



Groundnuts Production Guide



Researching Soils, Crops and
Water In Zambia



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Foreword



Zambia has the potential to produce sufficient food for its citizens and for export.

In order to ensure that good agricultural practices are employed by farmers, crop specific production information should be made available to them.

Due to technological advances and the changing environmental and socio-economic conditions it became necessary to revise the first edition of the Groundnut Production Guide, which was published in 2002. This revised edition of the Groundnut Production Guide is meant to provide farmers and other stakeholders crop specific information in order to promote good agricultural practices and enhance productivity and production.

The information contained in this booklet has been generated over a number of years of research and is appropriate for all categories of farmers. The information is meant for extension officers, agricultural training institutions and other development partners.

It is my sincere hope that this information will go a long way in stimulating Groundnut production in Zambia.

The Zambia Agriculture Research Institute (ZARI) is committed to alleviating poverty and enhancing food security by contributing to increased and sustainable food production.

A handwritten signature in blue ink, appearing to be 'M. Mwale', written over a light blue horizontal line.

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2018

Acknowledgements

The Editorial Committee wishes to express its gratitude to the Food Legume Research Team of Zambia Agriculture Research Institute for providing the technical information and invaluable advice.

The Zambia Agriculture Research Institute wishes to recognize the support provided by World Bank through the Agricultural Productivity Programme for Southern Africa- Zambia Project (APPSA-Zambia), for financing the publication of this production guide.

We also wish to recognize financial support provided by the World Bank through the Agricultural Productivity Programme for Southern Africa- Zambia Project (APPSA-Zambia) to facilitate the publication of this production guide.

1. Introduction

Groundnut (*Arachis hypogaeae* L.) is an annual crop from the legume (Leguminosae) family. It is the second most widely cultivated crop in Zambia mainly grown by small scale farmers. It is however mostly grown in Eastern Province as a subsistence and cash crop.

Groundnuts are an essential part of many relishes, providing an important source of both fat and protein among rural households. It contains 23-25% protein and 45-52% edible oil, providing useful nutrition to households, particularly children.

A number of criteria are used to describe types of groundnuts. In Zambia, these include growth habit, kernel size and oil content. The large kernel size are referred to as 'confectionery' and those with high oil content as 'oil types'. The spreading type, which are late maturing and large seeded, are categorized as 'Virginia' while the bunchy type, which are early maturing and small seeded, are categorized as 'Spanish'. The other distinguishing characteristics between these two types of groundnuts is dormancy and oil content. The Virginia types are low in oil content and exhibit seed dormancy while the Spanish types have high oil content and do not exhibit seed dormancy. The non-dormant Spanish types may sprout at maturity if there is excess soil moisture, through late rains, resulting in reduced yield and quality of the crop.

2. Climatic and Soil Requirements

2.1 Climate

Groundnuts grow well with the rainfall range of 800–1000 mm (Agro-ecological Region II) which is well distributed during the growth and development period. Moderate temperatures are ideal for the groundnuts. However, dry weather is required during

ripening.

2.2 Soil Types

Light and well drained soils are best for groundnut production. Soils which form a hard crust on the surface when dry should be avoided as this hinders pegging and harvesting. Groundnuts do not yield well on acid soils which are low in calcium as this causes high incidence of 'pops' (pods without kernels).

3. Recommended Varieties

There are a number of improved varieties that are available on the Zambian market adapted for cultivation across the three agro-ecological regions. These varieties and their major characteristics are given in the table below.

Variety	Maturity days	Growth habit	Kernel colour	Kernel size	Type	Dormancy	Yield Ton/ha
Luena	90-100	Bunch	Tan-pink	Small	Span	Absent	1-2
Chipego	110-120	Bunch	Tan-pink	Small	Span	Absent	1-1.5
N. Common	90-100	Bunch	Tan	Small	Span	Absent	0.5-1.5
Comet	90-100	Bunch	Tan	Small	Span	Absent	0.5-1.5
Kadononga	90-100	Bunch	Tan	Small	Span/Vir	Absent	-
MGV-4	120-140	Bunch	Red	Medium	Vir	Present	2-3
MGV-5	130-145	Bunch	Tan	Large	Vir	Present	2-3
Chishango	130-145	Bunch	Tan	Medium	Vir	Present	2-3
Chalimbana	140-160	Runner	Tan	Large	Vir	Present	0.8-1.5
MGS-2	140-150	Runner	Tan	Large	Vir	Present	1.5-2.5
Champion	150-160	Bunch	Pink	Large	Vir	Present	2.5-3
Locals	120-160	-	-	-	Span/Vir	Pre/abs	-

Chishango is the only variety which is tolerant to Rossette.

Please note that there could be other varieties available in Zambia which have been developed by seed companies

Early maturing varieties such as Luena are suitable for planting in drier areas of agroecological region I and II.

4. Recommended Management Practice

4.1 Land Preparation

Land should be free of clods and coarse trash. The crop may be planted both on ridges and on flat. Planting on ridges alleviates harvesting difficulties and is necessary on fields with heavy soils prone to water-logging.

The seedbed may be prepared using a hand hoe or with ox plough.

4.2 Planting

Timely planting is the single most important determining factor for good yields. Although dry planting is done by some farmers, it is recommended to plant late maturing varieties after the first effective rains (late November to early December). Early maturing varieties should be planted by mid December.

Before sowing, groundnut seed should be treated with a fungicide dust to control seedling blights caused by soil bacteria and fungi. Fungicides will reduce fungal disease and damping off, and thus increase both quantity and quality of crop. Fungicidal dust, e.g. Thiram, has so far proved to be the best in Zambia, and gives adequate protection if coverage is good. The usual application rate is 120 grams of Thiram per 100kg of seed.

Groundnut seed should be handled carefully so that the testa (the outer skin of the seed) is not damaged.

Spacing

Spacing between rows or ridges should be 75 cm for spreading types. Early maturing, erect type varieties should be planted in closer spaced rows or ridges (50-60 cm). Spacing within the row should be 15 cm and sown at a depth of 5 cm. It is recommended to plant one seed per station.

In conservation farming, planting basins measuring 30cm long, 15cm wide and 15cm deep, spaced at 90cm between the rows and 70cm within the row should be prepared immediately after harvest. Plant 8-10 nuts across the basin and cover with 2.5-3cm of soil.

Spacing specifications for different varieties are given in the table below.

Variety	Recommended seed rate kg/ha	Spacing (cm)	Plants population /ha
Chalimbana	80	75x15	89000
MGV 2	80	75x15	89000
MGV 4	80	75x10	133000
MGV 5	80	75x10	133000
Chishango	80	75x10	133000
Champion	80	75x10	133000
Chipecto	60	60x10	167000
Luena	60	60x10	167000
Natal common	60	60x10	167000
Comet	60	60x10	167000

Note: The above recommendations are for sole cropped groundnut. For intercrops, use half the recommended seeding rates and adjust spacing depending on the companion crop .

4.3 Fertiliser Use

Groundnuts respond well to application of D-compound fertiliser (10:20:10+5). However when grown on a field previously grown with a well fertilized cereal crop, direct basal fertilizer application may not be necessary. Direct application of nitrogenous fertilisers including manure to groundnuts is not recommended.

In acid soils, lime application is recommended for good plant

growth and development. Where calcium is deficient, Calcitic lime is recommended to avoid pops (pods without seeds).

4.4 Weed Control

Groundnuts cannot compete effectively with weeds, particularly at the early stages of development, hence early removal of weeds is recommended. First weeding should be done 2 weeks after emergence, followed by a second weeding at 4 weeks after emergence and finally the last weeding at 6-8 weeks after emergence. Once pegging begins, especially in varieties that have a spreading growth habit, avoid mechanical weeding or earthing up so as not to disturb the developing pods. Instead, weeds at this stage can be controlled by hand-pulling.

Herbicides may also be used to control weeds. These include pre-emergence herbicides such as Lasso" (Alachlor).

Groundnuts like other legumes are subject to witch weed (Alectra species) attack which is similar to Striga on cereals. These appear as yellow flowering weeds that grow from the roots of the groundnut. This parasitic weed should be removed before seed setting to avoid further spread.

Rotation with non-legumes may reduce infestation.

4.5 Crop rotation practices

Fields for groundnuts should not have had groundnuts for at least 2 years and no other legume crop the previous season. This avoids buildup of pests and diseases. Groundnuts should best follow a maize, sunflower or cotton crop.

When planted on a field previously grown with a well fertilized cereal crop, the groundnut crop will benefit from residual fertilizer and it may therefore not be necessary to apply basal fertilizer.

5 Crop Protection

Groundnut is susceptible to a number of insect pests and diseases that reduce the yield and quality of the produce. There are measures that can be taken to minimize the damage.

5.1 Major Diseases and their control measures

Groundnut Rosette Virus (GRV)

This is a viral disease transmitted by aphids. Primary infection depends on the presence of infected groundnut plants. The symptoms of groundnut rosette disease are of three main types known as chlorotic rosette characterized by stunted plants with chlorotic, twisted and distorted leaflets; mosaic rosette characterized by mosaic symptoms on the younger leaflets and green rosette characterized by mild mottling on the young leaflets and a reduction in size and downward twisting of the margins of the older leaflets.



Groundnut rosette virus
infected plants

Control Measures

The occurrence of Rosette may be minimized by early sowing to allow the crop to escape the period when aphids are prevalent. The use of rosette resistant varieties such as Chishango will minimise crop damage. Roguing of volunteer plants and timely application of appropriate insecticides to control aphids are recommended.

Early and Late Leaf Spot of Groundnut (*Cercospora arachidicola* and *C. personata*)

Late and early leaf spots are considered to be the most serious and widespread diseases of groundnut. Where fungicides are not used, pod yield losses are as high as 50 %. The symptoms of early leaf spot are small necrotic spots of upto 10 mm in diameter and are dark brown on the underside of the leaflets and light brown on top. Necrotic areas are surrounded by a chlorotic or yellow halo.



Early leaf spot
on leaves

The symptoms of late leaf spot are similar in form and size to those of early leaf spot but the spots are dark brown on the underside of the leaflets and black on the upper side. The necrotic areas have a less pronounced halo or no halo. Early leaf spot lesions can also develop on stems, petioles, stipules and pegs. Early and late leaf spot may result in premature senescence and defoliation.



Late Leaf Spot
on leaves

Control Measures

Planting groundnuts in a rotation after two cropping seasons of cereals or sunflower, removal of infected crop residues and removal of volunteer plants reduces the incidence of leaf spots significantly. A spray of fungicides (Benomyl + Dithane M45) against leaf spots at 75 days after planting is recommended for commercial groundnut production.

Crown Rot and Yellow Mould of Groundnuts (*Aspergillus niger* and *A. flavus*)

The pathogens can be seed-borne with losses of between 20 – 80% recorded. Both fungi attack the germinating seeds and young seedlings from the soil. Usually, a rapid desiccation of emerging seedlings is the first symptom of crown rot and the affected tissue is covered by black spores. Seeds and seedlings attacked by *A. flavus* are rapidly reduced, shriveled and covered with brown-black, dried masses of yellow to greenish-yellow spores.



Crown rot infected groundnut plant

Control Measures

Use of disease-free seed and seed dressing with an appropriate fungicide will reduce incidences of disease.

Groundnut Rust (*Puccinia arachidis*)

The main symptoms are orange-colored lesions on the underside of the leaflets exposing many spores when ruptured. Pustules may also develop on the upper surface of the leaflets. Lesions can develop on other parts of the plant, including the flowers. Infected leaflets dry up but the plant remains green.



Rust on leaves

Control Measures

Practicing crop rotation, removal of all volunteer plants and use of appropriate broad-spectrum fungicides will reduce incidences of the disease.

Web Blotch of Groundnuts (*Phoma arachidicola*)

Web blotch tends to be more severe under cool (15-20°C), moist conditions. It is more severe on irrigated crops than on rainfed crops. The symptoms range from a tan to bronze net-like (webbed) pattern to dark brown blotches on the upper side of the lower leaflets. Petioles, stipules and stems can be infected by the fungus.



Web blotch on leaves

Control Measures

The removal of crop debris and volunteer plants will reduce incidence of the disease. Use of an appropriate fungicide is recommended.

Aflatoxin

Aflatoxin contamination and aflaroot (*Aspergillus flavus*), fungi of the *Aspergillus* group can invade groundnut tissues, producing toxic compounds known as aflatoxins. Contaminated produce can be poisonous to people and livestock, and cannot be exported. Aflatoxin contamination and the related aflaroot disease also affect groundnut seed, leading to low germination percentage and poor seedling establishment. Aflatoxin contamination can occur before harvest, during field drying and curing and in storage. Pre-harvest contamination is influenced by soil moisture and temperature, and is likely to be most serious under drought conditions. Post-harvest aflatoxin contamination occurs if the groundnuts become moist and / or damaged, and can occur at harvest or later.

Control Measures

The available control measures include the following:

- Avoid mechanical damage to pods or kernels during

weeding, harvesting, and storage

- Harvest groundnuts as soon as they are mature
- Proper curing or drying to reduce the moisture content to as low levels as possible. Normally this can be achieved by drying the pods in the sun for 6 – 7 days, taking care to cover them if it rains.
- Store groundnut in the shell, at low temperature, under dry conditions.

5.2 Major Insect pests and their control measures

Except for jassids, termites and aphids, groundnuts have relatively few pest problems. Apart from the direct damage, aphids may transmit the Rosette virus disease.

Under heavy aphid infestations, recommended insecticides may be applied.

6. Harvesting

The crop should be harvested when more than 3/4 of the pods are ripe. Yellowing of the foliage is a sign of ripening, but has to be confirmed by test harvesting at several places inside the field. The seed should fill the pods completely while showing the typical colour for the variety and the pods should expose dark markings on the inside linings of the shells.

If harvested early before they are fully mature, the kernels will be shriveled upon drying. But if left too long in the ground regardless of the variety, fungi infestation may occur affecting the quality of the kernels, while sprouting of the kernel is likely to occur in the Spanish type.

Harvesting is done by cutting roots, 10-15 cm below ground, with hoe or ox-drawn groundnut lifter. Ox-drawn groundnut lifters have

been developed to reduce the considerable labour requirement for harvesting (digging) groundnuts grown on flat as well as on ridges. These are implements manufactured locally in metal workshops.

7. Post-harvest Handling and Processing

Drying of the pods is very important to avoid fungal infection of the produce. Whole plants can be turned upside down and left in rows or small heaps in the field for about a week.

Do not leave them longer in the sun as this will cause sunburn of the kernels. Do not dry excessively on iron sheet roofs if you intend to use for seed as heat will reduce germination of seeds.

For farm saved seed, groundnuts intended for sowing **should be** hand shelled 1-2 weeks before sowing. Bear in mind that germination rate declines when seed is kept for more than one month after shelling. However, loss of viability can be partly reduced by storing seed in a cool dry place.

The crop should always be stored unshelled in a cool and dry place until used for consumption, sale or seed. Avoid storage in iron-roofed rooms as they become too warm. Protect the storage from rats and mice.

Apart from numerous common uses, oil for marketing can locally be extracted from groundnuts (oil type) using a spindle press. The oil cake is also used as cattle feed.

Plant residues are a very nutritious cattle fodder and should be stored for supplementary feeding at the farm.

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