation distances and barrier crops are intended to minimize spread of pests and diseases from infected to clean fields. These are cultural control strategies that reduce probability of attack or chances of invasion by making the crop unreachable by the pest in space and time.  Isolation distances take advantage of maximum flight distances for pathogen vectors whereas barrier crops impede movement of the vectors. Successful implementation of these strategies requires good knowledge on pest biology, ecology, phenology and timing.

**Recommendations and experiences in implementing isolation distances and barrier crops in different countries**

1. *Uganda*

In Uganda, the minimum field isolation distance with suitable barrier crop is 30 meters for QDS, and 70 metres for certified 1 and 2. This is a challenge especially in the central region because of land limitation. This has led to piloting of mini-screen houses and net tunnels to maintain sources of clean planting material. Barrier crops such as maize are recommended but can potentially host polyphagous pests such army worms which could also affect sweetpotato. In 2017, there was a regional outbreak of army worms in Uganda and Kenya leading to destruction of several crops including sweetpotato.

1. *Tanzania*

In Tanzania, an isolation distance of 20 metres is recommended for QDS, certified 1 and certified 2 classes and 50 metres for basic seed. The isolation distances for certified 1, certified 2 and basic seed classes are official having been approved in January 2017 by the government under the amended seed regulations act. QDS guidelines are awaiting ministerial approval. Several farmer-multipliers have already been trained on good practices for production of quality planting material including isolation distances. However, implementation is still a challenge due to small land sizes and unwillingness to change practices.

1. *Nigeria*

Nigeria has 30 m recommendation for certified 1 and 2, 60 for foundation seed and 100 m for breeder’s seed. This is incorporated in the draft standards for production of quality seed. The major limitation noted during development of the standards was that farmers might not be able to maintain sufficient isolation distances due to the land tenure system which is characterized by fragmented farm land and increasing pressure on available land. In addition, most farmers practice mixed cropping and some of the crops planted with sweetpotato might harbor disease vectors.

1. *Ethiopia*

The Ethiopian standards for production of quality declared seed for sweetpotato recommends an isolation distance of 5 meters with barrier crops and 10 meters without barrier crops.  Maize and Napier grass are the recommended barrier crops. This recommendation is targeted at virus control and excludes weevils. Experience has shown that large scale QDS multipliers (5 ha and more) can successfully implement the minimum isolation distance requirement.  However, small scale QDS multipliers find it difficult adhering to the recommendation. It is especially a challenge for decentralized vine multipliers located in sweetpotato producing villages. Large scale multipliers who can fulfill this requirement are often located very far from small scale farmers.

1. *Rwanda*

According to sweetpotato seed standards in Rwanda, recommended isolation distances are: 5 meters for QDS, 10 meters for certified 1 & 2 and then 20 meters for pre- & basic seed. Recommended barrier crops are maize, beans and soy beans in marshlands and banana, maize and cassava on the hillside. Implementation of these recommendations is however constrained by land shortage, farming system, government policies on crop prioritization and farmers knowledge. According to the National Institute of Statistic of Rwanda (NISR, 2016), the average land size in Rwanda is 0.3ha. With this, it is almost impossible for farmers to isolate their fields from others of the same crops. According to the government’s Crop Intensification Programme, all marshlands belong to local governments. The local governments in liaison with farmers decide on the crop to grow and in most cases, maize is prioritized with sweetpotato allocated a small portion in a corner of the marshland. On the hillside, farmers mostly mix sweetpotato with cassava. Sometimes every farmer plants sweetpotato leading to many scattered sweetpotato fields often lacking barrier crops.

**Successful implementation of isolation distances and barrier crops: What to consider?**

To successfully implement use of isolation distances and barrier crops it is important to understand mechanisms which contribute to their effectiveness. For instance, at what stage of growth or height will a barrier crop be effective in limiting vector movement and when should it be planted? Preferences on choice of barrier crop may differ from farmer to farmer due to economic and consumption preferences. In addition, the value of the barrier crop to the farmer may be of great interest. The value of the sweetpotato vines being protected should be high enough to justify use of isolation distances and barrier crops.

The peak demand for sweetpotato planting material is usually at the onset of rains after a long dry season. This implies that planting material is normally irrigated which means that the barrier crop will also be irrigated therefore inflating the operational costs. Cooperation from neighbours is also important. Another crucial factor to be considered while choosing appropriate barrier crop is whether that crop can serve as an alternate host for disease vectors and pathogens. Successful use of barrier crops needs further investigations on efficacy, height of the barrier crop at the time of maximum risk of infection, site location, appropriate crops, and the extent of competition between the barrier and protected crop.

**Conclusion**

Isolation distances and use of barrier crops can reduce spread of pests and diseases. Locating seed beds far away from other sweetpotato plants is a recommendation contained in guidelines for production of quality seed in many countries. However, this should consider vector dynamics including flight and how long they can remain viruliferous.  Spatial and temporal isolation have also been applied in some countries to control viruses especially in potato. For instance, many US states and Canadian provinces have areas designated for seed production only. Louisiana state in the US has a quarantine on sweetpotato seed movement due to weevils. A few regions on the North-eastern part, where the state’s Sweetpotato Research Station is, have been identified as weevil-free and tagged ‘green’. Other regions are tagged ‘pink’. Sweetpotato seed can only move from the ‘green-tag’ regions. In sub-Saharan Africa, decisions on use of isolation distances are influenced by land policies, seed regulations and land tenure.

Barrier crops can complement isolation distances in reducing transmission of pests and diseases. However, farmers need to be trained on selection of barrier crops.  A barrier crop should not be an alternative host for disease pathogens or vector multiplication. Understanding vector biology and ecology can help in selecting appropriate crops to use as barriers. Time of planting should be considered since a barrier crop should be well established before sweetpotato is planted. In addition, to isolation distances and barrier crops farmer-multipliers should continue implementing other cultural practices such as weeding, crop rotation, positive and negative selection etc.

**Summary on the respondents:**

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| --- | --- | --- | --- | --- |
| **Duration** | **No. of contributions** | **No. of unique respondents** | **No. and type of institutions** | **Number of countries** |
| 13/2/2018 – 4/3/2018 | 8 | 7 (6 males and 1 female) | NARIs: 2  CIP: 5 | 6 (Ethiopia, Nigeria, Rwanda Tanzania, Uganda, and Peru) |

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