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.
Some of the improved sweetpotato varieties available in Uganda

Variety’s official name: Ejumula
Other names: Nabagera
Origin: Local to Kakai, 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: Napsot 1
Other names: Ssetyabula in Luweero, Bwanga in Mungu
Origin: Bred by NARO, Nanumolone
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, Kembu-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: Kasuza
Other names: None
Origin: Bred by NARO, Nanumolone
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: # 282
Other names: None
Origin: Local to Soroti, Maturity period: 4 - 7 Months
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, Bwanga, 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
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.

Site selection
(Soil type)
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.

Sweatpotato 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.

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

Vines should be put in shade for not more than 2-3 days before planting
Plant vines singly at an angle and bury 2/3 of the length
Sprouting (pre-rooting) vines

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)

Removing 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.
Integrated control is cheaper than chemical use

Integrated control is cheaper than chemical use

- Spray - 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.

- Dressing - Dip vines in Ambush 50% M.L.
- Pest control (Sweetpotato weevils)

- Roguing - Uproot infected plants if seen

- Pest control (Sweetpotato weevils)

- Disease control
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.

The following sources of organic matter can be used to enhance soil fertility:

- 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.
- Compost, i.e., decomposed plant material, for instance, from the kitchen and garden waste, or crop harvest residues.
- 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.

**Harvesting**

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.

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 storage roots easily rot or fetch low price on the market. Therefore, select only those roots that do not have cuts or signs of weevil damage. Grade roots according to market requirements. Also, remember that delayed harvesting leads to a reduction in both quantity and quality of storage roots; rotting, sprouting and/or weevil damage increase with time. Organisms that cause rotting least affect varieties that have the ability to heal.

**Storage of sweet potato roots for future use**

- Roots can be left in mounds and harvest in piecemeal.
- Can be harvested and stored in a pit or clamp, stores. Prior to harvesting, prune sweet potato plant canopy 14 days (curing)

**Handling of fresh produce sweet potato for export**

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

**Pack house activities**

In the pack house, the following activities are important

- Sorting should be done according to color, size and shape
- The roots should be allowed to dry under shade
- They should be packed in cartons and ready for transport to the airport.

**Hygiene**

- Have clean water around the harvesting place
- Wear gloves (if you have them) during harvest
- Toilets should be at least 500 m away from planting site

**Good hygiene improves quality**

**Record keeping**

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.

**Market requirements for sweet potato for export**

- The skin of the roots should be intact and characteristic of the variety
- No pest/disease damage
- Should be sorted in weights
- Should be relatively uniform in size
- Must not be bruised
- Diameter should be 3-4 inches
- Roots must not be deformed
- Should be packed dry
- Must be devoid of dust or any other foreign material
- Should be transported at 13°C to avoid color loss.

**Curing improves quality during storage**
A farmer's estimated gross margin analyses per growing season for fresh Sweetpotato in Central Uganda, targeting the local and export markets

<table>
<thead>
<tr>
<th>Item</th>
<th>Type of market</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Export market (sea freight to Europe)</td>
</tr>
<tr>
<td></td>
<td>Low yields</td>
</tr>
<tr>
<td><em>Net Yield (Kg/ha)</em></td>
<td>400</td>
</tr>
<tr>
<td>Price per Kg (Shs)</td>
<td>7,000</td>
</tr>
<tr>
<td><strong>Gross field benefit</strong></td>
<td>2,800,000</td>
</tr>
<tr>
<td>Variable costs in Shs</td>
<td>300,000</td>
</tr>
<tr>
<td>1. First and second land preparation per hectare @ Shs 150,000</td>
<td>300,000</td>
</tr>
<tr>
<td>2. Ridging/heaping mounds per hectare @ Shs. 150,000</td>
<td>150,000</td>
</tr>
<tr>
<td>3. Purchase of 60 bundles of quality planting material @ Shs. 500</td>
<td>300,000</td>
</tr>
<tr>
<td>4. Transporting the above planting material estimated at average @ Shs. 50,000</td>
<td>50,000</td>
</tr>
<tr>
<td>5. Labor for planting: 10 man Days @ Shs. 800</td>
<td>80,000</td>
</tr>
<tr>
<td>6. Labor for weeding: 3 times; 10 Man Days @ Shs. 12,000</td>
<td>120,000</td>
</tr>
<tr>
<td>7. Labor for harvesting, sorting, grading and packing: 3 -10 Man Days @ Shs 15,000 - 30,000</td>
<td>90,000</td>
</tr>
<tr>
<td>8. Purchase of packaging material @ Shs 1,000 (50 to 150 bags)</td>
<td>0</td>
</tr>
<tr>
<td>9. Transporting produce to market estimated @ Shs 50,000/ton</td>
<td>0</td>
</tr>
<tr>
<td>Sub-total</td>
<td>1,090,000</td>
</tr>
<tr>
<td>Miscellaneous costs @ 3% of sub-total</td>
<td>32,700</td>
</tr>
<tr>
<td>Total variable costs</td>
<td>1,122,700</td>
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<tr>
<td>Gross Margin per 1 hectare</td>
<td>1,677,300</td>
</tr>
<tr>
<td>Interest 20% of working capital</td>
<td>224,540</td>
</tr>
<tr>
<td>Net benefit including interest (Shs/sha)</td>
<td>1,452,760</td>
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</table>

*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 1 US$ = 1900 Ug. Shs.

Low yield - When farmers use traditional agricultural practices.

High yield - when farmers used 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

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<td></td>
<td>8. Expenses of processing SP into dried chips</td>
</tr>
<tr>
<td></td>
<td>a. Water for washing, 1000 litres of water per ton @ Shs 5,700/ton fresh roots</td>
</tr>
<tr>
<td></td>
<td>b. Labor for washing @ Shs 19,000/ton fresh roots</td>
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<tr>
<td></td>
<td>c. Peeling @ Shs 43,700/ton fresh roots</td>
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<tr>
<td></td>
<td>d. Slicing fuel expenses 2 litres Petro/ton = Shs 3,800/ton fresh roots</td>
</tr>
<tr>
<td></td>
<td>e. Drying expenses @ Shs 15,000/ton fresh roots</td>
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<tr>
<td></td>
<td>9. Expenses processing chips flour</td>
</tr>
<tr>
<td></td>
<td>a. Transporting chips to one particular miller in Kampala estimated @ Shs 24,700/ton</td>
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<tr>
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<td>b. Milling expenses estimated @ Shs 50,000/ton</td>
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<tr>
<td></td>
<td>10. Purchase of packing material @ Shs 1000 (50 to 150 bags for fresh, 250 and 7000 light- protective 1 Kg packets for dried chips and flour @ Shs 500)</td>
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Note: The currency exchange rate at the time of compiling this information was 1 US$ is equal to 1,500 Shs. Good quality sweetpotato which cannot be sold fresh can be processed into simple products such as dried chips, flour etc. 5kg of fresh sweetpotato yield 1 kg dried chips.