

1. Cowpea and groundnut seed production practices

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Introduction

The most important prerequisite for good crop production is the availability of good quality seeds of high yielding varieties, adapted to the growing area, and preferred by the farmers. The quality of seeds alone is known to account for an increase in productivity of at least 10–15%. To achieve this high quality, all the factors in production that will affect viability, and genetic purity should be taken into account. The production techniques should be mastered and the environmental conditions (soil fertility and climate) known.

Cowpea and groundnut are both self-pollinated crops and seed production does not differ significantly. Agronomic practices in both crop and seed production are similar to those used for producing food grain. The difference lies in the standard of the output. Good quality seeds should meet the following characteristics:

- Genetic purity and uniformity conform to the standards of the particular cultivar.
- Seeds are disease-free, viable, and free from admixtures of seeds of other crops and weeds, and inert material.
- Seeds are uniform in size, shape, and color.

To be successful, seed producers must understand seed quality, know how it is achieved and maintained, and how they can process the seeds from harvest to their delivery to the farmers.

Characteristics of seed lot quality

Improved seeds have five related components.

Genetic purity: Genetic superiority is inherent in the variety and has an effect on the maturity date, disease and insect resistance, and nutritional quality. Protecting genetic purity depends on accurate record keeping, the use of clean equipment, and good handling.

Crop purity: Crop purity means that crop is free from contaminants, including the seeds of weeds and other crops, and inert material.

Seed health: Seed health refers to the absence of seed-borne diseases existing on or in groundnut or cowpea seeds.

Germination: Germination is the measure of a seed's ability to produce a normal seedling when planted in ideal conditions (with optimal temperature and moisture plus good aeration). The seed germination test is the universal standard measure of seed quality.

Vigor: Seed vigor has an important implication in the emergence rate and the final plant stand. According to their vigor, seeds can withstand stress during germination and early seedling development.

Classes of seeds

Breeder seeds: This is the primary source for the entire system. They are usually produced by crop breeders or at least under their supervision. Breeder seeds are usually produced in a limited quantity at a time (from about 100 kg to 2–3 t/variety). This is to ensure high quality. Breeder seeds should have not less than 100% variety purity.

Foundation seeds: These are the seeds produced from the breeder seeds. An enlightened farmer can produce foundation seeds under a contract agreement with a national seed regulation body, such as the National Seed Service (NSS). Other agencies such as research institutions, ADPs, and NGOs can also be commissioned to produce foundation seeds. Foundation seeds should have 99.9% varietal purity and are used for certified seed production.

Certified seeds: Certified seeds are produced from foundation seeds, usually by seed companies and other private seed producers certified by the NSS. Production is guaranteed by inspection and certification by an agency independent of the seed production agencies. Certified seeds are used for grain production.

Preplanting and planting decisions

Seed selection: It is important to use genetically pure seeds of a given variety from a reliable source (registered seeds). Pure seeds should be obtained from the breeder or the research institution responsible for developing the variety, or from registered growers in your area.

Field selection: The choice of field is an important component of good seed production. Cowpea is less demanding than groundnut and can be grown in soils of diverse types, ranging from predominantly clay to predominantly sand, and from acidic to basic. For both cowpea and groundnut, the best soil is a well-drained, sandy loam to clay loam soil with pH 6 and 7. To manage disease, insects, and weeds, the history and crop rotation of the field should be known. It is important to select a field that was not planted in the previous year with another variety of cowpea (or groundnut, in the case of groundnut seed production). The field should be isolated from other fields of the same crop by at least 3 m for certified seed production and by 5 m for foundation seeds.

Equipment tune-up: Planting equipment should be tuned-up to maximize planting efficiency with uniform plant spacing and planting depth.

Land preparation: Land should be prepared as early in the season as possible. The land should be cleared of old crop residues that could be burned. For cowpea that is planted later in the season, herbicide can be used before planting. Generally, deep plowing and harrowing once or twice will provide good root growth that enables plants to get moisture from the soil. The recommendation for groundnut production in drier areas is a flat seedbed and in the forest, ridges 1 m apart and running across the slope.

Fertilization: For good cowpea or groundnut seed production, phosphorus and potash fertilization are required, notably in the poor soils of the Sudan savanna and Sahelian regions of West Africa. Fertilizer applied at the rate of 200 kg/ha of 0-5-15 or a combination of 30–40 kg/ha P_2O_5 and 25–30 kg/ha K_2O is sufficient to ensure good growth of the cowpea crop. The fertilizers should be incorporated in the soil before planting. Top dressing is not advised. For groundnut, the application of 54 kg/ha P_2O_5 and 25 kg/ha K_2O is required to get good crop production. Fertilizer can be applied before or immediately after planting. If available, organic manure at the rate of 3 t/ha should be applied.

Method of planting and spacing: Both cowpea and groundnut can be grown in flat beds or on ridges, depending on the field conditions. For cowpea, a spacing of 75 cm between the rows and 20 cm between plants within the rows is used for the medium maturing varieties; spacing of 50 cm between the rows and 20 cm between the plants within the row is used for early maturing varieties. The recommended spacing for groundnut is 75 cm between the rows and 25 cm between the plants within the rows.

Planting date: For groundnut, planting should be done as soon as possible after the onset of the rains. Early planting is recommended to avoid rosette attack. For cowpea, planting is done when there is sufficient moisture in the soil to allow germination and when there will be enough time for the varieties to mature after the end of the rainy period. In general, IITA recommends that the ideal time for planting medium maturing varieties is about 60–75 days before the rains are expected to end and for extra-early varieties, about 45–50 days before the end of the rains.

Growing season decisions

Weed control: It is important to keep the field for seed production free of weeds from planting to harvesting. All available and effective weed control methods should be used according to growing or field conditions. Mechanical weeding, hand weeding, preemergence and postemergence herbicides can be adopted to keep the fields weed-free.

Disease control: All the available control methods should be used to reduce disease incidence. Treatment of seeds with chemicals is recommended for both groundnut and cowpea. Fungicides are used to control fungal disease in cowpea. For groundnut, two main diseases are reported in Nigeria: *Cercospora* leaf spot and rosette during the growing period. Resistant varieties are available for their control.

Insect control: To ensure good quality and quantity, it is important to control insects in both groundnut and cowpea. Millipedes and termites are the most damaging for groundnut. The most important insect pests of cowpea include aphids, flower thrips, *Maruca* pod borers, and pod sucking bugs. Insecticides are recommended to prevent crop losses. In general, the number and the type of insecticide sprays will depend on the nature and severity of infestation and also the cowpea variety. However, 3–4 insecticide sprays are recommended for cowpea seed fields.

Rogue off-type plants: Field inspection is one of the important activities in seed production. Off-type plants are removed from the field as soon as they are seen. Off-types have different leaf types, different flower colors, different pod colors, or different maturity periods compared with the variety being multiplied. Not more than 0.5% of off-type plants should be found in a good seed production plot after roguing has been completed. Diseased plants should also be discarded.

Harvesting

Harvesting should be timely when most pods are dry. For cowpea, multiple picking may be necessary.

Digging and harvesting for groundnut

Groundnut is indeterminate in growth habit. Usually, better germination is obtained when seed fields are harvested one week earlier than commercial fields. Optimum harvest dates differ from one variety to another and from one set of growing conditions

to another. Harvesting very early is not recommended. Although immature seeds can grow, their germination is slow, their vigor is low, and their survival can be difficult in stressful growing conditions. Early harvesting can decrease the seed value. Too late harvesting also has an adverse effect on seed quality (deterioration of the pods, more mechanical damage to the seeds, increased number of seed pathogens). Harvesting is recommended when at least 70% of the seeds are close to or at maturity, i.e., when most of the pods are in the brown and early black stages.

Some environmental elements can influence seed quality during harvesting because of high moisture content (35–60%). High temperatures will cause physiological heat damage that will reduce germination and vigor. A good rule of thumb is to harvest groundnut as soon as possible after seed moisture has reached 20 to 25%.

Threshing/decorticating

Threshing and decorticating can be done by hand or by using a hand-operated decorticating machine. Care should be taken to prevent cracking the kernels. For cowpea, it is possible to identify off-type seeds (different seed coat colors, different seed sizes).

Big seeds versus small seeds

In general, many farmers and seed producers think the bigger the seeds, the better the seed quality. Others believe that smaller seeds germinate faster and are therefore better than larger seeds. Although this is true, it does not mean that larger seeds are poor quality but they take more time to hydrate and germinate. Small seed size is usually associated with immaturity. This is not always true, as some larger seed sizes can be immature.

Postharvest handling of seeds (curing)

Groundnut should be cleaned before being dried. Cleaning and spreading of seeds will reduce drying time and costs. Seeds can be damaged by excessive drying, rapid drying, or drying at high temperatures. For cowpea, the moisture content should not be more than 10%.

Seed storage

Groundnut seeds should be stored in a cool, dry, airy environment. They can be shelled soon after harvest and stored in bulk containers. Continuous airflow should be ensured.

Cowpea seeds should be properly stored to avoid attack by bruchids. Seeds should be stored using fumigants in closed containers or in closed rooms.

Summary

The production of high quality groundnut and cowpea seeds necessitates a high level of management that covers the period from planting to the delivery of seeds to the growers. Seed growers should plan all farm operations well in advance to ensure the seed crop has the highest priority. Lastly, agronomic practices (disease management and maturity at harvest) should be applied properly in seed fields.