



KENYA AGRICULTURAL AND LIVESTOCK RESEARCH ORGANIZATION

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FACTSHEET FOR TECHNOLOGY INNOVATORS WORKING WITH SMALL HOLDER

FARMERS IN KENYA

GROUNDNUTS



INTRODUCTION

- Groundnut (*Arachis hypogaea* L) (peanut) *Njugu karanga* is not a nut as the name may suggest but belongs to legume family, which also includes common bean, cowpea and soybean amongst others.
- A unique characteristic with groundnut is that the flowers are formed above ground, but after pollination they bend down and push into the soil. Pods develop in the soil and usually contain 2-4 seeds.
- In Kenya, the crop is grown in an estimated area of 18,000 ha, producing about 21000 MT of nuts valued at KES 2.6 billion annually. The main producing counties include Elgeyo Marakwet, Homabay, Kisumu, Kakamega, Busia, Siaya and Migori.
- Groundnut is rich in protein (26-28%), oil (38-50%), and some vitamins and minerals such as calcium, magnesium, phosphorus, potassium.

- The seeds are eaten raw, as roasted snack, used in confectionary, used in soups and made into sauces to accompany meat and starchy dishes. Groundnuts are used for extraction of oil, the pressed cake used as animal feed and production of peanut flour.
- Improved varieties in Kenya include: KEN-GNUT 1, Egerton GN-1 (L), Egerton GN-2 (R), Gathuku, Lihanga and Kanga.

SITE SELECTION

- Groundnut grow best in deep, well drained sandy or sandy loam soils rich in organic matter. Sandy soils are easily penetrated by pegs (young pods) and roots and allow easier harvesting without leaving pods behind in the soil.
- Optimum soil pH is between 5.3 and 7.3. The crop is sensitive to salinity, and high soil acidity (pH<5). Add calcium to maintain pH above 6 in acidic soils.
- Early maturing small-seeded varieties require 300-500 mm while the medium to late maturing large-seeded varieties require 1000-1200 mm rainfall per growing season.
- Optimum temperatures for growing groundnut ranges between 25 and 35° C. Cooler temperatures, especially at night, prolong the growing cycle.

LAND PREPARATION

- Groundnut requires a deep seedbed without compaction layers or a hardpan. Deep ploughing breaks the hardpan and leaves the soil easier for roots and pegs to penetrate and for the pods to be pulled from the ground at harvest.
- Use either hand hoe, tractor or oxen pulled disc plough to deeply dig the soil and break the big soil clods to a fine tilth 2-3 weeks before the beginning of the season.
- Groundnut can be grown either on flat beds or ridges.
- Use of ridges is recommended where there is a problem of water-logging. However, this requires additional labour for land preparation.
- Prepare the ridges shortly before planting and make the ridges flat on top. Beds are often spaced about 75 cm from the center of each bed. Establishing groundnuts on ridges also make harvesting plants easier.
- Planting on flat ground requires less labour for land preparation but can allow water to pool and can reduce groundnut stands in lowland areas during the rainy season.

PLANTING

Variety selection

- Groundnut varieties vary in terms of seed size, colour, shape, oil content, pod yield, maturity period and resistance to diseases.
- Select for varieties with high yield potential, good tolerance to diseases and with high target market acceptability.

- Groundnuts can be classified into two main growth habit types: bunch and runner.
- Runner types have trailing branches on the surface of the soil, produce pods all along the branches, possess dark green leaves, oblong shaped seeds, brownish seed testa, high yielding and late maturing.
- Bunch types are erect, possess light green coloured leaves, produces pods in cluster at the base of the plant and has round seeds with light red testa and are early maturing.
- Farmers can source certified seeds from Kenya Seed Company, Leldet Seed Company and Egerton University.

The following are some of the released groundnut varieties in Kenya

Official Variety release name	Optimal production altitude range (M) a.s.l	Duration to maturity (days)	Grain yield (t/ha)	Special attributes
Dove	1000-1600	90-100	2.5	<ul style="list-style-type: none"> • Tolerant to rosette disease and leaf spot • Small seed size & tan red colour
Kanga	1000-1600	100-110	2.5-2.8	<ul style="list-style-type: none"> • Tolerant to rosette disease and drought • Large seed sized & tan red colour • High oil content (42%) • It's a Virginia variety
Lihanga	1000-1600	115-120	2.5	<ul style="list-style-type: none"> • Tolerant to rosette disease • Preferable for confectionery
Gathuku	1000-1600	95-105	2.5-3	<ul style="list-style-type: none"> • Tolerant to rosette disease • Preferable for confectionery • Large seeded type
Egerton GN-2 (R)	500-1500	120-150	1.5-2	<ul style="list-style-type: none"> • Medium seed size • Red seed colour • Suitable for sandy and loamy soil • Preferable for oil extraction
Egerton GN-1 (L)	500-1500	120-150	1.5-2	<ul style="list-style-type: none"> • Brownish white seed colour • Large seeded • Preferable for oil extraction
Ken-G-Nut (I)	200-1000	101-110		<ul style="list-style-type: none"> • Mid brown seed colour • High oil content • Rosette disease tolerant

Planting

- Plant the seeds when the soil moisture is sufficient to guarantee good germination. However, avoid sowing seeds immediately after heavy rains since the seed can imbibe too much water, causing rotting.

Spacing

- The planting spacing is determined by the variety planted.
- The spacing for small seeded varieties is 45cm between rows and about 10cm between plants.
- For large seeded groundnut varieties, use a spacing of 60cm between rows and 15cm between plants. Plant your seed about 5cm deep in the soil.

SOIL AND WATER CONSERVATION

Tied ridges

- Tied-ridges are soil and moisture conservation structures that involve the construction of small rectangular basins formed within the furrow of cultivated fields mainly to harvest and increase storage of rain water and allow more time for rainfall to infiltrate the soil.



Groundnut planted in tied ridges (from Mukunga et al., 2019)

SOIL FERTILITY REQUIREMENTS AND MANAGEMENT

- Groundnut crop like other crops requires to be supplied with sufficient nutrients, both macro and micro nutrient elements for optimum growth.
- Soil fertility can be improved through application of organic fertilizers/manures and inorganic or chemical fertilizers.
- Soil testing is recommended for proper decision on the type and amount of fertilizers to apply.
- In case no soil test has been done, apply about 40-50 kg of di-ammonium phosphate (DAP) fertilizer per acre of land or 2 soda bottle-tops level full of DAP fertilizer for every one square metre. Mix the fertilizer well with soil before planting the groundnut seed.

- In addition to mineral fertilizers, farmers can also apply manure to supply nutrients, improve soil health and soil structure.
- Add about 2 handfuls of well decomposed manure for each planting hole / hill and mix thoroughly with soil before planting.

ROUTINE CROP MANAGEMENT PRACTICES

Weed control

- Early removal of weeds is important in groundnut because the crop cannot compete effectively with weeds especially during the first 6 weeks after planting.
- Carry out the first weeding before flowering (within the first 45 days after planting) followed by the 2nd weeding during pegging. Pay extra attention when walking through a flowering groundnut field in order not to disturb the flowering plants.
- Avoid covering the plant with soil during weeding as it could lead to increased disease incidences such as white mould, reduced flowering and pod development hence reduced pod yield.
- Avoid weeding using a hoe during flowering and pegging so as not to disturb any developing pods. Therefore, hand pulling of weeds is recommended during pegging.
- Post-emergence herbicides may also be used to eliminate weeds.

Irrigation

- Groundnut requires adequate moisture especially during crucial growth stages such as plant emergence, flowering, pegging and pod development.
- Irrigate your crop during these crucial growth stages in case of absence of adequate rainfall.
- Different irrigation methods can be used including overhead (sprinkler), drip and furrow irrigation.
- Avoid flood irrigation as it wastes a lot of water, results in overwatering and trampling of plants in the field by persons engaged in irrigation.

Top dressing

- In sandy soils, calcium is critically required during the pod formation stage and lack of it results in empty pods. Top dress with rock phosphate at a rate of 200kg/ha just before flowering.
- Avoid topdressing after flowering to reduce damage of flowers and developing pods.

Crop protection

- There are number of pests and diseases that affect groundnut causing considerable yield losses. Follow regularly the recommended protection measures against diseases and insect pests during the cropping season.

Crop rotation

- Avoid growing groundnut crop in the same land continuously to evade build-up of pests and diseases.
- Practice crop rotation of 3 years or longer to reduce disease, pest and weed problems.
- Rotate groundnut with non-leguminous crop such as cereals (maize, pearl millet and sorghum) and root crops (cassava and sweet potatoes).
- Avoid crop rotating groundnuts with other legumes, tobacco, and tomatoes as it would lead to build-up of nematodes and soil-borne diseases.

Intercropping

- Intercropping groundnuts with other compatible crops provides farmers with alternatives to diversify their farming systems and improve soil fertility through nitrogen fixation.
- Groundnut is tolerant to shading and is therefore suitable for intercropping farming system.
- Suitable crops for intercropping with groundnut includes; cereals, cotton, bananas, pigeon peas, coconut, palm oil and cocoa.



2 rows of ground nut intercropped with one row of maize

DISEASE AND PEST MANAGEMENT

Arthropod pests

Termites:

- Termites damage groundnuts at all stages of growth but are more serious near harvesting time when the soil is dry.

- Termite infestation usually occur in patches in the field which result in yield and quality reduction. Termite infested kernel are also more susceptible to mold and aflatoxin contamination.

Management

- Control termites by deep ploughing and incorporating crop residues into the soil during land preparation.
- Apply chemicals such chlorpyrifos on infested areas using the recommended rates.

Groundnut aphids (*Aphis craccivora*)

- Young colonies of aphid concentrate on growing points of plants and are regularly tended by ants. They suck sap and plant juices from the plant's growing points.
- Aphids are vectors of groundnut rosette disease and can significantly reduce yield, especially during drought.



Aphids on groundnut shoot. (courtesy of Plantwise Knowledge bank, CABI)

Management

- Practice early planting to allow plants to grow and mature before build-up of aphid population.
- Dense planting may also provide a barrier to aphids penetrating in from field edges.
- Remove and destroy all virus-infected plant material after harvest and any volunteer plants or weeds that harbour viruses.
- Practice crop rotation.
- Use sticky traps to monitor the aphid population in the field.
- Spray soapy solution (10-15 tablespoon full of liquid soap in 20lt of water).
- Use neem based botanical insecticides such as Nimbecidine at 20ml in 20L of water.

Leaf miner (*Aproaerema modicella*)

- The groundnut leaf miner is a key pest of groundnut. The damage to groundnut is caused by both larval and adult stages.

- The adult is a tiny moth measuring about 6 mm in length with brownish grey coloured wings. The larvae mine the leaves and feed inside the leaflet. Initially, short blister-like mines can be seen on the upper side of the leaflets.
- The larvae come out of the mine after 5-6 days and migrate together to nearby leaves to feed and pupate in the webbed leaves.
- The mined areas in the leaf become dry. In severe infestation, the entire foliage dries and gives a burnt appearance.



Leaf miner damage on groundnut leaf (courtesy of Plantix)

Management

- Intercrop groundnut with trap crops such as pearl millet.
- Practice crop rotation with non-leguminous crops such as maize, cotton and sorghum.
- Remove the alternative hosts and weeds such as Lucerne and amaranthus.
- Apply the recommended chemicals when notice 5 larvae per plant at the seedling stage.

Diseases

Groundnut rosette disease

- Groundnut rosette is an important disease of groundnuts that is widespread in all major growing areas.
- Disease is transmitted by aphids feeding on the crop.
- The affected plants are stunted, have a bushy appearance, reduced leaflets size and show some mottling.
- When older plants are infected the symptoms are generally restricted to a few branches or the apical portion of the plant.

Management

- Use resistant varieties.
- Control of aphids using recommended insecticides to prevent spread of the disease.
- Early planting and close spacing of rows can reduce spread of the disease.

- Intercropping with beans or sorghum is effective in reducing the disease incidence.
- Plant at the onset of rains.
- Remove volunteer groundnuts crops in the field prior to planting.
- Practice crop rotation i.e. groundnuts with cereals (sorghum, maize and millet).
- Use appropriate spacing.



Groundnut rosette disease (source : CABI Knowledge Bank)

Leaf spot disease

- Early leaf spot occur as early as 2 weeks after crop emergence. Symptoms include circular, dark brown spots on the upper surface with yellow halos on the lower surface of the leaflets.
- Severe attacks can cause heavy defoliation and result in huge yield loss.
- Late leaf spot occur later in the season. The symptoms include circular lesions with a less brilliant yellow halo on the lower leaf surface. Late leaf spot cause less yield reduction compared to early leaf spot.

Management

- Use tolerant varieties
- Practice cultural practices such as crop rotation, burying crop debris during land preparation and early sowing to significantly reduce the incidence of the diseases.
- Apply fungicides such as mancozeb at recommended rate immediately when lesions are first seen.



Groundnut early leaf spot



Late leaf spot

Rust (*Puccinia arachidis*)

- The disease attacks all aerial parts of the plant. The disease is usually found when the plants are about 6 weeks old.
- Small brown dusty pustules appear on the lower surface of leaves while brown spots appear on the upper surface of leaves. The rust pustules may also be seen on petioles and stem.
- In severe infection lower leaves dry and drop prematurely. The severe infection leads to production of small and shrivelled seeds.

Management

- Remove volunteer groundnuts crops in the field prior to planting.
- Sow early with the first rains.
- Keep field free of weeds.
- Use seed dressing fungicides before planting as the disease is seed borne.
- Apply fungicides such as chlorothalonil on the crop at recommended rate immediately when symptoms.



Rust in groundnut leaf

HARVESTING

Harvest timing

- Groundnuts are mature when 70-80% of the inside of the pods shells have dark markings and the kernels are plump, with colour characteristic of that variety.
- Avoid harvesting too early, because the seeds will shrink when drying which lowers the yield, oil content and quality of the seed and increases chances of aflatoxin contamination of the seeds/pods.
- Late harvesting also reduces yield because higher proportions of pods are left in the ground due to the pegs being weak and the pods breaking off.
- Uproot randomly some few plants and shell the pods. Examine whether majority of pods have dark markings inside the shell and the seeds are plump and the correct colour for that variety. If so, the groundnuts are mature and ready for harvest.

Lifting groundnuts from soil

- Lift the plants from the soil by hand only when harvesting bunch/erect groundnut varieties in sandy, loam soils which are well drained. This will avoid losing some pods in the soil.
- For heavy or dry soil and spreading/runners varieties use hoe or ox plough to lift the pods. Set the plough to cut below the pods, which are 10-12 cm below the surface.
- Shake the plants after lifting to remove excess soil from the pods, particularly when the soil is wet or heavy.
- Soil stuck to the pods will lengthen drying times and produce conditions for fungal growth.

POST-HARVEST MANAGEMENT

Drying and stripping

- Stake the harvested plants in the field and to allow them to dry in the sun and air for 1-3 weeks, before shelling the pods. Poor drying can induce fungal growth and aflatoxin contamination.
- Use sticks to gently beat the dried harvested plants in order to strip the pods from the plants. Winnow to separate the pods from the chopped vines.
- Shelling is usually done by hands. However, hand-operated machines are currently available. Care should be taken to prevent cracking of the kernels.

Storage

- Store your groundnuts in their shell for long postharvest life.
- Ensure that the pods have dried to 7–8% moisture content before storage. Avoid storing pods with high moisture content.
- Sort to remove, poor, damaged, shrivelled, rotten, or fungus-infected pods before storage.
- The storage room should have good ventilation to avoid fungal growth on the pods/seeds.
- Gunny bags (sisal) are recommended for packaging groundnuts for storage. Avoid use of polythene or polypropylene bags as they restrict air flow which can encourage fungal growth. Also, avoid covering bags with plastic or tarpaulin (canvas) because can encourage moisture build up.
- Store your bags away from the ground on wooden slats to avoid dampness.
- When stacking bags in the store, leave a gap left between stacks to allow ventilation. Avoid stacking more than ten bags high.
- Dust the seeds with insecticide during bagging and then apply insecticide also between each layer of bags during stacking.

Aflatoxins

- Aflatoxins are toxic substances produced by certain types of fungi (*Aspergillus flavus* and *A. parasiticus*), which can grow on groundnut and other crops such as maize.
- Contamination can occur at any stage from pre-harvest to storage.
- The fungi (soil-borne and air-borne) enter the seeds through pod wall and seed coat, mechanical injury to pods during growing and harvesting, insect and nematode damage.
- Grains and pods stored before they are properly dry, or in damp conditions, can get the contamination.
- Aflatoxins can cause severe life-threatening illness such as hepatitis and liver cancer.

Control of Aflatoxin contamination

- Plant healthy seeds
- Avoid damaging pods during crop growth
- Avoid end-of-season drought through supplementary irrigation (if possible).
- Remove dead plants from the field before harvest.
- Harvest the crop immediately as it matures.
- Remove soil from the pods before leaving to dry.
- avoid long-term contact of pods with soil after harvest.
- Ensure that the correct drying procedures are used such as drying of groundnut pods tarpaulin sheets rather than on bare ground.
- Practice stripping the pod immediately after drying.
- Remove damaged, shrivelled, or rotten pods before storage.
- Store the pods under dry, well ventilated conditions to avoid re-humidification of pods.
- Avoid pod damage by insects.

MARKETING

Groundnuts Quality and marketing

- The quality of groundnut is determined from selection of seed through to production in the field and postharvest practices.
- Good market quality attributes include varietal purity, low moisture content (7–8%), high shelling percentage, low level of damaged pods/ kernels and no aflatoxin contamination.

Groundnut markets include

- Retailers
- Wholesalers
- Processors

- Exporters
- Offtakers
- Supermarkets

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