

The Groundnut Value Chain: Management Practices That Boost Production



Groundnut (*Arachis hypogaea* L.) is a leguminous oilseed crop cultivated in the semi-arid and subtropical regions of the world; it is a member of the genus *Arachis* in the family leguminosae fabaceae which has replaced the traditional Bambara groundnut (*Vigna subterranean*) in many areas. Groundnut is usually grown as a smallholder crop in the semi-arid tropics under rainfed conditions.

The total world groundnut output in 2016 was estimated at 43.98 million metric tonnes (FAO,2016) out of which, Nigeria accounted for about 3.58 million metric tonnes (FAO,2016). Nigeria is considered the third largest producer of groundnut in the world after China and India with an output of 16,422,832, 7,462,000 and 3,581,800million metric tonnes respectively in 2016. The major groundnut producing states in Nigeria are Kano, Katsina, Kaduna, Jigawa, Sokoto, Zamfara and Kebbi in the Northwest; Adamawa, Bauchi, Yobe and Borno in the Northeast; and Benue, Plateau, Taraba, Nasarawa, FCT Abuja, Kogi, Niger and Kwara in the Central Zone. The recommended varieties and planting time of each of these agroecologies are presented below:

Agroecological zones (AEZ)	State	Recommended Varieties	Planting date
Wet Season			
Sahel Savanna	Sokoto, Yobe, Borno, Jigawa	Samnut 24 Samnut 25 Samnut 26	Early July
Sudan Savanna	Kebbi, Sokoto, Zamfara, Katsina, Kano, Jigawa, Yobe, Borno, Bauchi	Samnut 24 Samnut 25 Samnut 26	End of June to early July
Northern Guinea Savanna (NGS)	Kebbi, Zamfara, Katsina, Kano, Kaduna, Bauchi, Gombe, Adamawa, Niger	Samnut 21 Samnut 22 Samnut 23 Samnut 24	Mid- to end June
Southern Guinea Savanna (SGS)	Niger, Kwara, Nasarawa, Borno, Bauchi, Gombe, Benue, Taraba, Adamawa	Samnut 10 Samnut 21 Samnut 22	1st Planting: May 2nd Planting: End July
Derived Savanna	Kwara, Nasarawa, Benue, Taraba, Kogi, Oyo	Samnut 10 Samnut 21 Samnut 22	1st Planting: May 2nd Planting: End July
*Dry Season	All states	Samnut 24 Samnut 25 Samnut 26	End October or Early February

*The challenge in the dry season is the low temperature during Harmattan months of December to January. Low temperatures significantly affect germination and growth.

The crop is also being called different names in many local languages, namely, peanut earthnut, goober peas, monkey nut, pygmy nut and pig nut. Similarly, despite its names and appearances, it is not considered as nut but rather a legume with high oil and protein content. Groundnut seeds (kernels) contain 40-50% fat, 20-50% protein and 10-20% carbohydrates, groundnut seeds are nutritional source of vitamin E, niacin, folic acid, calcium, phosphorus, magnesium, zinc, iron, riboflavin, thiamine and potassium.

Constraints and Management Practices

Before the fossil oil boom, groundnut was one of the major sources of revenue and foreign exchange earnings. However, in the post-1967 period, the combined effects of drought, increasing prevalence of diseases such as rust, leaf spots and groundnut rosette disease (GRD) have caused a decline in groundnut production. Due to insufficient groundnut stocks, processors and marketers in Kano State source groundnut from as far as Chad Republic. The year-round demand for groundnut means farmers can increase production without any fear of market glut.

Biotic and abiotic constraints: Groundnut rosette disease, early leaf spot (ELS), late leaf spot (LLS) and rust are the major biotic constraints responsible for low yield of groundnut in Nigeria. Groundnut rosette is one of the most destructive diseases that affect groundnut, and wiped out more than half of the groundnut cropped area Nigeria in 1975. Resistant cultivars provide the most appropriate means of controlling the diseases, especially for smallholder farmers. Therefore, development and cultivation of rosette-resistant, high yielding groundnut varieties with optimal duration is important to enhance and stabilize productivity.

Early maturing varieties resistant to several biotic stresses that have been released are: SAMNUT 24 (ICAR19BT) in 2011, and SAMNUT 25 and SAMNUT 26 in 2013. Some newly released groundnut varieties in Nigeria with large kernel size and high fodder yield potential and with resistance\tolerance to important constraints are listed below:

- Samnut-21: Medium-maturing (115-120 days) with dual purpose (kernel and haulm), high pod yield (2.5 t ha⁻¹), high haulm yield (4-5 t ha⁻¹) and good oil content (51%).
- Samnut-22: Medium-maturing (115-120 days), dual purpose (kernel and haulm), high haulm yield (4-5 t ha⁻¹), high pod yield (2-2.5 t ha⁻¹) and good oil content (45%).
- Samnut-23: Early-maturing (90-100 days), 2 t ha⁻¹ haulm yield, good pod yield (2-2.5 t ha⁻¹) and high oil content (53%) and quality.
- Samnut-24: Early-maturing (80-90 days), good haulm yield (2.5-3 t ha⁻¹), vigorous plant growth, good yield (2-2.5 t ha⁻¹) and high oil content (53%).
- Samnut-25: Early-maturing (80-90 days), good yield potential (2.5-3 t ha⁻¹), highly resistant to rosette and moderately resistant to ELS and LLS disease, with high oil content (51.5%).
- Samnut-26: Early-maturing (80-90 days), highly resistant to rosette and moderately resistant to ELS and LLSs disease, good yield potential (2-2.5 t ha⁻¹) and good oil content (50.9%).

It is recommended to treat groundnut seeds with chemical fungicides to avoid rot and pre- and/or post emergence damping off of seedlings due to fungal attack. Some insects are also known to attack germinating or emerging groundnut seedlings. In addition to seeds and seedling protection, seed treatments also reduce seed borne infections during seedlings germination and allow initial vigorous growth. To control the pathogens causing seed and seedling diseases, it is necessary to coat the seed with either Thiram® or Mancozeb® (50% a.i. at 3 g kg⁻¹ seed) before sowing. Seed treatment before planting ensures the establishment of good plant stand and, subsequently, good yield. Care should be taken while mixing these chemicals as they are poisonous, and the directions for use indicated on the label should be strictly adhered to.

Groundnut Diseases and their Control

Groundnut production is adversely affected by a large number of fungal, viral and bacterial diseases. The major diseases in Nigeria include groundnut rosette, ELS, LLS, rust and aflatoxin contamination.

A. Groundnut Rosette Disease

Groundnut rosette disease, a viral disease transmitted by aphids, is the most common and most significant disease of groundnut in all regions where this crop is grown. It is widespread in SSA and has been a major factor in the decline of the Nigeria groundnut pyramids. Symptoms: The disease can manifest two types of symptom: green or yellow (chlorotic). The affected plants are stunted and present a bushy appearance with a marked reduction in leaflet size with visible mottling.

- Yellow (chlorotic) rosette causes plants to initially develop a faint mottling on young leaves. Subsequently, leaflets are yellow with green veins. Plants infected when young produce progressively smaller, distorted, curled and yellow leaflets, while the symptoms in older plants are generally restricted to a few branches or the apical portion of the plant.

- Green rosette disease shows middle mottling on young leaflets with some leaf curling, but leaves are not distorted. Plants infected when young are severely stunted and dark green in color. Total yield losses have been reported in susceptible varieties. Early infected plants produce no yield and there is no control once a plant is infected.



Groundnut green and chlorotic rosette disease.

A 100% loss in pod yield due to either chlorotic or green rosette disease may result if infection occurs before flowering. Control of aphids will prevent further spread of the disease.

Management 1. Chemical control:

- Spray the entire plant with insecticides, 14 days after emergence (usually 5 ml per 2 l of water, but check the label for instructions) and then at 14-day intervals with a total of three sprayings.

2. Cropping practices:

- Planting should be done as soon as there is enough moisture in the soil
 - Close planting should be adopted
 - Intercropping with cereals (maize, millet or sorghum) has been found to be effective in reducing the disease incidence
- Note: Early sowing and close spacing of rows reduce disease incidence

3. Host plant resistance:

- Rosette-resistant varieties should be used for planting. Resistant varieties (Samnut 24, 25 and 26) have been released in Nigeria.

B. Early and late leaf spots

Early leaf spot (*Cercospora arachidicola* Hori) and LLS (*Phaeoisariopsis personatum* Berk & Curt) are the most damaging diseases of groundnut worldwide. Besides adversely affecting the yield and quality of pod, they also affect the yield and quality of haulm. Although just one leaf spot pathogen usually predominates in a production region, both leaf spot species are generally found in a single field. Shifts in leaf spot species have also been observed over a period of years.

Symptoms: Early leaf spot causes small necrotic flecks (spots) to develop which usually have light to dark-brown centers and a yellow halo. The spots may range from 1 mm-10 mm in diameter. Sporulation is on the adaxial (upper) surface of leaflets. In LLS, small necrotic flecks develop that

then enlarge and become light to dark brown. The yellow halo is either absent or less conspicuous in LLS. Sporulation is common on the abaxial (lower) surface of leaves. Farmers often confuse leaf spots with harvest indicators, making mitigation measures difficult. The disease(s) may be expressed on both the leaves and stems, which results in poor crop stand and yields.



Symptoms of foliar diseases (ELS, LLS and Rust).

Management Cultural control

- Crop rotation with crops like maize has been shown to provide partial management of leaf spots
- Early sowing has been shown to reduce the severity of leaf spot diseases. The date of sowing should be adjusted to avoid conditions favorable for rapid disease development.
- Burying all groundnut crop residues by deep plowing will reduce initial inoculum. Chemical control
- Multiple applications of a fungicide such as benomyl, captafol, chlorothalonil, copper hydroxide, mancozeb or sulfur fungicides may control ELS and LLS. However, carbendazim (0.05%) has been found to control both leaf spots very effectively.
- Three sprayings of 0.2% chlorothalonil at intervals of 10-15 days starting at 40 days after germination up to 90 days provides effective control to ELS and LLSs. Use of resistant lines
- Grow cultivars tolerant to LLS: Sources of resistance to both ELS and LLSs have been identified in groundnut and used to develop varieties with resistance. Recently released groundnut varieties in Nigeria are tolerant to foliar diseases.

C. Groundnut Rusts Rust

(*Puccinia arachidis* Speg.) is one of the important foliar diseases that reduces seed quality and causes substantial losses to groundnut production worldwide. If this occurs along with LLS over the losses can be as much as 50%. Symptoms: Rust pustules (spots) are orange colored and appear on the lower surface of leaflets. On rupturing, they release masses of reddish brown spots. In contrast to the rapid defoliation associated with leaf spots, leaves infected with rust become necrotic and dry up but tend to remain attached to the plant.

Management Cultural Control

- Crop rotation and field sanitation. This helps to reduce the initial inoculum in the soil
- Strict plant quarantine regulations should be enforced to avoid the spread of rust on pods or seeds to disease-free areas
- Early sowing minimizes incidence of the disease
- Intercropping cereal (maize, pearl millet or sorghum) with groundnut has been found useful in reducing the intensity of rust.

Mechanical Control

Destroy volunteer (self-sown) groundnut plants and crop debris to reduce/ limit primary source of inoculum.

Chemical Control

There are some chemicals effective for the control of rust disease, and these should be applied as soon as the symptoms are noticed. Some of the chemicals used are Chlorothalonil 0.2%, Mancozeb 0.25% and Hexaconazole/ propaconazole.

Use of resistant varieties

In places where rust disease is endemic (common), the use of resistant/ tolerant varieties in combination with a little chemical control provides the best results. Rust-resistant varieties have been released in Nigeria.

D. Aflatoxins

Aflatoxins are a group of toxic metabolites produced by the fungi *Aspergillus flavus* and *Aspergillus parasiticus*. Aflatoxins are some of the most potent toxic substances found in foods and feeds. Scientific research shows that aflatoxin can cause various types of cancer in both animal species and humans. It has been reported to cause severe illness and death in many parts of the world. Chronic intake of aflatoxin in animals can lead to poor food intake and weight loss.



Aflatoxin contamination in groundnut

Aflatoxin contamination can occur in the field, during postharvest drying and storage, and even during transportation. Crop husbandry practices, mechanical damage, insect and bird damage, climatic conditions (drought, stress or excessive rainfall), and soil factors, in addition to host-plant susceptibility, significantly

Recommended postharvest practices to manage aflatoxin infection Harvesting:

- Do not delay harvest when groundnuts have reached maturity
- Immediately after harvesting, pluck the pods off the haulms and place to dry as soon as possible
- Harvest carefully to avoid mechanical damage. This is particularly important if hand hoes are used to harvest the pods.
- Avoid field drying of groundnuts when attached to haulms as aflatoxins increase with delays of produce in the field.

Drying

- Do not dry produce in contact with soil. Use clean sheets, for example polythene sheets or tarpaulin or mats made of papyrus, cemented grounds or raised structures
- Dry harvested pods to moisture content level below 13% • Avoid mixing diseased or infected pods with healthy ones. Shelling
- Separate out immature pods as well as those infested with pests and diseases • Do not shell by beating or trampling on groundnut in shells
- Manual or motorized shelling is recommended but care should be taken that the shellers do not damage the pods. Use hand or motorized shellers specifically designed for groundnuts

- Do not sprinkle water on dry pods while using mechanical shellers. Instead, adjust (where possible) the space between blades and the sieve according to pod size to reduce breakage
- Remove shriveled, discolored, moldy and damaged grains from the lot including groundnuts with damaged testa and dispose of them.
- Remove dust and foreign material which can be a source of contamination. Storage
- Properly dry groundnuts for safe storage to moisture content to less than 10%
- Place them in packages that will maintain suitable environment and prevent or restrict moisture pick-up and insect/rodent infestation
- Use new/clean gunny or polybags to store the groundnuts
- Put only clean sorted kernels into the bags
- Do not place bags directly on floor
- Do not heap groundnuts in shells/pods on the floor/ground inside storage structure
- Maintain proper storage facilities (well-ventilated, dry and with low relative humidity) and take care not to expose produce to moisture during transport and marketing
- Control insects and rodents during storage
- Do not mix new produce with old stock.

Source:

<http://oar.icrisat.org/8856/1/2015-084%20Gnut%20Production%20in%20Nigeria.pdf>

<http://www.fao.org/faostat/en/#data/QC>