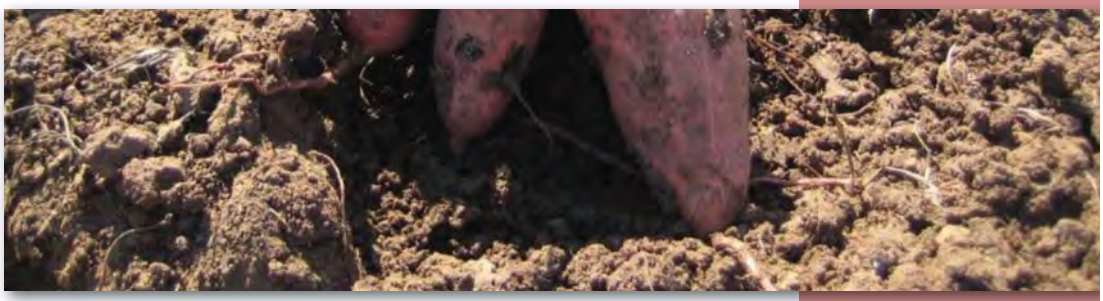
Sweet potato (*Ipomoea batatas* L.) production



Guide

agriculture,
forestry & fisheries

Department:
Agriculture, Forestry and Fisheries
REPUBLIC OF SOUTH AFRICA

Sweet potato (*Ipomoea batatas* L.) production

Directorate: Plant Production

Department of Agriculture, Forestry and Fisheries

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Contents

PART 1: General aspects

CLASSIFICATION

Sweet potato is cultivated as a perennial in tropical and subtropical lowland agro- ecologies, although it is well adapted to other zones and can be grown over widely different environments.

Scientific name: *Ipomoea batatas* L.
Common names: Sweet potato (English), batata (Spanish), potata (Setswana),
Family name: Convolvulaceae

ORIGIN AND DISTRIBUTION

Sweet potato originated from tropical Central America. Botanically, the underground part is classified as a storage root, rather than a tuber, as is the white ("Irish") potato (Solanum tuberosum). The most common type of sweet potato found in US markets is the "moist-fleshed" type, red-skinned with dark-orange flesh. Dry-fleshed types of I. batatas (yellow, ivory, or white flesh) are popular among both Caribbean and Asian shoppers—especially in the US.

MAJOR PRODUCTION AREAS IN SOUTH AFRICA

South Africa

Currently, sweet potato is cultivated in more than 100 countries, mostly throughout tropical and subtropical Asia. Limpopo (Hoedspruit, Marble Hall, Burgersfort, Levubu), Mpumalanga (Nelspruit), KwaZulu-Natal and Western Cape provinces are the major production areas.

DESCRIPTION OF THE PLANT

Botany

The sweet potato is a perennial, although it is grown as an annual. It belongs to the morning glory family or Convolvulaceae.

Roots

Large, fleshy, edible storage roots are formed on the underground stem nodes. Latex occurs in all parts of the plant.

Stem

A perennial herb cultivated as an annual, with trailing or twining stems up to 4 m long, which sends roots into the soil at the nodes.

Leaves

The general form of the leaf is heart-shaped or halberd-shaped.

Flower

The flowers have purplish throats and white margins, resembling those of the morning glory. The blooms are rare and may not produce seed.

Seeds

The tubers are also variable in shape, size and colour. Some are long and cylindrical, others short, thick and rounded at the ends. The skin may be whitish, dull straw-coloured, light red or purple. The flesh is also variable in colour, texture, moisture and quality. Classification of varieties is usually based upon the shape of the leaves.

CULTIVARS

There are two broad categories of sweet potato:

- The staple type with white flesh and white or purple skin has a high starch and dry- matter content.
- The dessert type with orange flesh and orange skin with a high sugar and beta-carotene content.

Commonly three distinct types of sweet potato available for commercial production include:

1) Orange/copper skin with orange flesh, e.g.: Beauregard, Hernandez, Beerwah Gold, NC-3, LO-323, Centennial, Darby and Jewel.

   South African orange cultivars such as Beauregard have long, cylindrical to heavy elliptic tubers. They have high beta-carotene content and are fairly quick growers. It may become too big with a long growing period.

2) White/cream skin with white/cream flesh e.g.: Hawaii, Kestel.

   Blesbok, which has cream flesh colour, has a high yield and a good stor-

age life. It can produce good yield in a relatively short growing period (4 months) which is important for cold regions. It produces some long, curved sweet potatoes, especially in sandy soils.

3) Red/purple skin with cream/white flesh, e.g.: Northern Star, Red Abundance, Rojo Blanco.

   Koedoe is a very attractive and tasty cultivar when cooked also with a pointed oval tuber. Its tips break off easily. It requires a growing period of 5 months to produce a good yield.

   Selection of a variety to grow should be based on market demand. Varieties are assessed on a number of parameters, including root shape and uniformity, marketable yield, skin and flesh attractiveness and plant vigour.

CLIMATIC REQUIREMENTS

Temperature

Because sweet potatoes are of tropical origin, they adapt well to warm climates and grow best during summer. Sweet potatoes are cold sensitive and should not be planted until all danger of frost is past. The optimum temperature to achieve the best growth of sweet potatoes is between 21 and 29 ^{0}C, although they can tolerate temperatures as low as 18 ^{0}C and as high as 35 ^{0}C.

Storage roots are sensitive to changes in soil temperature, depending on the stage of root development.

SOIL REQUIREMENTS

Site selection and soil

A well-drained sandy loam is preferred and heavy clay soils should be avoided as they can retard root development, resulting in growth cracks and poor root shape. Lighter soils are more easily washed from the roots at harvest time. Wet season green manure cropping with sterile forage sorghum is recommended and should be thoroughly incorporated and decomposed by planting time.

Soil pH should be adjusted to about 6,0 by applying lime or dolomite. Rates of 240 kg and 400 kg/ha respectively will raise the pH by 0,1 of a unit. The soil should be deep ripped and then disk cultivated to break up any large

clods and provide enough loose soil for hilling of beds. A yearly soil test is recommended to assess soil properties, pH and nutrient levels before ground preparation.

PART 2: Cultivation practices

PROPAGATION

Sweet potatoes are propagated from sprouts or from slips (vine cuttings); sprouts are preferred. Sprouts are grown from plant stock selected for its appearance, freedom from disease and off-types. Approximately 75 kg of planting stock sweet potatoes are needed to produce enough sprouts to plant one hectare.

Cutting collection

Tip cuttings of about 30 to40 cm long with approximately eight nodes are collected from the nursery bed, or the last established planting. Tip cuttings should be taken from crops that are old enough to provide material without excessive damage. Avoid “back cuts” as these will have variable maturity and result in significant yield reduction. The lower leaves should be cut away as tearing these off may damage the nodes that will produce the roots. Cuttings can be left under a moist cloth in the shade for a couple of days to promote nodal rooting before planting in the field. At the recommended plant spacing, 330 cuttings are required for a 100 m row.

Seedbed production of cuttings

This involves the propagation of cuttings from harvested roots which are placed close together in a seedbed. This is an alternative method of producing planting material which requires less labour but does sacrifice a percentage of marketable roots. Research was conducted at the Coastal Plains Horticulture Research Farm (CPHRF) in 1992. Seedbed production of cuttings showed that it required about 25 kg of roots to plant 1 m^2 of seedbed, which yielded approximately 200 cuttings per cut over four cuts.

Planting cuttings

Cuttings should be planted at about a 45^0 angle into heaps as this promotes good, even root development. Half of the cutting or three to four nodes should be buried at a spacing of 30 cm between plants. Mechanical planters are available and used on large-scale plantings but manual planting is widely practised. This can be as easy as pushing the cutting into the heap with a

forked stick. The labour requirement for hand planting is estimated at 32 h/ha. Cuttings need to be watered at or immediately after planting. Plantings should be scheduled to allow for progressive fortnightly harvests over the desired production period.

Sprout production

Sprouts are produced from the conditioned roots in cold frames, heated beds, or field beds of clean sand or fumigated sandy soil. Conditioned roots are covered by more soil sand, though not too much. Four to five weeks are needed to develop strong plants if the soil in the plant beds has been kept at 23 to 26 ^{0}C. Six to eight weeks may be needed if roots have not been "pre-conditioned". Adequate moisture is especially critical to germination of the sprouts and proper root formation on the sprouts.

Planting the sprouts

Sprouts should be taken from the plant beds when 6 to10 leaves and a strong root system have developed on each one. They are set out into the field as early as possible when the soil has warmed and the risk of frost or a cold weather period has passed.

Plants should be spaced 30 to 38 cm apart in rows that are 1 m apart. This requires approximately 14 520 plants per hectare. Management of water is very critical to avoid transplant shock.

SOIL PREPARATION

Bed formation

Sweet potato is grown on raised beds or mounds. This provides the developing roots with loose, friable soil to expand to their potential size and shape without restriction. It also allows adequate drainage and provides easy harvesting with a mechanical digger.

Mounds should be approximately 30 cm high and 40 cm wide at the base. The main consideration is that the developing roots remain under the soil within the heaps. If using a mechanical digger at harvest time it is important to match the width of the mound with the width of the digger mouth. Spacing the mounds at 1,5 to 2,0 m apart (depending on the tractor width) with a roadway every six rows allows access for boom spray. Mounds are formed,

using hilling discs, and the base fertiliser can be incorporated during this operation.

PLANTING

Planting period

Planting time is mainly determined by the climate of a location. Sweet potato plants are damaged by light frost and the plants require high temperatures for a period of 4 to 5 months to yield well.

In areas with mild frost, mid-November to mid-December is the best time to plant, and usually the crops gets ready for harvest from April to May.

Mid-November to the beginning of December is recommended areas with heavy frost and, with harvesting taking place from April to May.

It is common to plant from January to March in frost-free areas so that the growing season extends through winter. Cold spells during winter can be a risk, depending on the climate of the specific area. In very hot areas, planting should be avoided from November to middle of February as storage root formation is reduced by high temperatures.

Spacing

Optimum plant density depends on cultivar, but is usually around 40 000 plants per hectare. Rows may vary from 1 to 1,25 m apart; in-row spacing it is usually 25 to 30 cm.

Seeding rate

The number of cuttings required to plant 1 ha varies between 30 000 and 60 000, depending on the specific spacing used.

FERTILISATION

The recommended fertiliser rate for sweet potato production is based on crop removal figures. Research (1992 Nutrition monitoring trial) has shown that this recommendation will produce high yields when used in conjunction with yearly soil nutrient testing and petiole sap nutrient monitoring.

Estimated crop removal in kg per ha is:

- 100 kg Nitrogen (N)
- 90 kg Phosphorus (P)

- 200 kg Potassium (K)
- 200 kg Calcium (Ca)

All the phosphorus may be applied in the basal along with 50 kg of N and 50 kg of K. The remaining 50 kg N and 150 kg K should be divided into two side-dressings at 4 to 6 weeks and at 10 to 12 weeks from planting. Some calcium will be supplied by the lime or dolomite used to adjust the soil pH, and any additional calcium may be applied in the basal as gypsum. Petiole sap nutrient monitoring is advisable so that the desired nutrient levels for different growth phases can be checked. Any trace element deficiency would be detected by regular petiole testing, but generally, two foliar applications around the time of side-dressing should maintain adequate levels. Sprays should include zinc, copper, manganese, iron and boron.

The following table shows the optimum ranges for the major nutrients in petiole sap:

Fertiliser	Early running (0 – 10 weeks)	Mid growth (10 – 15 weeks)	Late growth (15 – 20 weeks)
Nitrate ppm	2 000 – 3 000	1 000 – 2 000	500 - 1000
Phosphate ppm	100 - 200	100 - 200	100 - 200
Potassium ppm	3 000 – 4 500	3 000 – 4 500	2 500 – 4 000
Calcium ppm	300 - 700	300 - 700	300 - 700
Magnesium ppm	300 - 700	300 - 700	300 - 700

Fertiliser application

The recommended rates of side-dressing fertiliser should be calculated on the crop area (e.g.: 20 rows, 50 m long at 2 m spacing = 2 000 m^2 or 0,2 ha). If using drip tape, this fertiliser needs to be injected through the lines. If watering with sprinklers, then the fertiliser can be either injected or applied in the solid form and irrigated into the beds.

IRRIGATION

Sweet potato responds well to increasing moisture, but is considered a drought-tolerant crop because it is deep rooted and capable of developing storage roots under very dry conditions.

Requirements for water vary with soil type but can be generally estimated as 18 to 20 mm per week early in the season, 40 to 45 mm per week during

the middle part of the season when storage roots are enlarging rapidly and a reduction to about 20 mm late in the season. Excessive moisture early in the season delays storage root development and enlargement; late in the season, it induces cracking and/or rotting of roots.

Irrigation and scheduling

The best way to maintain the desired moisture content in the hills is to monitor the soil moisture with tensiometers. A shallow tube at 15 to 20 cm into the hill will indicate the timing of irrigation, and a deeper tube just below the base of the hill at 40 to 50 cm will determine the length of irrigation. Water requirement will vary with soil type and increase as storage roots develop within the hills. It is desirable to maintain moisture content in the hills at or near field capacity. Both tensiometers should remain within the 10 to 20 kPa range on sandy soils. This is especially important from 10 weeks onward as roots have been initiated and are starting to fill out. This is also the period of increased water use by the plants. Fluctuating soil moisture levels during this stage will reduce yield and cause cracking of roots.

WEED CONTROL

Weeds may be a problem early in crop growth before vigorous vine growth covers the beds as plants become established. A number of control strategies may be used:

- After bed formation, irrigating should be applied to germinate any weed seed. Spraying with a knockdown herbicide before planting has been an effective method.
- Rotary finger cultivators are effective in removing small seedling weeds during early crop growth. Encourage vigorous early vine growth to smother weeds.

PEST CONTROL

A fallow period should follow each crop to prevent build-up of soil-borne pests and diseases. Planting a green manure crop after harvest helps to suppress any regrowth and weeds as well as improving soil structure, and is essential for the long-term health of the soil.

Sweet potato weevil

This is the most serious pest of sweet potato. Adults are ant-like and lay eggs on stems and roots. The larvae burrow into the roots, making them unmarketable. They can pupate in the stems and be transferred in planting material. Once established in a crop, this pest is difficult to control. Research (1993 Soil insect control trial) has shown that a pre-plant treatment of cuttings with chloropyrifos combined with foliar applications of chloropyrifos at 5 and 10 weeks from planting provides significant control. Planting material collected from an infected crop would require insecticide dipping before planting. Destroying all crop residues after harvest and crop rotations are the best ways to keep weevil numbers down.

Giant termite

Termites can be a major problem, especially on newly cleared ground where the activity of established colonies has not been identified. Avoiding known termite-infested areas may be successful in the short term. Aggregation techniques to locate and concentrate termite activity followed by a baiting programme is the best way to clear future planting areas of this pest.

Other pests

Leaf-feeding caterpillars may cause problems if infestation is severe enough to cause significant leaf reduction. At the start of the wet season, hungry magpie geese can cause serious damage by trampling crops and eating the roots. Black-footed tree rats are also a problem.

DISEASE CONTROL

Mycoplasma (little leaf disease)

Infected plants have small, pale-yellow, stunted leaves and stems. The infection is spread by leafhoppers and if plants are infected while young, yields are greatly reduced. Control is by regular monitoring for symptoms and the removal and destruction of infected plants.

Fungal disease

Soil-borne fungal diseases can infect the roots but are not a large problem on well-drained, sandy soils. Any organic matter added to the soil should be well decomposed before planting.

Viruses

Feathery mottle virus has been detected in various sweet potato growing areas but research has shown that the infection had no significant effect on yield (1993 Virus effect on yields). In other major production areas of Australia, severe infection has caused yield reduction and distorted roots. Symptoms are often not visible on infected plants, and laboratory testing is required to confirm any infection. The virus is spread by insect vectors and by infected planting material. If sweet potato is to be grown over an extended period, then new virus-free material should be obtained from the virus-free programme every few years.

OTHER CULTIVATION PRACTICES

Bedding seed roots

Before bedding sweet potatoes for plant production, examining roots carefully and discarding diseased, mutated and bruised roots should be the first step. Treatment of seed potatoes with a recommended fungicide dip immediately before bedding is needed. Dipping will help control surface infestations of black rot, scurf and root rot organisms. Washing seed potatoes before fungicide treatment allows for more efficient removal of all diseased potatoes and removes dirt that reduces the effectiveness of the chemicals. Seed potatoes should not be washed unless they are treated in a fungicide dip before bedding.

The fertiliser should be mixed with the bedding material. Warm beds to 26 °C prior to bedding, then lower the temperature to 21 to 24 °C once sprouting begins. Treated roots can be placed in the bed so that they are not in contact with each other. About 1 m^2 of bed is needed per volume of seed potatoes. Mesh wire prevents roots from being pulled along with slips. Roots must also be separated according to size to get an even depth of covering and uniform sprouting.

After bedding, the roots, water should be sprinkled over the bed to slightly moisten the soil (not soggy wet). Tar paper or plastic can be placed directly over the plant bed surface. When the slips push the covering up about 5 cm, the covering material should be removed. Watering the beds is important to keep the soil moist. The beds should be kept covered with sash or film plastic until the plants begin to emerge. Ventilating during the day is necessary

to control air temperature in the beds after the emergence of the plants. Air temperature in the beds should be kept under 32 °C to produce good-quality plants. The plants should be pulled when they are about 20 cm tall. They should have at least five leaves, stocky stems and a healthy root system. This type of plant is best for mechanical transplanting.

HARVESTING

Sweet potatoes, which bruise easily, are harvested by hand with mechanical aids. Vines are mechanically removed. Large tractor-drawn platforms that have a digger chain running in the centre are frequently used to lift the sweet potatoes from the ground. The sweet potatoes are then carefully removed from the chain by hand and placed either in wooden boxes holding 18 to 23 kg or in a bin that measures by 1,2 by 1,2 m and holds 454 kg.

Root maturity can vary between varieties, and root development is slower during cooler weather. Growers need to monitor the development of roots with regular checks of root size after 18 weeks. Marketable grades of roots are between 0,25 and 1 kg. If harvested at the correct time, around 60 to 70% of total roots should be within this grade. If grown during the dry season, most varieties should be ready for digging up at about 20 to 22 weeks from planting. If left too long in the ground, the roots can become oversized and unmarketable.

Harvesting methods

Harvesting sweet potato can be very labour intensive, and requires suitable equipment for commercial production. Before harvesting, most of the top growth needs to be removed or it will become entwined in the digging machine. Vine removal is best done with a swinging pulveriser where the flails are shaped to the contour of the bed. This will chop the vine into pieces and leave the hills bare. A standard slasher or pulveriser can be used, but will not remove material between the rows. Chopping into the top of the hill should be avoided at all costs as this may damage the roots. Following this, any remaining vines can be cut on both sides of the hill with large, sharp coulters mounted on a tool bar. This vine removal should be done a week before digging to toughen the skin of the roots.

Roots are lifted from the soil using a single row potato digger. To avoid digger damage, this should be done while the hills are still moist so that some

soil travels up the digger bars with the roots. The digger elevator should be moving only slightly faster than ground speed.

The dug roots are then manually collected into bulk bins and transported to the shed. The harvested crop must be kept away from lengthy exposure to the sun, and skin damage will be less if the roots are kept wet during handling.

Research trials have shown that 20 to 40 t/ha of marketable roots is achievable, depending on variety and management.

Root curing

Sweet potatoes to be stored for later marketing or for seed stock must be cured immediately after harvesting to minimise storage losses. Curing involves controlling temperatures and relative humidity and providing ventilation for seven to ten days. Curing is a wound-healing process which occurs most rapidly at 26 to 32 °C, a relative humidity of 85 to 90% and good ventilation to remove carbon dioxide from the curing area. Wounds and bruises heal and a protective cork layer develops over the entire root surface. In addition, suberin, a waxy material, is deposited. The cork layer and suberin act as a barrier to decay-causing organisms and to moisture loss during storage.

This process involves the forced hot air treatment of roots at 30 ^{0}C with 90% relative humidity for between 4 to 6 days. This must be done immediately after harvest, and will result in the formation of a wound skin, which heals any mechanical damage suffered during harvesting. Post-harvest rot infections are minimised and excessive moisture loss prevented. Curing can also improve eating quality by increasing sweetness.

Root curing is not a standard commercial practice, but is worth considering if roots need to be stored for a prolonged period. Subsequently, harvested roots are placed in buildings to cure (30-35 °C, 90% RH) and then stored (10-15 °C; 85-90% RH) until needed for the market. Curing promotes wound healing and provides a barrier to prevent bacteria and fungi from entering damage that results during harvesting and handling. Properly cured roots will store for 12 months or longer with 15 to 25% losses under the best conditions.

Temperature must not drop below 12 °C in order to prevent physiological cold damage to which sweet potatoes are particularly susceptible. Relative

humidity should remain between 80 and 90% to prevent dehydration as the living storage roots continue to respire. As they are needed for marketing, roots are removed from storage rooms, processed through a mechanical washer/grader and packed into boxes of about 15 kg. Wash water may contain chlorine or other approved fungicides to reduce infection of wounds generated by the grading procedure.

PART 3: Post-harvest handling

Because at least 90% of the crop must be stored before packing, sweet potato post-harvest handling requires a large investment in specialised equipment, boxes and storage facilities. After harvesting, sweet potatoes are transferred to storage where they should be rapidly cured at 29 ^{0}C for 4 to 7 days, at a relative humidity of 85 to 90%. Curing allows cuts and scrapes that occurred during harvest to heal, thereby preventing the entrance of decay organisms. After curing, the potatoes must be stored at a temperature of 13 to 16 ^{0}C for long-term storage at a relative humidity of 85 to 90%.

SORTING AND GRADING

Correct post-harvest handling is critical for any produce, and sweet potato is no exception. Harvested roots should be washed, graded and cooled soon after being dug and not left in the field for an extended period. Keeping the roots wet or moist will help prevent skin damage. Washing equipment includes a water hopper or soaking trough connected by an elevator to a conveyor of soft brushes with multiple high-pressure spray jets. Harvested roots are immersed in the water hopper which lessens skin rubbing damage and loosens soil adhering to the roots before entering the washing brushes. Avoid hard brushes which can damage the skin and clean brushes and conveyors regularly to avoid latex build-up.

At packing time, sweet potatoes are dumped into a water tank to be washed and then dried while travelling through a heated tunnel. They are graded into three sizes, No.,1 is a uniform size of 9 cm maximum diameter, 4,4 cm minimum diameter and no less than 7,5 cm or greater than 23 cm long; they may weigh no more than 567 g. No. 2 (mediums) may be misshapen, with a minimum diameter of 4 cm. Jumbos weigh more than 567 g and are true to type. No. 1s command the highest price, followed by Jumbos and then grade 2s. Other grades such as rounds and longs may be packed by the shipper.

Marketable root weight is between 0,25 kg and 1,0 kg with 2 grades of 0,25 to 0,6 kg and 0,6 to 1,0 kg. These are usually packed in 20 kg boxes with one size grade per box. Top- quality roots should be free of soil with smooth, undamaged skins. They should have good even shape with no cracking or insect damage.

PACKAGING

The graded product is then hand-placed in 18 kg fibreboard cartons for marketing. Sweet potatoes are sensitive to ethylene and should not be shipped or stored with ripening fruit and melons that produce ethylene.

Containers

Containers are important in handling and proper curing and storage of sweet potatoes. To minimise handling and reduce tuber injury, containers used to harvest potatoes in the field are used in curing and storage. Volume crates are usually used; however, larger containers cause less root damage.

Processing

Most of the sweet potatoes which are processed in many countries such as the US are canned. This is because the best prices are received for roots on the fresh market, those going to canning processors are the smaller roots (2,5 to 5 cm in diameter). Roots larger than those desired for fresh market (>9 cm in diameter) are usually sent to baby food processors.

STORAGE

The roots are also sensitive to chilling injury and should not be stored below 12,2^{0}C. Storage at freezing temperatures will severely damage sweet potatoes; the damage usually does not show until the product is returned to a warmer temperature.

Storage temperature is between 12 and 15 °C. Relative humidity should be maintained between 75 to 80% to prevent excessive water loss from the roots. Some ventilation should be provided to prevent carbon dioxide buildup.

Post-harvest storage rots such as Rhizopus fungi can infect damaged areas on roots and can spread to other roots on contact. The best control is preventive by avoiding skin damage and not packing damaged roots. Roots should be dry before packing.

Optimum storage conditions are at 14 to 16 ^{0}C in a high humidity cool store.

Storage below 10 ^{0}C may cause chilling injury, and above 16 ^{0}C can lead to excess weight loss and sprouting.

MARKET PREPARATION

Whether marketed from the field or from storage, fresh market sweet potatoes are usually washed, graded and often waxed before marketing. Poorly shaped, diseased and damaged roots should be graded out to make an attractive pack. Buyer requirements for grade and size must be met for repeat sales. Fresh market sweet potatoes are usually packed in 18 to 22 kg per container or bag.

Small hectares of sweet potatoes can be marketed by pick-your-own methods. Only potatoes that will be picked up by customers during the next hour should be dug up to prevent sun scald injury. Roadside stands, farmers' markets and local stores are other possible markets for small producers. Some processing potatoes are also produced in various regions. Be sure to determine processor requirements prior to production and delivery. There may be size restrictions on processing deliveries, or potatoes may be delivered field run with culls removed.

PART 4: Production schedule

Activities	January	February	March	April	May	June	July	August	September	October	November	December
Soil sampling	X								X	X	X	X
Soil preparation	X	X								X	X	X
Planting	X	X	X								X	X
Fertilisation	X	X	X								X	X
Irrigation	X	X	X								X	X
Pest control	X	X	X								X	X
Disease control	X	X	X								X	X
Weed control	X	X	X								X	X
Leaf sampling	X	X	X								X	X
Harvesting	X	X	X	X	X							
Root curing	X	X	X	X	X	X						
Marketing	X	X	X	X	X	X						X

PART 5: Utilisation and nutritional value

CULINARY/COOKING

Uses

Cultivated primarily for edible storage roots; vines are used as vegetables in some parts of the world. Both starchy roots and vines can be used as animal feed or feed supplement. Various products such as candy, pastas, flour, drinks are produced in local industries.

Sweet potato is a dual-purpose crop, as the roots are edible, and the tops may be consumed as a green vegetable. Although the leaves and shoots are also edible, the starchy tuberous roots are by far the most important product. In some tropical areas, they are a staple food-crop.

Apart from the utilisation of the roots, stems and leaves are readily eaten by cattle, goats, pigs, poultry and even fish when green or as hay or silage.

Humans consume vines as a green vegetable or salad green.

Processed products of sweet potato include:

- As a puree, it is used in pie fillings, sauces (e.g. tomato sauce in Uganda), frozen patties, baby foods and in fruit-flavoured sweet potato jams, e.g. with pineapple, mango, guava and orange.
- Production of starch is a major operation in China. It is used for making pasta and as a substrate for alcoholic drinks.
- In the US, whole, halved, chunks or puréed sweet potatoes are canned.
- Freezing: Cubes, slices, French fries, mash, halves, quarters and whole roots can be frozen.
- Confectionery: Candies and sweets, and sugar-coated or salted crisps for snack foods.
- Mashed sweet potato is used as an ingredient of ice cream, tarts, baking products and desserts as a substitute for more expensive ingredients.
- Sweet potato flour is used as a 20% supplement for wheat flour in baking bread, biscuits or cakes.
- Production of starch is a major operation in China. It is used for making pasta and as a substrate for alcoholic drinks.

Nutritional value

On a world scale, sweet potato provides significant quantities of carbohydrates compared to other staple foods. The protein content is a bit lower than

potato and grain crops, but still makes some contribution. Sweet potato has a low fat content.

Human health benefits and concerns

Apart from simple starches, sweet potatoes are rich in complex carbohydrates, dietary fibre, beta carotene (a vitamin A equivalent nutrient), vitamin C, and vitamin B6. Pink, yellow and green varieties are high in carotene, the precursor of vitamin A.

Sweet potato varieties with dark orange flesh have more beta carotene than those with light-coloured flesh and their increased cultivation is being encouraged in Africa, where vitamin A deficiency is a serious health problem. Despite the name “sweet,” it may be a beneficial food for diabetics, as preliminary studies on animals have revealed that it helps to stabilise blood sugar levels and to lower insulin resistance.

Anti-nutritional factors

Sweet potatoes contain trypsin inhibitors which may reduce the ability to utilise protein if eaten raw. However, trypsin inhibitors do not survive cooking and are of no consequence in cooked roots.

PART 6: References

Asian Vegetable Research and Development Center. 1982. Sweet potato: Proceedings of the First International Symposium. Shanhua, Tainan, p. 481. Taiwan: AVRDC Press.

Bouwkamp, J.C. 1985. Sweet potato products: A natural resource for the tropics, p. 271. Boca Raton: CRC Press.

Edmond, J. B. & Ammerman, G.R. 1971. Sweet potatoes: Production, processing, marketing, p. 334. Westport, CT: The AVI Publishing Co.

International Potato Center. 1987. Exploration, maintenance and utilization of sweet potato genetic resources; Report of the First Sweet Potato Planning Conference, p. 369. Lima, Peru

Woolfe, J.A. 1992. Sweet potato: An untapped food resource, p. 389. Cambridge, UK: Cambridge University Press.

Yen, D. E. 1974. The sweet potato and Oceania: An essay in ethnobotany, p. 389. Honolulu, HI: Bishop Museum Press.

http://www.hort.purdue.edu/newcrop/cropfactsheets/sweetpotato.html

http://agriculture.kzntl.gov.za/publications/books/vegetable_production_kzn/veg_sweet_potato.htm

http://www.omniseedsearch.com/bookdigest/growing-sweet-potatoes.html

CONTACT INFORMATION

Directorate	Plant Production
Division:	Vegetable Crops
	Private Bag X 250, Pretoria, 0001
Tel No:	012 319 6072
Fax No:	012 319 6372
Email:	DPP@daff.agric.za