KENYA ACCELERATED VALUE CHAIN DEVELOPMENT PROGRAM (AVCD)
ROOT CROPS COMPONENT

APICAL ROOTED CUTTINGS TO ENHANCE SEED POTATO PRODUCTION

Seed production in Kenya

Addressing seed shortages for potato is a perennial challenge. In Kenya, certified seed production meets approximately 2% of effective demand, which has slowly increased from 0.6% in 2009. Current seed systems rely on producing minitubers from tissue culture plants in the screenhouse, followed by three to four seasons of multiplication in the field to produce certified seed. Seed merchants normal start from basic seed available after two seasons of multiplying tubers from minitubers to produce certified seed. Apical cuttings are an alternative to minitubers in current production systems.

Production of seed from rooted cuttings, picture taken 5 weeks after transplanting (left), and at harvest 90 days after planting showing harvest, which averaged 28 tubers/cutting (right).

Productivity of potato apical rooted cuttings

Integrating cuttings into seed systems increases efficiency of seed production compared to current practices. While minitubers are more versatile – they can be stored until ready to plant and are easy to transport, productivity of cuttings surpasses that of minitubers. At a cost of 15 - 25 Kes, a minituber produces 5 - 10 tubers depending on spacing, while a cutting produces 10 - 20+ tubers at a cost of 10 - 15 Kes/cutting.

Description of rooted apical cuttings

A cutting is similar to a nursery-grown seedling except that it is produced through vegetative means and does not originate from a seed. Rather than allowing tissue culture plantlets to mature and produce minitubers in the screenhouse, cuttings are produced from the plantlets by taking single or double node cuts from lateral shoots. Cuttings mature quickly in the field, with egg-sized tubers observed 30 to 40 days after planting.

Cuttings under production in the screenhouse, noting the individual plugs each containing a single plant.

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14+ tubers per cutting of varieties Shangi (left) and Konjo (left center) and Unica (right center), majority of which are sizeable for direct planting in the field. Egg-sized tuber size 35 days after planting (right).

Apical cutting versus stem cutting

Apical cuttings originate from tissue culture material, ie the mother plant is maintained in a juvenile state throughout the production cycle. The high productivity potential is in the physiologically young tissue retained in a simple leaf stage. Stem cuttings generally implies that the mother plant has developed compound leaves, physiologically older. Normally mother plants for stem cuttings originate from a tuber, develop compound leaves, and sprouts and shoots are taken as cuttings. Stem cuttings originating from mother plants with compound leaves generally yield 2 tubers per stem.

Productivity of cuttings in the field

Evaluation of field performance of cuttings has revealed that cuttings often surpass the target of 10-15 tubers/plant Increasing the spacing from 20x25 cm on a seed nursery bed of three rows/bed to traditional field spacing of 75x30 cm results in tuber number per cutting increasing by approximately 50%. This indicates potential to increase spacing to improve productivity and for cuttings to be planted directly into field for market production, retaining small tubers for seed.

Transplanting cuttings in nursery beds.

With high productivity of cuttings, selling seed after two to three seasons of multiplication becomes economical, noting certified seed is sold normally after four seasons of multiplication. With farmers accessing earlier generation seed, harvested tubers can be multiplied on-farm for a further few seasons without risk of significant seed degeneration, provided good agricultural practices and rotation are followed, making seed systems based on cuttings compatible with seed-saving smallholder farming systems.

Way forward to developing and scaling out apical cuttings

Key to the success of this technology is building market demand for cuttings, which relies on diversifying end-uses. Currently the technology targets seed multipliers, but expanding to ware farmers who practice saving seed on-farm will increase opportunities for private sector to invest in producing cuttings. Investing in rooted cuttings for seed production could be interesting for youth as little land is required, and profit margins are high when producing seed from cuttings. Youth could even embark on businesses to produce cuttings. There further remains technical and economic questions to produce cuttings to determine unit price which is currently estimated at 10 to 15 Kes/cutting.