Better cowpea

through good agricultural practices

For farmers in Nigeria

Cowpea is a grain legume that grows throughout sub-Saharan Africa. The leaves, green pods, young and mature seeds are very nutritious and rich in protein. Also the crop residues are rich in protein and are good feed for livestock. Cowpea tolerates heat, drought and acid soils but not waterlogging.

With bacteria that live in the soil, cowpea forms root nodules. These bacteria are called rhizobia. In the root nodule, the bacteria can fix nitrogen from the air into a form that cowpea can use for growth. Part of the nitrogen is used to make protein in the grain, but some of the nitrogen is also left behind through falling leaves and roots. The nitrogen that is left behind improves soil fertility. This makes cowpea a good crop to grow as intercrop or in rotation with other crops, because these other crops then also benefit from the nitrogen. With good agronomic practices and the right varieties, cowpea can yield about 2500 kg/ha when grown in monocrop.

Because cowpea is a short duration crop, it is a good choice for relay cropping. Cowpea can be grown at the start of the season with a cereal crop relayed into the cowpea several weeks after cowpea sowing. Alternatively, cowpea can be relayed into cereals in the second half of the growing season.

Step 1: Land selection and preparation

- Cowpea is well adapted to sandy and poor soils, but best yields are obtained in well-drained sandy loam to clay loam soils with a pH between 6 and 7.
- Cowpea can tolerate drought, but not waterlogging. Therefore, select land without waterlogging and avoid poorly drained soil.
- Think about the rotation scheme for the field you want to plant. Do not plant cowpea in the same field for two succeeding seasons, as this increases the chance for disease.
- Clear all vegetation and prepare the field manually with a hoe, or use animal power or a tractor. You can plant cowpea on ridges or on a flat seedbed.

Well-prepared land ensures good germination, reduces weed infestation and prevents water-logging, which may damage the cowpea plants.

Step 2: Variety and seed selection

Select a good cowpea variety suited to your agro-ecological zone and cropping system. In Nigeria, the Sahel, Sudan, Northern Guinea and Southern Guinea savannas are good for growing cowpea. When making a choice about a variety think about the maturity period, yield potential, drought tolerance, responsiveness to day length (for some varieties, flowering is influenced by length of day), pests and disease resistance and preferred colour and size of the grains. Also think about whether cowpea is being grown for leaves, grain or both.

Variety	***Grain characteristics***	***Attainable grain yield (kg/ha)***	***Maturity period (days)***	***Growth habits***	***Pest/diseases resistance***
IT 90K-277-2 (SAMPEA 9)	Small to medium-size; white and rough	1000 – 2000	90-100	Determinate, Semi-erect	Some resistance to aphids, thrips, bruchids, viruses and other diseases.
IT 99K-573-1-1 (SAMPEA14)	Medium-size; white and rough		60-100	Determinate	Some resistance to aphids, thrips, bruchids, viruses and other diseases.
IT 97K-499-35 (SAMPEA 10)			90-100	Determinate, Semi-erect	Resistant to many insects and diseases infestation. Also resistant to Striga.
IT89KD-288 (SAMPEA 11)	Large size; white and rough. High protein content		Photo-sensitive	Indeterminate (dual purpose variety)	Resistant to septoria leaf spot, scab, bacterial blight and nematodes. Tolerant to Striga.
IT 93 K-452-1	Small to medium-size; white and rough		60-70	Determinate, erect	Resistant to insect pest and diseases

****The seed rate for all the above varieties is 25-30 kg/ha***

Use only high quality seed for planting.

- Make sure seed is not more than 12 months old to ensure good germination.
- Sort out the good seeds for planting to ensure that they are free from insects, disease infestation and weed seeds. Do not use damaged or wrinkled seeds or seeds with holes.
- Do a germination test at least 10 days before time of planting. Plant 50 seeds. If at least 40 emerge, the seed is good for planting. If 30-40 emerge, plant more seeds than recommended. Get new seeds if less than 30 seeds emerge.

Step 3: Applying fertilizer

Important points

- Cowpea can fix its own nitrogen and therefore does not need to be fertilized with nitrogen fertilizers such as ammonium nitrate or urea.
- Cowpea cannot fix other nutrients and needs other nutrients such as Phosphorus (P) or Potassium (K) at planting.
- Good fertilizer types for cowpea that supply phosphorus are Single Super Phosphate (SSP) and Triple Super Phosphate (TSP). Both fertilizers also contain calcium (Ca), and SSP also contains sulphur (S). TSP contains more phosphorus than SSP.
- Diammonium Phosphate (DAP) contains both phosphorus and nitrogen. If SSP or TSP is not available you can use DAP. The nitrogen content of DAP is small compared to its phosphorus content.
- Muriate of Potash (MOP) supplies potassium. Use MOP in combination with one of the P-fertilizers mentioned above.

Application

- Make furrows along the rows of cowpea. The furrows should be 8 cm away from the cowpea plants and 5 cm deep. Place the fertilizer in the furrows and cover with soil. Do this at planting or right after planting.
- Cowpea needs about 20 kg P/ha (50 kg P_2O_5/ha) and about 25 kg K/ha (30 kg K_2O/ha). Use the fertilizer rates given in the table below for mono-cropped cowpea. You can use a teaspoon or soda bottle-cap to measure the amount of fertilizer.
- When manure has been applied recently, you can reduce the fertilizer rates.

Fertilizer type	***Rate (kg/ ha)***	***Row spacing: 50 cm***		***Row spacing: 75 cm***	
		In the furrow, spread 1		***In the furrow, spread 1***	
		Teaspoon	*Soda bottle-cap*	*Teaspoon*	*Soda bottle-cap*
SSP	100	Every 120 cm	Every 80 cm	Every 90 cm	Every 60 cm
TSP	50	Every 500 cm	Every 330 cm	Every 330 cm	Every 220 cm
MOP	50	Every 450 cm	Every 300 cm	Every 240 cm	Every 200 cm
DAP	50	Every 360 cm	Every 240 cm	Every 300 cm	Every 160 cm

Step 4: Planting

Different varieties have different planting times and different planting requirements. Most of the semi-erect and creeping cowpea varieties are photosensitive. When those varieties are planted early, they will not flower but instead grow very leafy and grain yield may be reduced.

- When to plant cowpea thus depends on the maturity period of the variety and on the duration of the growing season. Generally, creeping varieties need wider spacing than erect varieties. Because erect varieties are planted closer to each other, more seeds are required for erect varieties than for creeping varieties.
- Planting in rows has many advantages; you use the correct plant density, weeding is easier and harvesting takes less time. Use planting spaces as indicated below.
- Plant seed at 2.5 to 5 cm depth. Planting seeds more than 5 cm deep will delay emergence and seeds may rot.
- Fill plant gaps 1 to 2 weeks after planting where seedlings have not emerged.

Spacing for sole cropped cowpea

Cowpea type	***Maturity***	***Spacing***
Erect	Extra early	50 x 20 cm (2 seeds per stand)
Semi-erect	Early/medium	75 x 20 cm (2 seeds per stand)
Creeping	Medium/late	75 x 30 cm (2 seeds per stand)

Cowpea in intercrops

- You can plant a short-duration, determinate cowpea variety at the start of the season and relay a cereal crop into the cowpea several weeks after cowpea sowing.
- You can also relay a medium duration, semi-determinate cowpea variety into cereals in the second half of the growing season. Plant cowpea about 4-6 weeks after planting the first crop (maize, sorghum or millet).
- For strip intercropping, plant 2 rows of cereal, alternated with 4 rows of cowpea. This improves the productivity of especially erect and shade-sensitive varieties.
- Choose a variety suitable for intercropping. Spreading types may overgrow the other crops.

Weeds

Weeds can harbour pests and reduce both yield and grain quality. Weeding is needed to minimize competition for nutrients, water, sunlight and space. Weed control can be manual or chemical, or both.

Manual weed control:

Weed about 2 weeks after planting and again 4-5 weeks after planting.

Chemical weed control:

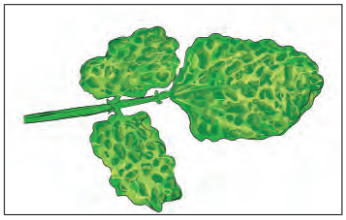
Herbicides, if used properly, are safe and effective in controlling weeds. There are different types of herbicides. The choice of herbicide depends on the predominant weed species and the availability of the herbicide. Herbicides are available for control of weeds before they emerge (pre-emergence) or after they emerge (post-emergence).

If pre-emergence herbicide is applied at or just before planting, one manual weeding may be required at 4-5 weeks after planting. Use herbicides as presented in the table below or seek advice from an extension agent or agrodealer.

Product name	***Active ingredient***	***Use rate***	***Time of application***	***For which type of weeds***
Paraquat plus	Paraquat dichloride	3 l/ha	Pre-emergence	Rottboellia
Paraquat + dual Gold				Most grasses and broadleaf weeds
Buta Force	Butachlor	4 l/ha		
Round Up	Glyphosate			

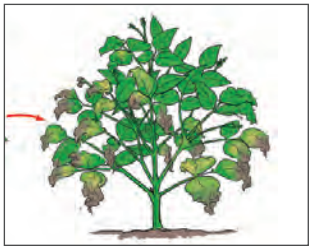
Diseases

Cowpea mosaic viruses produce irregular light and dark green mosaic patterns on the leaves. In some cases the affected parts thicken. Affected plants may be stunted and will not produce normal pods. If the disease attacks plants at the early growth stage, no pods should be expected. Mosaic viruses are transmitted by aphids.



Cowpea mosaic virus

Fusarium wilt is a fungal disease which can cause yellowing of the lower leaves on one side of the plant. Infected plants usually are stunted and wilted. When the stem is split over its length, brick red tissue can be observed. Root knot nematodes increase a plants' susceptibility to Fusarium wilt.



Fusarium wilt

Leaf spots can be caused by various bacteria. Some bacteria cause yellowish spots, or spots with a yellow halo. Other bacteria cause brown to purplish spots. Usually, spots develop first on lower leaves. When plants are severely affected, defoliation can occur. Leafspot diseases are most serious on late plantings and during long, moist periods. To minimise the spread of the disease, avoid working in the field when the foliage is wet.

Leaf spots

Anthracnose is a fungal disease which attacks the stems, branches and pods. Stems show dark brown areas, which later may cover the entire stems and branches. Pods have sunken brownish lesions, which in wet conditions can be covered with a pink fungal spore mass. Anthracnose mostly occurs during warm, humid weather. The disease can survive in crop debris and is also transmitted through infected seeds.

Anthracnose

Sclerotium stem, root and crown rot can be caused by various pathogens. Usually, the infection starts at soil level and extends a few centimetres above and below. Initial symptoms are small brown water soaked dots. Later the dots expand into irregular necrotic spots. Affected parts can become covered with white spores. Infection during the season can come from infected crop or weed debris, in which the disease can survive. The disease spreads through dispersion of the spores via cultural practices, wind and water. Shading and very high plant densities can increase the incidence of the disease.

Sclerotium stem, root and crown rot

To control diseases:

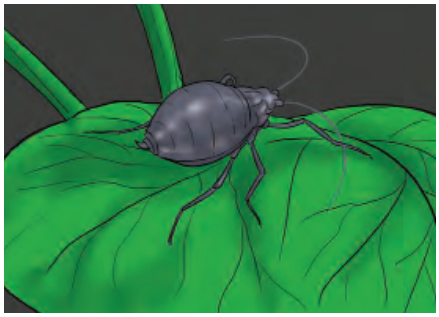
- Practice crop rotation
- Use clean seeds and avoid seeds from diseased plants
- Use disease resistant varieties
- Uproot and destroy infected plants
- Plant in a good seedbed and avoid poorly drained soils
- Fungicides can be used against fungal diseases. *Benomyl* or *Manconzeb* can be applied to leaves at the rate of one small matchbox in a 15 L sprayer. Seek advice from an extension worker before using fungicides.

Insect pests

Insect pests can be a major constraint to cowpea production. If not effectively controlled, insect pests can totally destroy a cowpea crop. Based on when they occur, cowpea pests can be classified into three major groups: pre-flowering, flowering/post-flowering and storage.

Pre-flowering pests

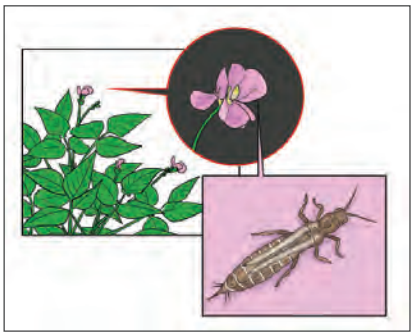
The cowpea aphid is a medium sized, shiny black insect. The aphid directly damages the cowpea plant by sucking its sap. The aphid also transmits the cowpea mosaic virus. Honeydew produced on plants is evidence of aphids feeding on the crop.



Cowpea aphid

Flowering/post-flowering pests

- Flower thrips are very tiny black insects, which feed on flower buds and flowers. When severely infested, plants do not produce any flowers, or flower buds and flowers fall prematurely without forming any pod. Flower thrips can cause total crop loss.

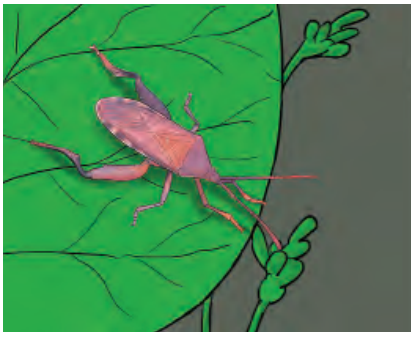


Flower thrip

- Blister beetles feed on flowers, leading to crop damage or total crop loss. The adult beetles are attracted to maize pollen. Therefore, this pest is mostly occurring in cowpea fields near to or intercropped with maize.

Blister beetles

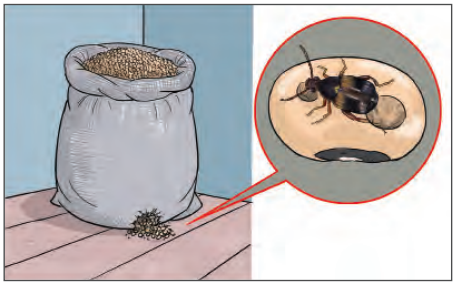
- Pod-sucking bugs such as the tip wilter, suck the sap from green pods. This causes shrivelling and premature drying of pods.



Tip wilter

- Maruca pod borer is a nocturnal moth, light brown with whitish markings on its forewings. The larvae feed on the tender parts of the stem, peduncles, flower buds, flowers and pods.

Storage pests
The cowpea weevil (bruchid) can lay eggs on pods or grain. The larvae hatch and damage the grain, and emerge as adults through holes on grain.



To control insect pests:

- Regularly check the field for harmful insects and hand-pick and destroy them. Wear gloves when picking blister beetles because the beetles can release a liquid that burns the skin.
- Clean up (e.g. by burying) crop residues from previous crops, in which insects may survive.
- Plant resistant varieties.
- Practice crop rotation.
- Plant early.
- Spray with insecticides

The frequency of spraying depends on the severity of the insect attack and on the cowpea variety. Late maturing varieties require more sprays than early maturing. Generally 2-3 sprays are sufficient.

- *1st spraying:* generally 4-5 weeks after planting, when flower bud initiation has started. This controls thrips. Spraying can be at 2-3 weeks after planting if aphids are present.
- *2nd spraying:* 10 days after the first spraying, when podding has started.
- *3rd spraying:* 10 days after the second spraying. This is only necessary for medium/late-maturing varieties, or varieties that are indeterminate, and when there is a heavy attack of pod-sucking bugs.

Check the table below for different types of insecticides and/or ask advice from an extension worker.

Product name	***Active ingredient***	***Use rate (L/ha)***	***Amount for one sprayer load***	***For which pest***
MagicForce	Lambda-cyhalothrin +Dimethoate	0.4-0.8 l	35 – 70 ml in 15 l sprayer	Control of leaf, seed and soil dwelling insects and migratory insects.
CyperDiForce	Cypermethrin +Dimethoate	1 l	75 ml in 15 l sprayer or 100 ml in 20 l sprayer	Control of leaf, seed and soil dwelling insects and migratory insects.
Perfekthion	Dimethoate	0.5 – 0.8 l	40 – 70 ml in 15 l sprayer	Controls plant sucking insects.

Safe use of chemicals

- Use only herbicides, pesticides and fungicides that are recommended to cowpea to avoid damage to the plant.
- Chemicals can be toxic, so always follow instructions on the product package or from the agro-dealer for safe use. Also follow the instructions about the time needed between spraying and safe consumption of fresh pods.
- Do not store chemicals in the same place as food.
- Do not eat from the same spoon you used to measure chemicals.

Step 6: Harvesting

Cowpea can be harvested in various stages, for example for consumption of fresh immature pods or for grain. Many varieties have a prolonged and uneven ripening period. When you harvest grain only pick dry pods.

1. Harvest pods when they are dry. Pick pods from plants and leave the rest of the plant material in the field. Plant material left in the field will improve soil fertility.
2. Dry the pods in the sun and protect from rain. Dry the pods on a clean surface such as a mat, plastic sheet or tarpaulin, or on a raised platform. Do not dry the pods on the soil.
3. Thresh the dry pods on a clean surface such as a tarpaulin.
4. Clean the grains. Winnow to remove chaff, dust and other rubbish. Also remove shrivelled, diseased or broken grains and grains of other varieties.
5. Dry the threshed grains on a clean surface for two sunny days. Test the grain to see if is dry enough for storage or market by biting or pinching grain with your finger nails – when dry enough, grain should break or crack not bend or stick between teeth or fingernails.
6. Place grain in clean bags; if re-using bags in which grain was previously stored, the bags must first be washed and then disinfected by boiling them in water for 5 minutes. If the bag is polyethylene, make sure it doesn't touch the outside of the pot or it will melt. Completely dry container/bag before placing the grain inside.
7. Grain can be treated before storage to control storage pests. For example coat seeds with edible oil, ash or insecticides. Ask an extension worker or agro-dealer which insecticides you can use.
8. You can also use PICS (Purdue Improved Cowpea Storage) triple bags to store grain under air-tight conditions and keep away insects from the grain. Place grain in the innermost bag and tie this bag tightly. Then tie the middle bag, and finally tie the

outermost bag. When all the bags are tied, any insects in the grain die from lack of oxygen. It is not necessary to treat seed against storage pests when using PICS bags.

9. Clean the storage room. Stack the grain bags on a raised platform or wooden pallet away from the wall. Avoid direct contact of storage bags with the ground.

10. Inspect and remove infested or rotting grains on a regular basis.

If you apply chemicals to grain before storage, do not eat or sell grain before it is safe for consumption.

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