



## SWEETPOTATO (*Ipomoea batatas*): A CROP FOR HOUSEHOLD FOOD SECURITY, HEALTH AND INCOME GENERATION

### Importance

- Sweetpotato is an important food crop, grown and consumed by the majority of Ugandans.
- Excess produce is marketed to supplement family income.
- Sweetpotato is an exportable crop
- The crop can be produced under marginal conditions, such as low soil fertility and low moisture (water) supply, where other crops (except cassava) fail.
- It takes a relatively short time to reach maturity (3 to 6 months) compared to cassava (12 months or more), meaning sweetpotatoes can be grown twice a year.
- Sweetpotato fits well in the food and farming systems, and serves well as a food security crop.
- Storage roots may be eaten boiled or processed into simple products such as chips, juice, pan-cakes and composite flour (e.g., mixed with maize flour to make porridge), scones, Mandazi, Chapati. These are also sold to supplement income.
- The stems and leaves are used to feed livestock.
- Tender (young) leaves are consumed as vegetables.
- Orange-fleshed sweetpotatoes (orange like carrots), contain vitamin A. Vitamin A is important for building the body's immune system for defense against diseases and blindness. Other nutrients and uses include; Vitamin C, Iron, Calcium, Copper, and fibre.

# SWEETPOTATO VARIETIES FOR FOOD SECURITY, HEALTH, LOCAL AND EXPORT MARKETS TRAINING MANUAL

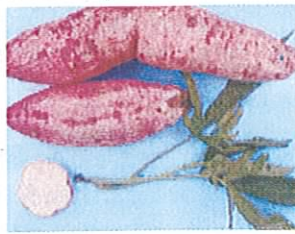




## Some of the improved sweetpotato varieties available in Uganda



**Variety's official name:** Ejumula  
**Other names:** Nabagereka  
**Origin:** Local to Katakwi, Released by NARO.  
**Maturity period:** 4 Months  
**Fresh storage root yield:** 7-20 tons/ha  
**Flesh color:** Orange  
**Root skin Color:** Cream  
**β-carotene content:** High, Over 2mg/100g fwt



**Variety's official name:** Kakamega  
**Other names:** BUCADEF, SPK 004  
**Origin:** From Kenya  
**Maturity period:** 4 Months  
**Fresh storage root yield:** 7-20 tons/ha.  
**Flesh color:** Light Orange  
**Root skin Color:** Light red/pinkish  
**β-carotene content:** High, Over 1.5mg/100g fwt



**Variety's official name:** Naspot 1  
**Other names:** Ssetyabula in Luweero, Bwengye in Mpigi  
**Origin:** Bred by NARO, Namulonge  
**Maturity period:** 4 Months  
**Fresh storage root yield:** 7-50 tons/ha  
**Flesh color:** Cream  
**Root skin Color:** Cream  
**β-carotene content:** Low



**Variety's official name:** New Kawogo  
**Other names:** None  
**Origin:** Local, Released by NARO  
**Maturity period:** 5 Months  
**Fresh storage root yield:** 7-20 tons/ha  
**Flesh color:** Whitish  
**Root skin Color:** Red/purplish  
**β-carotene content:** Very low



**Variety's official name:** Tanzania  
**Other names:** Soroti, Kemb-10, Africa  
**Origin:** Local, Released by NARO  
**Maturity period:** 4 Months  
**Fresh storage root yield:** 7-20 tons/ha  
**Flesh color:** Pale yellow  
**Root skin Color:** Cream  
**β-carotene content:** Moderate



**Variety's official name:** Kasujja  
**Other names:** None  
**Origin:** Bred by NARO, Namulonge  
**Maturity period:** 4 Months  
**Fresh storage root yield:** 7-20 tons/ha  
**Flesh color:** White  
**Root skin Color:** Red/purplish  
**β-carotene content:** Very low



**Variety's official name:** Kala  
**Other names:** None  
**Origin:** Local to Soroti  
**Maturity period:** 4 Months  
**Fresh storage root yield:** 7-20 tons/ha  
**Flesh color:** Cream  
**Root skin Color:** Cream/Yellowish  
**β-carotene content:** High, Over 2mg/100g fwt



**Variety's official name:** #282  
**Other names:** None  
**Origin:** Bred by NARO, Namulonge  
**Maturity period:** 4 - 7 Months. Can keep in ground for up to 7 months since it does not crack the ground to allow in weevils, good for food security, has good flavor and is as mealy as Kyebandula  
**Fresh storage root yield:** 7-20 tons/ha  
**Flesh color:** White  
**Root skin Color:** Light red/pinkish  
**β-carotene content:** Very Low

## PRE-HARVEST PRACTICES, WHICH ENSURE QUALITY SWEETPOTATO ROOTS FOR LOCAL AND EXPORT MARKETS

Practices	Recommendations	Impact points
Variety selection	Acquire high yielding popular and improved varieties e.g. Tanzania, Sowola, Bwanjule, New Kawogo, and NASPOT 1. Also try new clones e.g. No. 29. Orange –fleshed varieties (rich in vitamin A) e.g. Ejumula and Kakamega (SPK004) are also available at Research Institutes, NGOs and with farmers.	Good varieties for food security, health and income generation
Site selection (Soil type)	Varieties differ in terms of dry matter, starchiness/mealiness, sugar content, taste, flavour, fibres, colour of skin and flesh, and resistance to pests and diseases. Sugar content and dry matter affect lignification (wound- healing). Therefore, grow only those varieties that meet market requirements.  Plant on fertile soils, that are well drained, easy to work. Excess soil fertility leads to excessive vegetative growth. The crop can be grown on any soil, but sandy loams give the best yields. Avoid growing the crop on stony soils or waterlogged areas such as clay soils. These conditions do not encourage proper storage root development and expansion. Soil with a lot of stones promotes weevil attack on both vines and storage roots, whereas storage roots rot when the soil contains too much water.	Suitable sites
Quality of planting material	Select your planting material from a clean, healthy, vigorous looking crop, which is 2 to 3 months old. Vine cuttings from such a crop produce a vigorous crop and better yield, while vines cut from an old crop (4 to 6 months) produce a less vigorous crop and poor yield. This is because as the crop approaches maturity, food stored in stems (vines) is channeled to the enlarging storage roots and old parts have fewer dividing cells that produce new leaves, branches and roots.	Good quality planting materials



The best planting material is the stem (or vine tip), that is, the top 30 cm of the vine, when planting material is abundant. This part most easily recovers from cutting and planting "shock", and grows faster than the lower parts of the vine. In addition, the tip is more likely to be free of sweetpotato weevil and stem borer eggs. The middle parts of the vine may also be used if there is a shortage of planting material. Avoid, as much as possible, the basal (lower) parts of the vine as these may contain eggs, larvae or adult weevils inside. Pests and diseases reduce both yield and quality of storage roots.

Time of Planting, methods and plant population

Sweetpotato is planted at any convenient time when there is sufficient moisture in the soil to ensure crop establishment. Although the crop is fairly drought tolerant, drought occurring between time of planting and 6 weeks of crop growth reduces yields seriously. Avoid planting late in the growing season as this exposes the crop to drought and weevil damage. Low water availability will result in storage roots that are not marketable, whereas weevil damage reduces both yield and quality of storage roots.

Timely planting and optimum plant population  
Early planted crop may escape drought and weevil attack

The planting operation involves pushing the lower parts of the vine cuttings into the soil, such that they are nearly horizontal. About 20-cm (8 inch) length of the cutting should lie beneath the soil surface. When mounds are used, three vine cuttings per mound are planted singly in a triangular pattern below the tip of the mound, giving a plant population of about 33,300 plants per ha (or 13,500 plants per acre). If planting is on ridges, single vine cuttings spaced 30 cm (1 ft) apart, are planted in one row along the ridge top, giving the same plant population as the mounds. The spacing between rows is 1m. A low plant population will give very big storage roots, while high population gives many roots that are not marketable. The recommended spacing results in good size storage roots

Plant only apices of healthy vines, which should be 30 cm long.

Good planting material

Vines should be put in shade for not more than 2-3 days before planting

Sprouting (pre-rooting) vines

Plant vines singly at an angle and bury 2/3 of the length

Optimum root formation

Weeding

Hand weeding is done two times - the first round at 3 weeks after planting, and the second one at 6 weeks after planting. Late weeding encourages serious competition between the crop and weeds for sunlight, nutrients and water; this leads to low yield.

Early weeding and pest control (especially weevils)

Remove diseased plants as you weed, and re-hill the mounds, thereby sealing any cracks on the surface. Weevils enter through the cracks and damage the storage roots. Re-hilling also minimizes exposure of storage roots to sunshine; exposed roots turn green and this lowers their quality.

Disease and pest control

Use integrated methods of pest and disease control, e.g. clean disease-free vines, early planting, crop rotation and roguing (uproot) infected plants. One of the major pests of sweetpotato is the sweet potato butterfly. If the caterpillar population is high spray using insecticides (Cypermethrin, Ambush).

Integrated control is cheaper than chemical use

□ Spraying

- Use Ambush to control defoliators, caterpillars of butterfly moths.
- Buy the chemical from a recognized dealer
- Apply the right dosage
- The chemical **MUST** have a label intact
- Wear protective clothing
- Do not spray against the wind.
- Store chemicals away from animals and children
- Store pesticides in a separate well ventilated room
- Never buy pesticides in excess of what you use in a season
- Bury empty containers and never re-use them
- Wash hands with soap after spraying.

Pest control (Caterpillars)

Pesticides are dangerous to humans, livestock and the environment

□ Dressing

Dip vines in Ambush 50% M.L

Pest control

□ Roguing

Uproot infected plants if seen

(Sweetpotato weevils)  
Disease control



Soil fertility Maintenance	<p>Soil fertility is the ability of the soil to supply essential plant nutrients in a balanced way. A fertile soil is one that has a loose texture, is rich in nutrients and organic matter (decomposed dead plants and animals), a high water-holding capacity, and a high activity of living organisms. A good supply of organic matter and nutrients in such a way that it balances the removal of nutrients through harvesting of crops is very important to maintain soil fertility. Returning crop residues to the field from where they came can minimize nutrient loss.</p> <p>The following sources of organic matter can be used to enhance soil fertility:</p> <ul style="list-style-type: none"> <li>• Farm manure, i.e., the excrements of any kind of livestock, often mixed with left-over of feed. The manure should preferably be decomposed for at least 2 weeks before being applied to a crop.</li> <li>• Compost, i.e., decomposed plant material, for instance, from the kitchen and garden waste, or crop harvest residues.</li> </ul> <p>Green manure, i.e., a sole crop, or an intercrop that does not compete with the main crop and preferably can fix nitrogen from the air. If grown as an intercrop, the green manure crop should be trimmed regularly after which the cut parts are left as mulch on the soil surface or incorporated into the soil. If grown in pure stand, the crop is turned under when it has reached the flowering stage.</p>	Good Soil
Harvesting	<p>a) Piece meal harvesting. Start 3 – 4 months after planting using a sharp stick to remove big storage roots. Early maturing varieties take 3 months, while late maturing ones take 6 months from planting to harvesting.</p> <p>b) Whole sale harvesting (part of or whole garden) is done using a hoe. Make sure you minimize damage to storage roots. Start from the sides of the mound and move progressively towards the centre. Damaged</p>	<p>Piece meal and commercial harvesting</p> <p>Good handling of roots maintains quality and market value</p>

Storage of sweetpotato roots for future use	<ul style="list-style-type: none"> <li>• Roots can be left in mounds and harvest in piecemeal.</li> <li>• Can be harvested and stored in a pit or clamp stores. Prior to harvesting, prune sweetpotato plant canopy 14 days (curing)</li> </ul>	Curing improves quality during storage
Handling of fresh produce sweetpotato for export	<p>Harvest when the soil is moist or wet to avoid bruising the roots. After harvesting, dip the roots in water and wash them thoroughly but carefully to avoid bruising the skin</p> <p><b>Pack house activities</b> In the pack house, the following activities are important</p> <ol style="list-style-type: none"> <li>Sorting should be done according to color, size and shape</li> <li>The roots should be allowed to dry under shade They should be packed in cartons and ready for transport to the airport.</li> </ol>	<p><b>Market requirements for sweetpotato for export</b></p> <ul style="list-style-type: none"> <li>• The skin of the roots should be intact and characteristic of the variety</li> <li>• No pest/disease damage</li> <li>• Should be sorted into weights</li> <li>• Should be relatively uniform in size</li> <li>• Must not be bruised</li> <li>• Diameter should be 3-4 inches</li> <li>• Roots must not be deformed</li> <li>• Should be packed dry</li> <li>• Must be devoid of dust or any other foreign material</li> <li>• Should be transported at 13°C to avoid color loss.</li> </ul>
Hygiene	<ul style="list-style-type: none"> <li>- Have clean water around the harvesting place</li> <li>- Wear gloves (if you have them) during harvest</li> <li>- Toilets should be at least 500 m away from planting site.</li> </ul>	Good hygiene improves quality
Record keeping	<p>Keep all records right from planting to harvest e.g. date of planting, number of mounds/acre or hectare, variety planted, source of planting material, area planted, pests and diseases identified, yield/acre or hectare, etc.</p>	This is a EUREP-GAP requirement



Quality Aspect One of the key goals of the Eurep-gap is in relation to the the improvement of consumer EUREP-GAP confidence. The most important (European principle of the Eurep-gap protocol is Retail food safety – there are many factors that Produce Good do impact negatively on food safety but Agricultural the most important is crop protection. Practices)

Good Agricultural Practices leading to Healthy products

In the case of sweetpotato it is advised to use:

- Only approved pesticides
- Farmers must have the knowledge required to apply the pesticides
- Farmers must take all records regarding pesticide used
- Farmers must dispose off surplus spray mix in an orderly manner.

## HOW TO PREPARE AND EAT SWEETPOTATO

In Uganda sweetpotato is mainly eaten in its fresh form after either boiling or steaming. There are however many ways in which sweetpotato can be prepared and made into a delicious value-added product.

The fresh roots after washing and peeling can be boiled or steamed and then mashed. The mash could then together with suitable proportions of wheat flour and other ingredients be used in baking a range of delicious products.

Baked and fried products could also be produced from sweetpotato flour ; some examples below.

 <p><b>Sweetpotato Tea Scones</b> Ingredients 1 tea cup sweet cooked mashed potato 2 tea cups wheat flour 3 teaspoons baking powder ½ cup sugar 2 tablespoons margarine 1 egg (optional) About 2/3 cup milk or water Gram of salt</p>	 <p><b>Sweetpotato Cake</b> Ingredients 2 cups sweetpotato flour 2 cups wheat flour 4 teaspoons baking powder ½ cup sugar ½ cup margarine 3 eggs Flavouring (optional) ½ cup milk or water</p>	 <p><b>Sweetpotato Mandazi</b> Ingredients 2 cups sweetpotato flour 2 cups wheat flour ½ cup sugar 3 eggs 3 tablespoons baking powder Enough cooking oil for deep frying Gram of salt</p>
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## A farmer's estimated gross margin analyses per growing season for fresh Sweetpotato in Central Uganda, targeting the local and export markets

Item	Type of market			
	Export market (sea freight to Europe)		Local market Uganda	
	Low yields	High yields	Low yields	High yields
*Net Yield (Kg/ha)	7,000	21,000	7,000	21,000
Price per Kg (Shs)	400	400	150	150
**Gross field benefit	2,800,000	8,400,000	1,050,000	3,150,000
<b>Variable costs in Shs</b>				
1. First and second land preparation per hectare @ Shs 150,000	300,000	300,000	300,000	300,000
2. Ridging/heaping mounds per hectare @ Shs. 150,000	150,000	150,000	150,000	150,000
3. Purchase of 60 bundles of quality planting material @ Shs. 5000	300,000	300,000	300,000	300,000
4. Transporting the above planting material estimated on average @ Shs. 50,000	50,000	50,000	50,000	50,000
5. Labor for planting: 10 Man Days @ Shs. 8000	80,000	80,000	80,000	80,000
6. Labor for weeding 3 times: 10 Man Days @ Shs. 12,000	120,000	120,000	120,000	120,000
7. Labor for harvesting, sorting, grading and packing 3 - 10 Man Days (@ Shs 15,000 - 30,000)	90,000	300,000	45,000	150,000
8. Purchase of packaging material @ Shs 1000 (50 to 150 bags)	0	0	50,000	150,000
9. Transporting produce to market estimated @ Shs 50,000/ton	0	0	350,000	1,050,000
Sub - total	1,090,000	1,300,000	1,445,000	2,350,000
Miscellaneous costs @ 3% of sub-total	32,700	39,000	43,350	70,500
Total variable costs	1,122,700	1,339,000	1,488,350	2,420,500
Gross Margin per 1 hectare	1,677,300	7,061,000	438,350	729,500
Interest 20% of working capital	224,540	267,800	297,670	484,100
Net benefit including interest (Shs/ha)	1,452,760	6,793,200	-140,680	245,400

\* Net yield - the measured yield per hectare minus harvest losses and storage losses where appropriate

\*\* Gross field benefit - net yield times market price of the product.

Note: The currency exchange rate at the time of compiling this information (May 2004) was 1US\$ = 1900 Ug. Shs.

Low yield - When farmers use traditional agricultural practices.

High yield - when farmers use recommended practices.

Figures used in the calculations were collected from secondary sources and interviews conducted with a number of people e.g. farmers, millers, etc.



A comparison of farmers' estimated gross margin analyses for exporting fresh sweetpotato, drying to chips and milling Chips to flour

Item	Type of market					
	Fresh roots		Dried chips		Sweetpotato flour	
	Low yields	High yields	Output	Output	Output	Output
Net yield/output (Kg/ha)	7,000	21,000	2,333	7,000	2,000	6,500
Price per kg (Shs)	400	400	1,250	1,250	1,500	1,500
Gross field benefit	2,800,000	8,400,000	2,916,300	8,750,000	3,000,000	9,750,000
Variable costs in Shs.						
1. First and second land preparation per hectare @ Shs 150,000	300,000	300,000	300,000	300,000	300,000	300,000
2. Rigging/heaping mounds per hectare @ Shs 150,000	150,000	150,000	150,000	150,000	150,000	150,000
3. Purchase of 60 bundles of quality planting material @ Shs 5000	300,000	300,000	300,000	300,000	300,000	300,000
4. Transporting the above planting material estimated on average @ Shs 50,000	50,000	50,000	50,000	50,000	50,000	50,000
5. Labor for planting: 10 Man Days @ Shs 8000	80,000	80,000	80,000	80,000	80,000	80,000
6. Labor for weeding 3 times: 10 Man Days @ Shs 12,000	120,000	120,000	120,000	120,000	120,000	120,000
7. Labor for harvesting, sorting, grading and packing 3 - 10 Man days @ Shs 15,000 - 30,000	90,000	300,000	38,000	79,800	38,000	79,800
8. Expenses of processing SP into dried chips	0	0	0	0	0	0
a - Water for washing: 1000 litres of water per ton @ Shs 5,700/ton fresh roots	0	0	39,900	119,700	39,900	119,700
b - Labor for washing @ Shs 19,000/ton fresh roots	0	0	133,000	339,000	133,000	339,000
c - Peeling @ Shs 43,700/ton fresh roots	0	0	305,900	917,700	305,900	917,700
d - Slicing fuel expenses: 2 litres Petrol/ton = Shs. 3,800/ton fresh roots	0	0	26,600	79,800	26,600	79,800
e - Drying expenses @ Shs 19,000/ton fresh roots	0	0	133,000	399,000	133,000	399,000
9. Expenses processing chips flour						
a - Transporting chips to one particular miller in Kampala estimated @ Shs 24,700/ton	0	0	0	0	0	0
b - Milling expenses estimated @ Shs 50,000/ton	0	0	0	0	0	0
10. Purchase of packing material @ Shs 1000 (50 to 150 bags for fresh, 2500 and 7000 light - protective 1 kg packets for dried chips and flour @ Shs 500	0	0	475,000	3,458,000	475,000	3,458,000
11. Transporting produce to market estimated @ Shs 50,000/ton	0	0	0	0	0	0
Sub - total	1,090,000	1,300,000	115,900	345,800	114,000	345,800
Miscellaneous costs @ 3% of sub-total	32,700	39,000	2,267,300	6,738,800	2,438,100	7,261,300
Total variable costs	1,122,700	1,339,000	68,000	202,200	73,100	217,800
Gross Margin per 1 hectare	1,677,300	7,061,000	2,335,300	6,941,000	2,511,200	7,479,100
Interest 20% of working capital	224,540	267,800	581,000	1,809,000	488,800	2,270,900
Net benefit including interest (Shs/ha)	1,452,760	6,793,200	467,000	1,388,200	502,200	1,495,800
			114,000	420,000	-13,400	775,100

Note: The currency exchange rate at the time of compiling this information was 1US\$ is equal to 1,900 Shs. Good quality sweetpotato which cannot be sold fresh can be processed into simple products such as dried chips, flour etc. 3kg of fresh Sweetpotato yield 1 kg dried chips.



**Foodnet**



INTERNATIONAL  
POTATO CENTER (CIP)



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DEPARTMENT OF FOOD SCIENCE AND TECHNOLOGY



HORTICULTURAL EXPORTERS ASSOCIATION OF UGANDA

**MAGANJO**



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