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Building Resilience to Enhance Food & Nutrition Security, Incomes and Health in Northern Uganda

Orange Flesh Sweet Potato Production Guide

Implemented by: IITA Transforming African Agriculture, CGIAR, VEDCO, rikolto VECO, Kilimo Trust Transforming Lives Through Agribusiness, Bioversity International, CIAT International Center for Tropical Agriculture Since 1967 Science to cultivate change, ECUREI Excellence our goal

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Orange Flesh Sweet potato (*Ipomea batatas*), locally known as *"Layata"*, is commonly planted in flat to slightly rolling open areas. The crop is also known to be a cheap but excellent source of carbohydrates, vitamin A, carotene, calcium, and phosphorus. It is also a fair source of thiamine and iron but a poor riboflavin, niacin, and vitamin C source.

With their deep orange flesh, these edible roots have a naturally sweet flavor and are a top source of beta-carotene. Thriving in warm soil, unlike regular potatoes, sweet potatoes will be ready to harvest just as the ends of the vines begin to turn yellow.

The sweet potato is a large, sweet-tasting root of the morning glory family. (Regular potatoes belong to the nightshade family). It is a very undemanding crop to grow; sweet potatoes are drought- and heat-tolerant and have few pests or diseases. The sweet potato is also very nutritious and relatively low in calories. In addition, the sweet potatoes' lush vines make a lovely ground cover for beds.

The only major requirement for sweet potatoes is the sun and warm soil; this is a tropical plant. A versatile crop, sweet potato has multifarious uses. It is not only grown as a food substitute for rice and corn but also as a potential source of raw materials for industrial uses and food delicacies. Sweet potato is being processed into feeds, flour starch, and pectin for local and export markets. The flour is further processed into fermented products such as soy sauce and alcohol. When freshly cooked, it can be saccharified to produce wine, vinegar.

SOIL AND CLIMATE REQUIREMENTS

Sweet potato can be grown in a wide range of soils, from heavy to sandy. It thrives best in sandy loam soils rich in organic matter with pH ranging from 5.0-7.0 and constant rainfall, and good drainage areas. The ideal planting time for the best varieties is at the onset of the rainy season or immediately after the rainy season when soil is moist. Sweet potato generally requires a growth season of 3-4 months with optimum temperatures of 20°C - 25°C. It can however, grow at a wide range of temperatures between 15°C and 35°C. The highest root yields are obtained during day time temperatures of 25 to 30°C and night temperatures of 15 to 20°C.

VARIETIES

Choosing the kind of variety to plant is dependent on the purpose for which it is grown. Farmers in Uganda have a challenge of accessing improved varieties, and this leads to low productivity. So far, Naro has released many varieties of the crop.

These varieties have inherent characteristics such as high yield, resistance to pests and diseases, improved nutritional quality, short maturing, and many other desirable characteristics. Varieties with high dry matter content are traditionally the most preferred types, while others with low dry matter content are less preferred.

You can differentiate sweet potatoes by their skin and flesh color. The most predominant skin colors are white and pinkish, while the flesh colors are mostly yellow and orange.

The orange-fleshed varieties commonly grown in Uganda include NASPOT8, 11, 12, 13, and NAROSPOT1, 2, 3, and 5. They have good storage roots, high dry matter content, high beta-carotene level, and resistant to sweet potato virus.

CULTURAL REQUIREMENTS

LAND PREPARATION

To have a good root yield of the crop, plow and harrow the soil twice or until the soil is loose and friable. Form flat mounds or ridges or furrows of about 30-40 centimeters high using hand hoe, ox-plow, tractor-drawn disc plow with about 75-100 cms between ridges where three to four vines are planted with a spacing of 15cm apart.

Orange Flesh Sweet potatoes can be produced in low and high altitudes if the soils are fertile. The seedbed for sweet potato should be fertile and well prepared without big soil clods. The huge soil clods would interfere with tuber development later during the growth and development of the crop.

PLANTING MATERIALS

Sweet potatoes need 3 to 4 months of warm temperatures to produce a worthwhile harvest, so the key is to plant them early enough for them to mature properly. Vines should be planted in warm soil 3 to 4 weeks after rain onset.

Use vine tip cuttings from healthy plants 25-30cm long. However, for economic reasons, tip or terminal vine cuttings immediately, or you can store them in a shaded place, but they should be planted within two days from the time they are cut.

Farmers can propagate sweet potatoes as vegetative using stem segments called vines. These are taken from the top of the old stems, and caution should be taken to avoid chloric, mottled, wrinkled, or vines with mosaic patterns.

Plants with mosaic patterns could most likely be having a viral disease. Farmers can practice rapid multiplication practices to multiply vines.

PLANTING

Plant vine cuttings diagonally on top of ridges during the rainy season to prevent the crop from being soaked underwater or in the furrows during the dry season to utilize moisture reserve in the soil. Where sweet potato is grown on mounds, farmers usually plant 3 vines per mound with some space between the vines. At a spacing of 1 m x 1 m between mounds, 12,000 cuttings are

required per acre if three cuttings per mound are used. While on ridges, 13,200 cuttings are required to plant an acre, spacing 30 cm between plants and 1 m between ridges.

Sweet potato is either planted in mounds or on ridges using vine cuttings. Vines are the mature stems and are taken from the shoot. A good vine cutting should be 30cm or about one foot long with about six nodes and disease-free.

When mounds are used, they should not exceed a height of 1m in height and diameter. The size of the mound, however, varies with the type of soil.

In soils prone to drying, small mounds is recommended; big mounds in such a case are overexposed to sunshine and dry out very fast. The numbers of vines used do vary, as small mounds will take few vines and the big mounds accommodate more vines.

Planting is mostly done by hands, but you can plant sweet potatoes using forked sticks in some cases. Vines for planting should be picked and allowed to wilt in the shade for two days before planting. This ensures that the vines do not break during planting as fresh vines are brittle. These vines also root easily and ensure faster establishment of the crop in the soil.

Extensionists recommend using just one cutting per hole and then gap-filling any plants that fail to establish. On mounds, three cuttings are planted towards the top of the mound but equidistant from each other in a triangle configuration. On ridges, the cuttings are planted either vertically or at a slant along the top of the ridge at the required spacing.

Sweet potato is often planted after the priority cereal crops and other important cash crops and when sufficient planting materials have been generated by the rains. However, in areas with a short rainy season, these delays in planting can end up exposing the sweet potato crop to drought periods and weevil damage, significantly reducing potential yields.

FERTILIZATION

Follow the fertilizer recommendation based on the results of the soil analysis. If not available, follow the following general recommendations:

1. For poor soil, use 1.6-2.4 bags of complete fertilizer per acre.
2. For moderately fertile soil, use 1.6 bags of complete fertilizer per acre;
3. For fertile soil, fertilization is not advisable.

Apply fertilizer at planting time at 8-10 cms from the base of the plant or broadcast in the furrows and cover subsequently with soil. The use of compost or organic fertilizers at 1.2 tons per acre is highly recommended.

CULTIVATION AND WEEDING

If weeds are abundant, shallow cultivation is done 10-12 days after planting. Tilling up cultivation is done at 25-30 days after planting. This is to provide enough soil to cover the developing roots and thus, minimize the entry of weevils that may attack the growing roots.

Sweet potatoes should be kept weed-free in the first months, and this is done by weeding around the ridges/mounds. Weeding is normally done by hand. After about two months, the canopy of the crop is normally big enough, covering the ground, which helps keep away weeds.

It is important to cover cracks arising from the growth of the tubers with soil; otherwise, if left open, it will attract weevils that will infect the tuber.

Week	Development phase	Characteristics	Tasks
0 1 2 3	I. Establishment phase	• Planting • Fast growth of young roots • Storage roots start to differentiate • Slow growth of vines	• Planting • Gap filling • Avoid stress
4 5 6 7	II. Intermediate phase (storage root initiation)	• Initiation of storage roots • Fast growth of vines • Large increase in leaf area	• Weeding
8 9 10 11 12 13 14 15 16 17 18 ↓ 52	III. Final phase (storage root bulking)	• Growth of vines ceases • Rapid bulking of storage roots • Reduction of leaf area due to yellowing and falling • Harvesting ↓	• Vine lifting • Hilling up • Harvesting

PEST AND DISEASE MANAGEMENT

The most common pest is weevils; others are caterpillars and grasshoppers, which can be controlled using appropriate pesticides

The diseases include Sweet Potato Virus disease and Altarnaria affecting the leaves and stems and Fusarium wilt, among others

Farmers are advised to use resistant varieties such as the Orange Fleshed varieties, and they should avoid spreading susceptible seedlings.

Foliar spraying of fevinthrothion at 0.5% one (1) month after planting and twice, at 50 days and 70 days after planting (DAP).

HARVESTING

You can start digging up the potatoes as soon as they are big enough for a meal. Usually, sweet potatoes are ready to harvest when the vines' leaves and ends have started turning yellow. Most of the recommended varieties are ready for the harvest 90-120 days after planting (DAP). Harvesting can be determined by root sampling, and if the desired size has been attained, harvesting can be done anytime.

Before harvesting, cut and roll the vines like a mat, fork, hoe, pass a plow below the ridges, and then handpick the roots. Handle the roots carefully to minimize injury. Sort out damaged or bruised roots from undamaged ones.

POST-HARVEST OPERATION

If possible, use wooden crates for containers instead of sacks to avoid skin damage during handling and transport. If properly cured, harvest roots can be stored even for three months by keeping them under room temperature of 32^{o}C with a relative humidity of 92-95%.

CURING FRESH SWEET POTATOES FOR STORAGE

You must cure sweet potatoes, or they will not have that delicious, sweet taste. Curing the potatoes allows a second skin to form over scratches and bruises that occur when digging up the potatoes. To cure, keep the roots in a warm place (about 27°C) at high humidity (about 90%) for 10 to 14 days. A table outside in a shady spot works well. For best curing, make sure that the potatoes are not touching one another.

After curing, throw out any bruised potatoes, wrap each one in the newspaper, and pack them carefully in a wooden box or basket. Store the sweet potatoes in a root cellar, basement, or another place with a temperature of at least 13°C.

If stored at a temperature range of (13–15.5°C) with high humidity, the tubers should last for about six months. When removing the potatoes from storage, remember to be gentle; do not dig around or else you will bruise the potatoes.

PROCESSING OF SWEET POTATO CHIPS

Chipping or cutting sweet potato roots into thin slices should be done to facilitate efficient drying, handling, and storage and avoid jamming the grinding machine during feed milling operations. The desired size of chips should not exceed 1.5 cm thick and 10 cm long.

THERE ARE TWO METHODS OF CHIPPING SWEET POTATO ROOTS

1. Manual chipping or slicing using cutting knives
2. Mechanical chipping using chopping machines operated manually or by the engine.

Manual chipping is suited for small-scale operation (less than half a hectare yield). However, mechanical chipping is necessary for the huge volume of roots (more than one-hectare yield).

An example of a mechanical chipper is the one developed by the Bureau of Plant Industry. The BPI root crop chipper has a rated capacity of 0.3 tons per hour when pedal operated and 1.5 tons per hour when operated by a 3-horsepower gasoline engine.

Its cutting blades are mounted on a vertical disk located opposite a feed hopper. These blades are adjustable, allowing roots to be chopped to desired thickness, from 5 mm to 20 mm thick, and from 100 mm to 180 mm long.

DRYING

Dry sweet potato chips to 12-13% moisture content through sun-drying or artificial heat drying.

SUN-DRYING – spread chips uniformly in mat or concrete floor. Expose directly under the sun for 2-3 sunny days. Turn chips periodically to facilitate efficient drying. The drying period depends on the availability of sunlight and the size and thickness of chips.