How can sweetpotato seed standards contribute to scaling up delivery and access to quality planting materials? The Uganda Experience.

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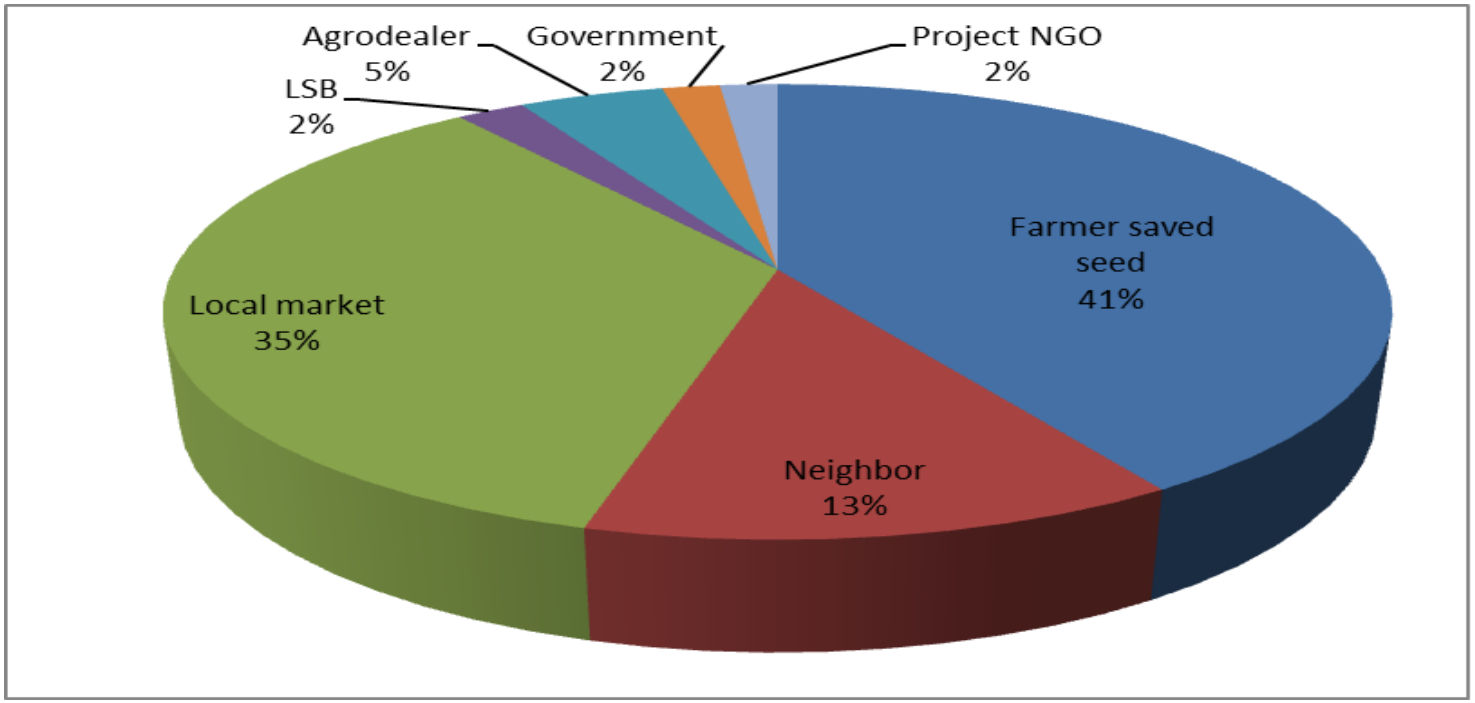
What would be an ideal seed system?

- A sustainable 'seed' system for vegetatively propagated crops should serve four critical roles: (i) provide a timely supply of adequate quantities of planting material for farmers, (ii) provide for development and conservation of varieties, (iii) provide a means for controlling quality of planting material, and (iv) provide planting material at affordable prices.
- The critical need to have planting material at the start of the rains to avoid late or missed planting is sometimes considered more important than quality of the planting material.
- This indicates the importance of finding solutions to the problem of vine conservation through dry periods; and increasing the multiplication rates from 15:1 to rate that are comparable to cereals (200 - 300:1).
- However, there are strategies for sp multiplication with the potential for attaining rates of 90:1. Their management require to understand of how to optimally structure primary multiplication and what mix of secondary multiplication and community based approaches are appropriate.

Background to the Uganda seed sector

- 13% of the planted area is planted with seed from commercial seed companies (formal system)
- ISSD Uganda baseline shows that 89% of the farmers obtain seed from the informal seed system
- The figures for vegetatively propagated crops (e.g. cassava and sweetpotato) are even worse.



Subsistence Vs commercial growing of sweetpotatoes

Sweetpotato seed system

Sweetpotato production and constraints to its seed system

- Sweetpotato is vegetatively propagated where each cropping cycle is started by planting the apical 20-30 cm vine cuttings. Use of root sprouts is also common.
- This allows accumulation of pests (e.g. weevils) and diseases (e.g. SPVD), through each successive generation leading to significant decline in yield.
- Most farmers source planting material from their own fields or purchase from neighbors. Thus, no check on the quality of vines planted.
- Sweetpotato virus disease (SPVD), caused by SPFMV + SPCSV, can cause 50-98% yield loss in susceptible varieties and has been associated with the extinction of once elite varieties. Other pests and diseases have been reported, and they also raise phytosanitary concerns.
- A more sustainable intervention would be to promote a combination of using moderately tolerant varieties and use of good quality (trueness to type, physiologically viable, free from pests/diseases) planting material.

Sweetpotato seed system

Purpose of seed certification and seed classes

- Good quality seed should be described the same way by all stakeholders in value chain, and therefore the need for **standards**.
- Then, the standards are used during **inspection** and **certification** of a seed lot to qualify as a given seed class.
- The purpose of seed certification is to ensure farmers realize the potential yield of sweetpotato (10-12 tons/acre) through timely access to adequate quantities of quality seed.
- This can be guaranteed by use of appropriate standards and protocols during inspection and certification of the different seed classes.
- The current seed classes being considered in Uganda include: Nuclear (Pre-basic) seed, Basic seed, Certified 1 (first generation) seed, Certified 2 (second generation) seed, and Quality declared seed (QDS).

Seed classes

There are a number of seed classification systems. Whatever system is used, standards and guidelines are set by the government. And, the classes of seed recognized for the purpose of seed certification are:

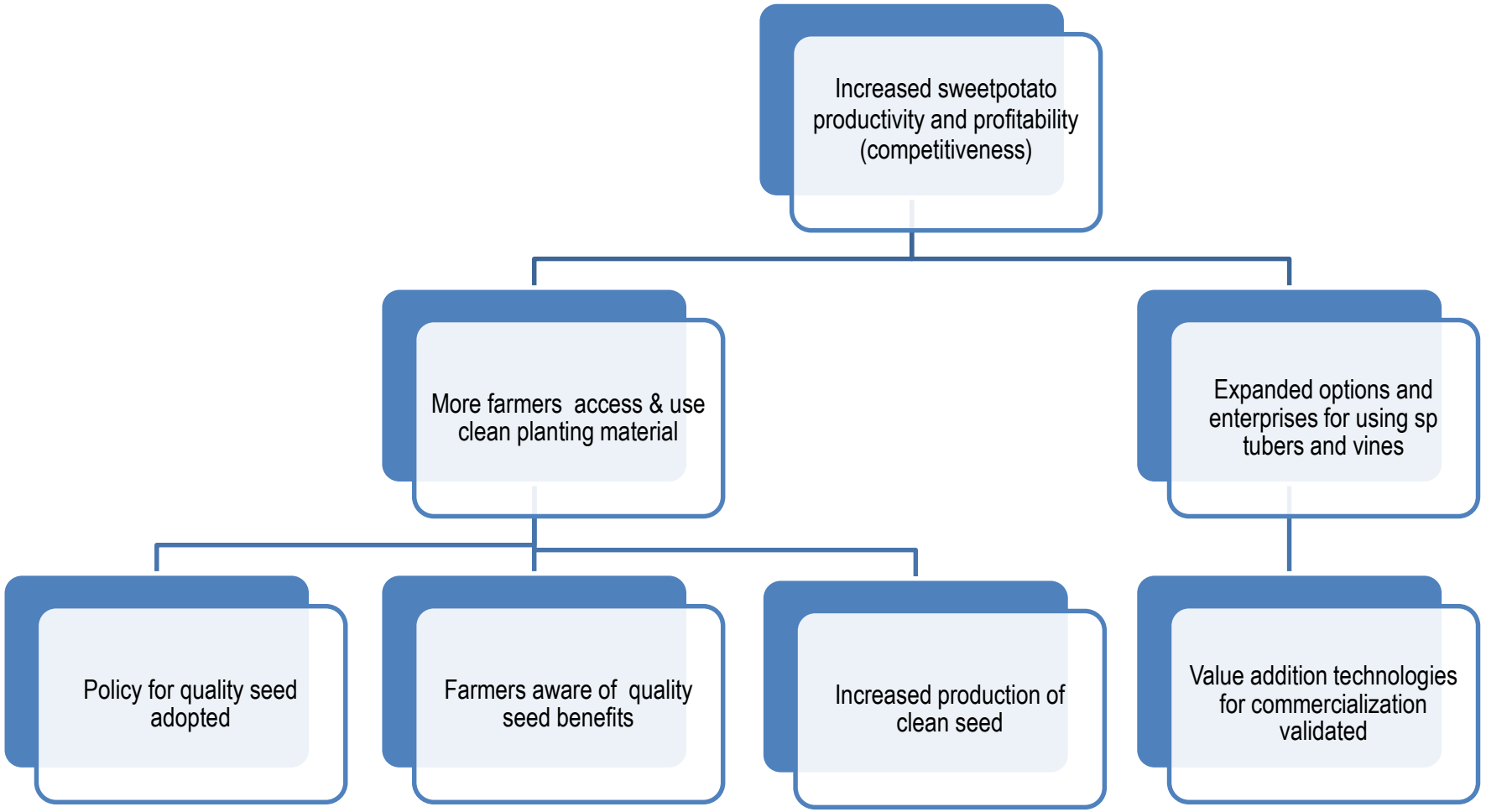
Table 1: Description of proposed sweetpotato seed classes

S/N	Harmonized sweetpotato seed class	Description for sweetpotato seed stage	Labels
1	Nuclear stock seed	Tissue culture plantlets (Laboratory produced)	Violet stripe on white
2	Basic seed	Screenhouse vines (net-protected production)	White
3	Certified seed 1	Isolated field vines (net-protected production)	Blue stripe on white
4	Certified seed 2	Isolated field vines (net-protected production)	Red stripe on white
5	Quality declared seed	Farmer or community field produced vines	Green

Recent Sweetpotato R4D in Uganda

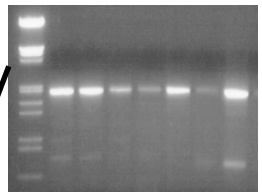
- MAAIF Dept. of Crop Protection (inspection and certification) in collaboration with Makerere University (CAES/MAK), HarvestPlus/ IFPRI, and CIP engaged in developing protocols for sweetpotato planting material (seed) as part of the comprehensive strategy to pluralistic seed sector including vegetatively propagated planting materials.
- The protocols are currently in form of technical guidelines for field inspection and certification of sweetpotato planting material in Uganda.
- The team is also developing inspection instructional materials for sensitizing, training and technically empowering the plant inspectors, seed producers, laboratory operators, and net protected nursery multipliers.
- The guidelines (standards) are primarily based on tolerances levels for visual disease readings, pest incidence varietal mixtures in the seed crop, land use history, source of planting material for the seed crop and laboratory testing in case of referral cases.

A conceptualized impact pathway for promoting the contribution of access to quality sweetpotato planting material



Commercializing micropropagation

Elite vine



Molecular (PCR) indexing for viruses, and Quality control

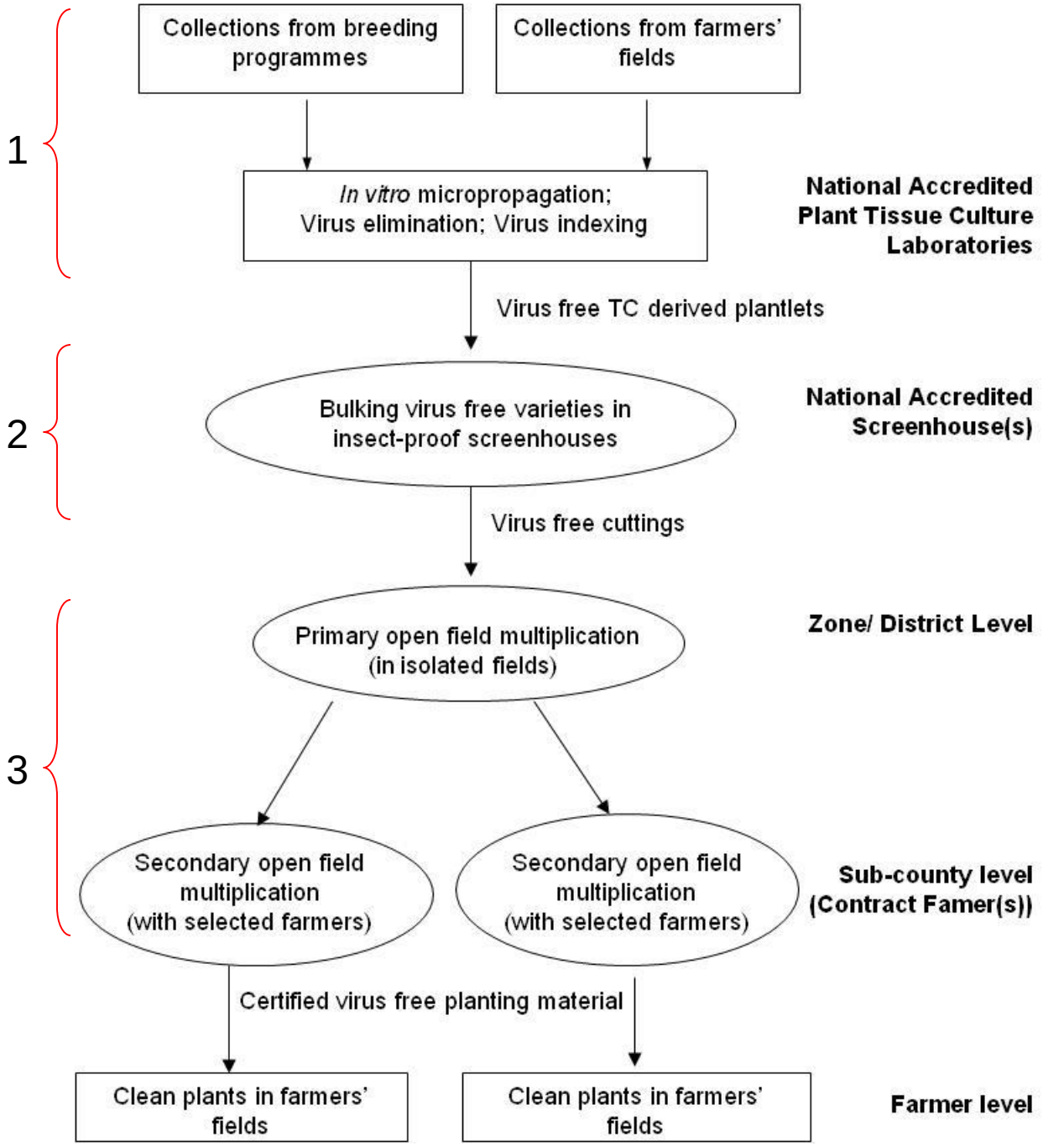
- Cassava
- Potato
- Sweetpotato

The Plant Tissue Culture Process and virus elimination

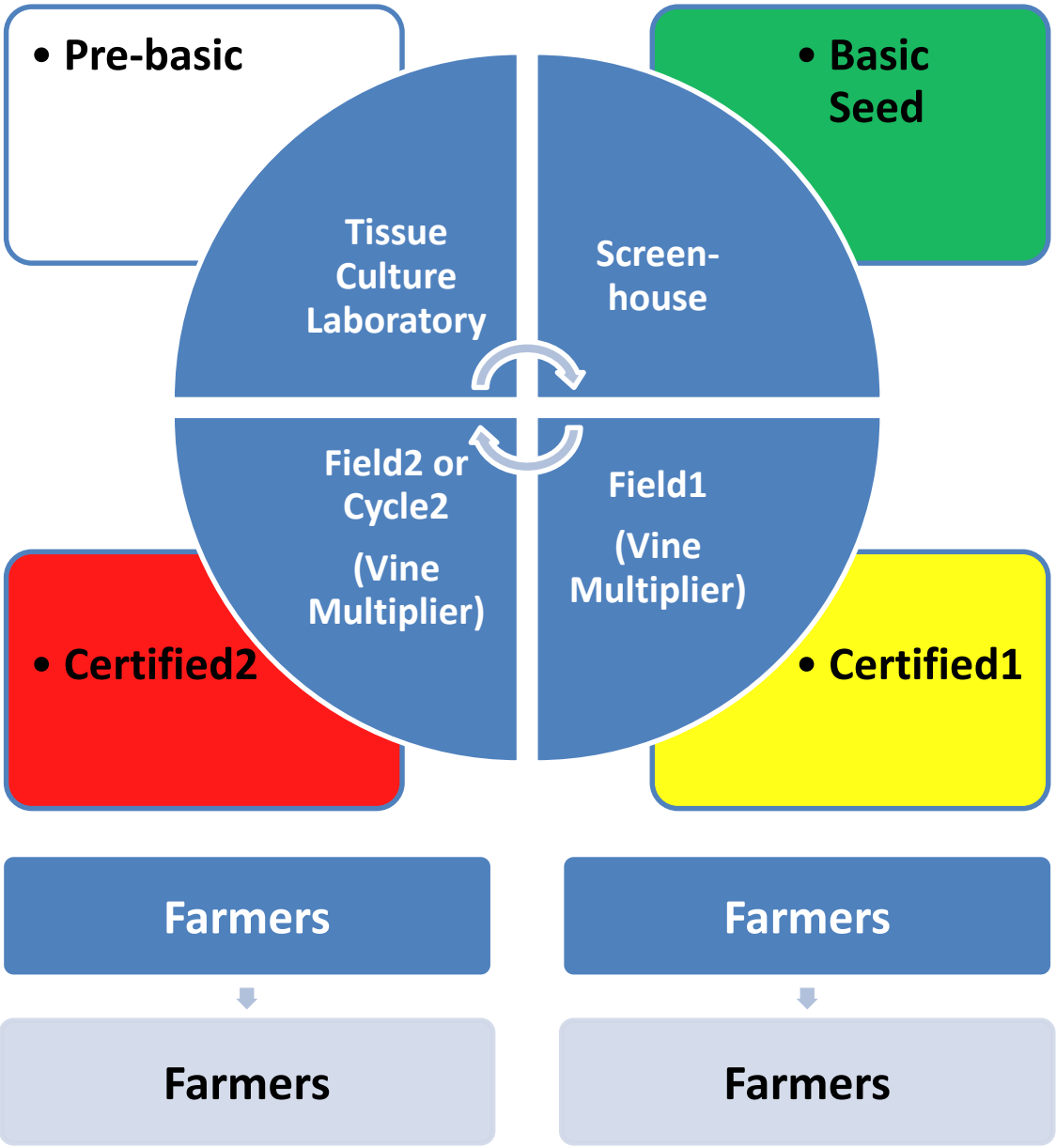
Thousands of plantlets in screenhouse

Sweetpotato in commercial fields

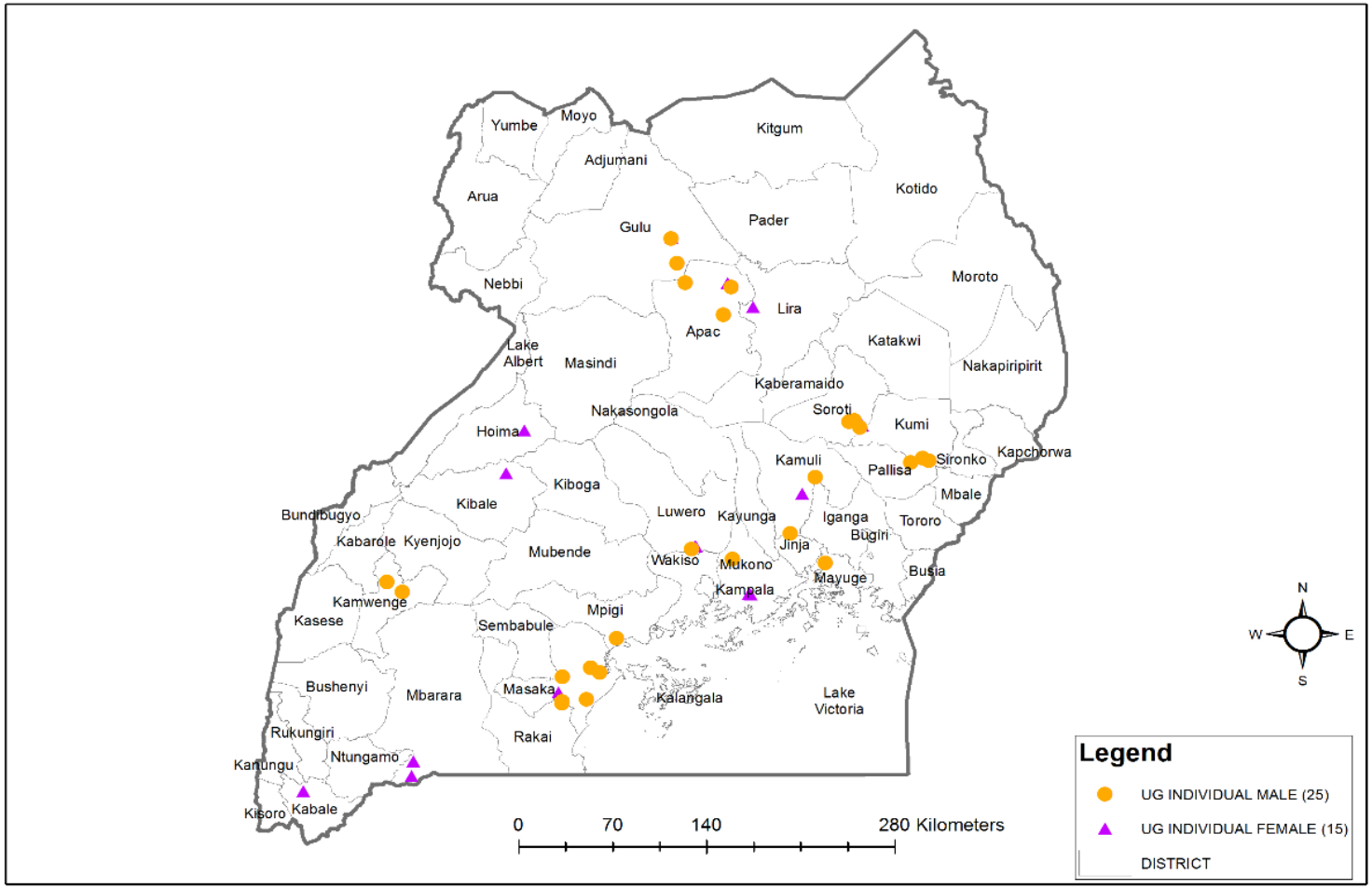
3 – Tier level system for rapid multiplication of quality sweetpotato planting material



Model of Production and Distribution of Quality Sweetpotato Planting Materials in Uganda



UGANDA VINE MULTIPLIERS - 2015



Vine Multipliers established by HarvestPlus with support from USAID

Source: Global Administrative Areas Database, 2015

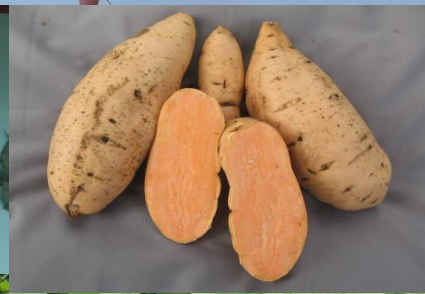
Pilot – Seed Delivery

- A 3-tier production, multiplication and delivery model was piloted in Uganda.
- Level 1 involved selection, virus indexing and in vitro multiplication of elite sweetpotato varieties.
- Level 2 involved rapid screenhouse multiplication and bulking of virus tested vines.
- Level 3 involved primary (and secondary) open field vine multiplication in key sweetpotato producing regions by selected individuals or farmer groups.
- However, for the sustainability of the sweetpotato seed system, there is need to identify policy issues that would ensure sustainability of a model for production and delivery of quality planting material.

Sustainability Issues

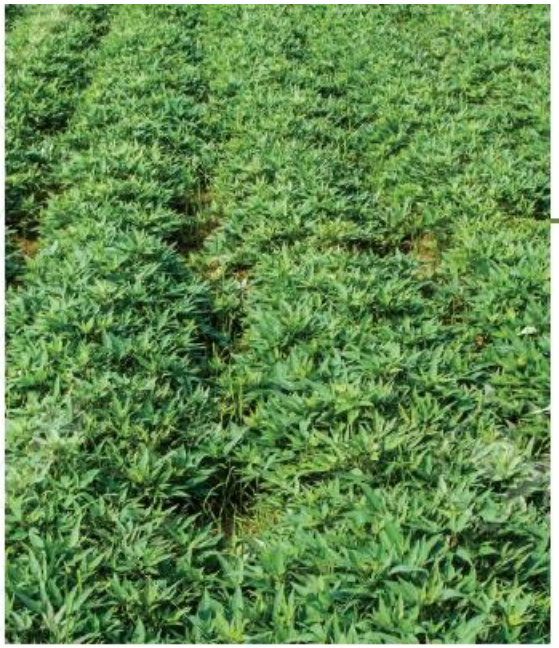
- A study done in 2013 on farmers willingness to pay for virus free sweetpotato vines in central Uganda indicated a market of UGShs 36.9 billion (US$ 14.8 million) per year. The potential supply volume of virus-free vines was estimated at 4.3 million bags per year each at UGShs 10,000 per bag.
- Our previous on-station studies at Makerere University showed over 80% yield increase when using virus-free planting material vis à vis farmer saved vines. Similarly, in China, the use of virus-free sweetpotato planting materials restored varieties' original excellent yield (Fuglie et al., 1999).
- An inspection process that can i) provide assurance to farmers and protection from unscrupulous seed dealers, ii) reduce the risk of spread of pests and diseases, iii) provide recognition to multipliers
- A sustained campaign about the health benefits of eating and using sweetpotato.
- Varieties with the market demanded qualities.

Some quality attributes as required by consumers



RELEASED OFSP VARIETIES AND THEIR ATTRIBUTES

Variety	Year released	Root yield (t/ha)		Pest/disease resistance		
		Station	Farm	SPW	SPVD	Alternaria
Ejumula	2004	19	15	S	S	M
Kakamega	2004	15	12	S	M	M
NASPOT 7	2007	25	12	S	M	M
NASPOT 8	2007	20	16	S	M	M
NASPOT 9 (Vita)	2007	20	13	S	M	M
NASPOT 10 (Kabode)	2007	18	12	S	M	M
NASPOT 12 O	2013	25	16	S	M	R
NASPOT 13 O	2013	38	11	S	M	R



TECHNICAL GUIDELINES

Recommended Practices **MAY 2016**

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Mukasa S.B., Namanda S., Musoke C., Magezi S., Kyalo G., Ssemakula G., Ball A-M., Kasharu, Kyamanywa S. and Tumuboine E. 2016

Technical guidelines for inspection and certification of sweetpotato planting material in Uganda: Recommended Practices.

A Guide for Field Inspection and Certification of sweetpotato Planting Material in Uganda

Table 6: Field standards for sweetpotato seed certification tolerance levels

Parameters	Seed classes				
	Nuclear	Basic	C 1	C 2	QDS
Variety purity and agronomy					
Varietal purity (%)	100	100	99	99	98
Field isolation distance (m) (with suitable barrier crop) (Minimum)*	100	70	50	50	30
Crop rotation or furrow (Min. years)	2	2	1.5	1.5	1
Maximum permitted ratoons	5	3	2	2	1
Recommended method of planting	Lab	Screen-house	Flatbeds/ Ridges	Flatbeds/ Ridges	Ridges/ Mounds
Diseases of sweetpotato					
SPVD symptoms (Max. %)#	0	0	2	3	5
SPVD causing viruses (Annex 6) – lab test is required (Max. %)##	0	0	2	3	5
Fungal infections e.g. black rot, Alternaria blight (Max %)	0	0	1	2	3
Pests of sweetpotato					
Nematodes (affected plants) (Max. %)	-	1	1	2	3
Sweetpotato butterfly/ caterpillars, counts per 100 plants (Max. %)	-	2	5	5	10
Sweetpotato weevil (Max %)	0	2	3	5	10
Mites/thrips (Maximum %)	2	3	5	5	5
Aphids/Whiteflies (adults per 100 plants) (Max %)	0	5	5	5	5
Harvesting and packaging					
Length of cutting (cm) (Min.)	15	15	20	20	25
Number of nodes/cutting (Min.)	3	3	5	5	5
Harvesting age of new crop (months)**	2-3	2-3	2-3	2-3	2-3
Harvesting age of ratoon crop (months)**	1-3	1-3	1-3	1-3	1-3
Inspection and certification					
Number of inspections/ crop (Min.)	1	1	2	2	2
Maximum permitted ratoons	5	3	2	2	1
Validity of certification (Months)	12	12	6	6	6
Labelling requirements	Plant	Bed	Field	Field	Field

Experiences and lessons learnt

- Informal ‘seed’ systems predominate, with the main source of planting material being farmer-saved ‘seed’ from old fields. This has a risk of spreading diseases despite farmers’ efforts to select healthy-looking vines.
- There is clear evidence of a willingness to pay for vines. Effective farmer demand for purchased vines will depend principally on the level of virus pressure, rain patterns, availability of irrigation or wetlands, and the existence of a significant demand for roots or specialty varieties.
- It will also be important to distinguish between developing ‘seed’ systems for farmers increasingly linked to markets and for those who remain largely subsistence farmers.
- For long-term economically sustainable ‘seed’ systems, there is need to involve the private sector, including farmers located in wetlands or prepared to irrigate, and private laboratories taking advantage of tissue culture, virus therapy, and diagnostic technologies.

Issues for Discussion

- **Seed standards**
  - What standards are currently appropriate at each level; need for more validation of the standards.
- **Capacity (technical)**
  - Who should do the inspection (knowledge)
  - When are visual observations or lab tests appropriate during inspection
- **Socio-economic aspects**
  - Will over-regulation and bureaucracy kill off emerging commercial enterprises?
  - What level of quality are farmers willing to pay for?
  - Who pays for inspection

Source of funding:

- Development partners, MAAIF, Farmer Cooperatives

Acknowledgement

- Clark C.A., Davis J.A., Abad J.A., Cuellar W.J., Fuentes S., Kreuze J.F., Gibson R.W., **Mukasa S.B.**, Tugume A.K., Tairo F.D. and Valkonen J.P.T. 2012. Sweetpotato Viruses: 15 years of progress on understanding and managing complex diseases. *Plant Disease* 96 (2), 168-185.