

KENYA ACCELERATED VALUE CHAIN DEVELOPMENT PROGRAM (AVCD)

POTATO APICAL ROOTED CUTTINGS ENHANCING SEED POTATO PRODUCTION AND DIVERSIFYING AGRI-BUSINESS OPPORUNTITIES

Seed production in Kenya

Addressing seed shortages for potato is a perennial challenge. In Kenya, certified seed production meets approximately 2.6% of effective demand, which has slowly increased from 0.6% in 2009. Multipliers adhering to quality control measures produce quality seed, complementing seed sources for high-yielding seed. Current seed systems rely on producing minitubers, followed by three to four seasons of multiplication in the field.



Production of seed from rooted cuttings by a seed multiplier. Picture taken 5 weeks after transplanting (left), and at harvest (right)

Productivity of potato apical rooted cuttings

Integrating cuttings into seed systems reduces time to which high quality seed potato is available to farmers, while increasing efficiency of seed production compared to current practices. Productivity of cuttings surpasses that of minitubers produced by sand hydroponics and aeroponics by greater than 11 and 3-fold, respectively.

Table 1. Projected production of seed potato tuber numbers from different technologies starting from a single tissue culture plantlet.

	Screenhouse production (G1) ^a		1 st field generation	2 nd field generation		3 rd field generation	
		Time (mo)	# seed tubers	# seed tubers ^e	Time (mo) ^f	# seed tubers	Time (mo) ^f
Cuttings	120 rooted cuttings	5	912 ^c	9,125	17	91,200	23
Aeroponics	35 minitubers	8 ^b	280 ^d	2,800	20	28,000	26
Sand hydroponics	10 minitubers	8 ^b	80 ^d	800	20	8,000	26

^a G = generation. ^b Inclusive of tuber dormancy. ^c Assuming 8 tubers/rooted cutting and 95% survival rate. ^d Assuming 8 tubers/minituber. ^e Each field generation after pre-basic assumes 1:10 production ratio from each tuber. ^f Total time to next seed class inclusive of dormancy, each field generation is assumed 3.5 months production and 2.5 months dormancy.

High productivity is a result of producing several rounds of mother plants from the initial tissue culture plantlet prior to producing cuttings. High tuber number per cutting further compounds productivity of cuttings.



14+ tubers per cutting of varieties Shangi (left) and Konjo (center) and Unica (right), majority of which are sizeable for direct planting in the field.

A cutting is similar to a nursery-grown seedling except that it is produced through vegetative means and does not originate from a seed. Cuttings are produced from tissue culture plantlets in the screenhouse, rather than minitubers, and after rooting, are planted in the field. Each cutting produces 7 to 10, and up to 15+, tubers which are multiplied a further season or two, then the harvest is sold as seed. This means that the seed that farmers buy is high quality seed, equivalent to certified one seed in seed certification systems, and will produce high yielding crops. With seed being available for farmers after two to three field generations of multiplication, seed tubers produced from cuttings are high quality planting material and can be multiplied on farm for a further few seasons without risk of significant seed degeneration, making seed systems based on cuttings compatible with seed-saving smallholder farming systems. Integrating cuttings diversifies entry and exit points, and business options along seed potato value chains. Production of cuttings embraces bio-technology and requires small land holdings, thus attractive for youth.



Mother plants to produce stem cuttings in the screenhouse, noting multiple shoots

Rooted cutting ready to transplant (left), production of cuttings in the screenhouse (upper right), cuttings in the field after establishment (lower right).



Cuttings are economical

Starting with 1,000 cuttings at an approximate cost of 15,000 KES, a seed multiplier is projected to produce 76 50-kg bags of seed potato after two seasons of multiplications (one year). Planting 1,000 cuttings requires 100 m² for the first season, then 0.20 ha (0.5 acres) for the second season. Compared to minitubers, where the same initial area of 100 m² is projected to produce 59 50-kg bags, profits from cuttings and can be 40% greater than those when starting with minitubers.