Production guidelines for Bambara groundnuts
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DEPARTMENT OF AGRICULTURE, FORESTRY AND FISHERIES
Directorate Plant Production
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Part 1: General aspects

1. CLASSIFICATION

Scientific name: *Vigna subterranea* (L.) Verdc
Common names: (including names used by different communities in South Africa):
- Congo: Groundnut, Congo goober, Madagascar groundnut, earth pea, baffin pea, Jugo, njugo bean
- Sepedi: ditloo
- Tshivenda: phonda voandzou, nzama
- Malawi: indhlubu and underground bean

2. ORIGIN AND DISTRIBUTION

The beans are related to cowpeas and botanically known as *Vigna subterranea* (L.) Verdc. There are two botanical varieties, namely *V. subterranea var. spontanea* which includes the wild varieties and *V. subterranea var. subterranea* which includes the cultivated varieties. Bambara is an African indigenous crop; it is used for both human and animal consumption. It is a third crop among the grain legume crops of the African lowland tropics after the popular groundnut and cowpea. The bambara groundnut has become less important in many parts of Africa because of the expansion of groundnut production. In recent years there has been renewed interest for cultivation in the arid savannah zones. It is resistant to drought and has the ability to produce a reasonable crop when grown on poor soils.

3. PRODUCTION LEVELS

3.1 South Africa

In South Africa it is produced by local people mostly for home consumption. It was only in recent years that people started selling it in local markets (e.g. boiled groundnuts). Very little research has been done to develop it commercially.

3.2 Internationally

While seldom grown in the United States, it produces a nutritious food under cultivation throughout Africa. It was carried to America by
slaves, but has never become as popular as the peanut, which has a higher level of protein. The world production is estimated at 330,000 tons annually, of which about half is produced in West Africa. The main producing countries are: Nigeria, Ghana, Chad, Niger, Togo and Benin. At present, the demand for bambara is larger than the quantities offered for sale. It provides a yield under conditions too dry for peanuts, such as in the Bambara district near Timbuktu on the Sahara Desert’s southern fringe. It also is known to grow in rainforest areas and the cool moist highland areas.

4. MAJOR PRODUCTION AREAS IN SOUTH AFRICA

The main producing areas of bambara in South Africa are Limpopo, Mpumalanga and KwaZulu-Natal.

5. VARIETIES AND CULTIVARS

There are seven types of bambara groundnut varieties:

- **Black**: Early maturing, usually small to medium-sized kernels. Mainly one-seeded
- **Red**: Late maturing. Kernels are large. A good yielder, however, it is prone to rotting onsite
- **Cream/black eye**: A large kernel and a good yielder
- **Cream/brown eye**: A moderate kernel and a good yielder
- **Cream/no eye**: Very small pods and kernels. It mainly produces one seed and yields are lower.
• **Speckled/flecked/spotted**: Purple colour predominates. Kernels are small and pods are mainly one-seeded.
• **Brown**: Continuous variation between light and dark brown. Kernels are of medium to large size.

6. **DESCRIPTION**

6.1 **Mature plant**

Bambara groundnuts take about three to six months to mature, depending on weather conditions and the cultivar.

**ROOTS**

A well-developed taproot with many profuse geotropic short lateral roots 20 cm long. The roots form nodules for nitrogen fixation, in association with appropriate rhizobia.

**STEM**

It has lateral stems which develop from the root.

**LEAVES**

The leaves are trifoliate (± 5 cm long) and are attached to the stem by the petiole. The petioles are about 15 cm long, stiff and grooved, and the base is green or purple in colour. Leaves and flower buds arise alternately at each node. Leaves are pinnately trifoliate, glabrous with erect petiole and thickened at the base. Two stipels are subtend to the terminal leaflet, while only one is assigned to each of the two lateral leaflets. The oval leaflets are attached to the ranchis with marked pulvini. The terminal leaflet is larger than the lateral leaflets, with an average length of 6 cm and an average width of 3 cm.

**FLOWERS AND PODS**

Flowering starts 30 to 35 days after sowing and may continue until the end of the plant’s life. After fertilisation the flower stem elongates. The sepal enlarges and the fruit develops above or just below the soil surface. The unripe pod is yellowish green, with up to six pods while the mature pods may be yellowish green or purple. The pod is small, about 1–5 cm long, round or slightly oval shaped and wrinkled with mostly one or sometimes two seeds. The seeds are round, up to 1.5 cm in diameter, smooth and very hard when dried. They are cream, brown, red, mottled, with or without haulm colouration.
6.1 Essential part
The essential parts are the flowers and pods.

7. CLIMATIC REQUIREMENTS

7.1 Temperature
For best growth, bambara needs bright sunshine, high temperatures, and frequent rain to grow best. It grows well in an average temperature of 20 °C to 28 °C. It requires a frost-free period of at least 3 to 5 months and is a typical short-day plant. The plant is highly adaptable and tolerates harsh conditions better than most crops.

7.2 Water
Bambara groundnuts need moderate rainfall from sowing until flowering. An annual rainfall of 500 to 600 mm is required. The plant tolerates heavy rainfall, except at maturity. It is also known to grow in rain forest areas and cool moist highlands areas.

8. SOIL REQUIREMENTS
Bambara grows well on well-drained soil. It can grow on poor soil that is low in nutrients. It requires a soil pH of 5.0 to 6.5.
1. PROPAGATION
Bambara is propagated through seed.

2. SOIL PREPARATION
Bambara gives the best yields on a deeply ploughed field with a fine seedbed. A level seedbed is best, but, it can be planted on ridges when very wet conditions prevail.

3. FIELD LAYOUT AND DESIGN
Bambara seed varies in size and therefore planting densities can vary from 25 to 75 kg/ha. The recommended spacing is 10 to 15 cm in single rows of 45 to 90 cm apart. On average, 1000 seeds are produced and the mass is about 500 to 750 g. Planting density is usually low especially when crops are not in rows.

4. PLANTING
Bambara groundnut can be planted from late October, through November to early December, after good rains. Late plantings in January and early February produce lower yields. In conditions of high moisture levels and in heavy soils (not recommended) seed can be planted 2.5 to 3.0 cm deep and 5.0 to 7.5 cm deep in sandy soil.
5. FERTILISATION

Chemical fertilisers are not usually applied on the land. Because the nitrogen requirement is met by natural $N_2$ fixation, seed should be inoculated. When nitrogen content is high in the soil, bambara groundnut usually produces mostly only a few pods and seeds on the top surface. It is always advisable to conduct soil tests and apply fertiliser according to the recommended rates. Fertiliser usage may be linked to the development of certain diseases.

6. IRRIGATION

Bambara is normally grown under dryland conditions. In the reproductive stage it may be sensitive to water stress; supplementary irrigation should be applied when necessary except at maturity.

7. RAINFALL

Bambara groundnuts need moderate rainfall from sowing until flowering. An annual rainfall of 500 to 600 mm is required. The plant tolerates heavy rainfall, except at maturity.

8. WEED CONTROL

Weed control is done mechanically or by hand. Care should be taken when weeding around the plant, especially at flowering as the flower stalks are fragile and may break with rough handling. There are no registered herbicides for bambara at the moment, but those registered for cowpea could be used for bambara groundnut.

9. PEST CONTROL

The pests attacking bambara are fusarium wilt, leaf spot, root-knot nematode, and a virus. These are worse in rainy climates than in dry areas. Others are leafhoppers, *Hilda patruelis* and the larvae of *Diacrisia maculosa* and *Lamprosema indicata*. *Meloidogyne incognita* and *Meloidogyne javanica* are the most parasitic nematodes on bambara groundnut. The level of nematode infestation is usually much greater on light-textured soils. The symptoms of nematode infestation include stunted growth, leaf chlorosis and yield losses. About 10 weeks after planting, the leaves turn yellow and the plants become stunted and die.
CONTROL

Preventative measures that could be applied include early plantings, before populations have had time to build up.

10. DISEASE CONTROL

The symptoms of nematode infestation include stunted growth, leaf chlorosis and yield losses. About 10 weeks after planting, the leaves turn yellow and the plants become stunted and die. Peanut clump virus (PCV) is able to persist in soil even for several years as its fungal vector, *Polymyxa graminis*, is capable of producing highly resistant resting spores. Another problem is that it is transmitted by using infected seeds.

CONTROL

Cultural practices such as trap cropping with pearl millet and judicious time of sowing are followed to reduce the incidence of the disease. Deep burial of crop residue assists in controlling certain diseases by placing the organism contained in the residue at a depth where there is an oxygen deficiency. This reduces the population of the disease-causing organism and permits the crop to escape much of the damage. Planting on a raised bed is useful in preventing certain diseases such as southern blight and certain of the wilt diseases.

11. HARVESTING

11.1 Harvest maturity

A growth period of 110 to 150 days is required for the crop to develop fully. However, it can be ensured by checking the plant and seed appearance. Seeds are mature when the parenchymatous layer surrounding the embryo has disappeared and brown patches appear on the outside of the pod. Plants are harvested as the plants turn yellow or die, or when about 80% of the pods have matured. Pods can also be harvested while they are still green before they reach maturity as they are more palatable at this stage. Pods are removed as they mature to restrict losses by rotting and premature germination.
11.2 Harvesting methods

Harvest bambara groundnut by hand lifting and pulling the plant or the taproot can be cut, using a groundnut harvester or ploughed out or hoed out. The nuts are then pulled off the plant, dried and stored or eaten raw. Harvesting small plots is often done over a period of time. Bambara pods can break off very easily and up to half of the pods can remain in the soil, requiring collection by hand.

Part 111: Post-harvest handling

1. SORTING

Usually seeds are sorted according to colour and size. The small seeds are consumed at household level while the bigger ones are for sale or seed.

2. POST-HARVEST HANDLING

After the plants have been cut, they are left for a day or two after which they can be stacked in wind rows to dry. The crop is ready for shelling when the pods rattle upon shaking. After drying, the pods are shelled by hand, using a flat stone or brick. On a large scale, groundnut shellers can be modified to handle the crop.

3. STORAGE

The crop is usually stored in shells. Shelling should take place only when the nuts are required for rations, sale or seed. Bambara nuts store well in the pods as the seed is extremely susceptible to weevil damage after shelling. If shelled the seeds have to be treated with insecticidal dust before storage. At times seeds are stored with sand or treated with wood ash to prevent insect damage on seed. However, better results are obtained with vegetable oils.

4. MARKETING

It was only in recent years that people started selling it in local markets like boiled groundnuts. Bambara is grown mainly by local people, mostly for home consumption while the surplus may be sold to individuals engaged in street sales at local markets. Seed size and colour
are important factors in determining the marketing of bambara. Bambara has not attained value on the international market yet.

**Part IV: Production schedules**

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**Part V: Utilisation**

The immature seeds are more palatable than the hard seeds. The immature seeds are normally eaten fresh, boiled or grilled and the mature seeds are ground into flour and then mixed with oil or butter to form porridge and sometimes they are roasted in oil. Young, whole pods can be washed and boiled and used in soups. Seed may be roasted. Flour may be prepared from roasted or unroasted seeds, which can be used for livestock feeding after being soaked in water. The roasted ground meal can be used as a coffee substitute. The porridge keeps well and is traditionally used on journeys. Ripe seeds are
also broken into pieces, boiled, crushed, and eaten as a relish with maize meal porridge. The bambara groundnut makes a complete food, containing sufficient quantities of protein, carbohydrate, and fat. It has been reported that tribes in the Congo have roasted seeds and pounded these for oil abstraction. If the seeds are eaten fresh or premature these can be consumed with no preparation. However, once the seed has dried out, boiling becomes necessary to soften it. Dried and roasted bambara can be used to make flour, soup and porridge. More recently, experiments have been conducted to make milk out of the bambara groundnut. Bambara groundnuts seeds contain 14 to 24% protein and about 60% carbohydrate. The protein is reported to be higher in the essential amino acid methionine than other grain legumes. Bambara groundnuts contain 6% to 12% oil, which is less than half the quantity found in peanuts, making it unsuitable as an oilseed crop. The leaves may be used as livestock feed and are eaten readily by cattle and game. The seed is also used as animal feed, the coarser parts of the meal being fed to pigs and poultry. The seeds of bambara groundnut are often mixed with other foods, such as meat stew, rice, spinach, other vegetables, maize and sorghum. Cakes or balls may be made from the flour mixed with maize.

MEDICINAL USE OF BAMBARA GROUNDNUT

• Water from the boiled maize and pulse mixture is drunk to treat diarrhoea.

• Bambara groundnut can also be used to cure nausea suffered by pregnant women. The raw bean has to be chewed and swallowed. The leaves are pounded with those of Lantana trifolia L. or Mexican marigold, water is then added to make a solution which is used to wash livestock as a preventative against ticks (as an insecticide). When applying the solution to vegetables, care has to be taken to apply it to the ground, and not to pour it on the leaves, as it has been reported to burn leaves.

Acknowledgement

The Department of Agriculture, Forestry and Fisheries is greatly indebted to the ARC-Grain Crop Institute for their valuable information.