

Doubled-up legume technology in Malawi boosts land productivity

In Malawi, farmers are used to intercrop two or more crops in their fields, usually maize and groundnut or cowpea. The reasons for intercropping include:

- to get more crops if land is limited;
- some crops are considered too minor to occupy land on their own; and
- to diversify income sources on farms.

Intercropping two legumes with different growth habits is a relatively new practice. This approach takes advantage of beneficial interactions between the two legume crops, usually pigeonpea.



Photo: Jim Richardson/ National Geographic

Doubled-up legume technology

- Pigeonpea can be intercropped with either groundnuts or soybeans, without too much competition for water, nutrients and sunlight.
- Pigeonpea only begins to grow rapidly when either soybean or groundnuts are approaching maturity.
- Groundnuts or soybean mature first in approximately four months and are harvested in May.
- Pigeonpea continues to grow as a sole crop, forms pods, and is harvested subsequently.
- This way we 'double' the crops and 'double' soil fertility benefits, as both legume crops add fertility to the soil.
- Thus the farmer successfully doubles the output of his or her farm with an additional legume to supplement household nutrition and earn additional income.

Soybean-pigeonpea doubled-up cropping

Step 1: Plant soybean first

- Remember to use rhizobia inoculants if varieties that require inoculation are used (see how to grow soybean guidelines for details).
- Soybeans need moist soil for germination. They should not be dry planted and planted until it is clear that rainy season has begun (i.e. plant after a few days of rainfall!).
- Make ridges that are 75cm apart, just as for maize, so that the normal ridging system is not disrupted by the soybean production. Avoid ridges wider than 75cm as this wastes precious land.

- Plant soybean on two shallow furrows (3cm deep at most) which can be made with a stick on each side of the ridge. Two rows per ridge (instead of only one) ensure high plant population > 250,000 plants per hectare. This results in good soybean yields.
- Within a row, drop (sprinkle) the soybean seeds about 5-8cm apart. These seeds must be planted no more than 3cm deep, otherwise germination will not be good.
- About 90kg of seed is required to plant one hectare (about 35kg per acre). For varieties with small seeds, less quantities of seed will be required.
- A farmer planting 30 x 40 field size requires only 10kg soybean seed.
- Weeding should take place at least twice, especially early in the season. Soybeans have the ability to shade out other plants, so a large soybean population is helpful to control weed growth.

Step 2: Plant pigeonpea on the same day

- On the ridges already planted with soybean, plant three pigeonpea seeds per planting station 90cm apart from each other. This results in about 44,000 plants/ha.
- This single row of pigeonpea should be at the centre (top) of the ridge.
- Only 8kg pigeonpea seed is required to plant one hectare of a soybean/pigeonpea doubled-up system.
- A farmer planting 30 x 40 field size requires only 1kg pigeonpea seed.
- In this intercrop, soybeans are harvested earlier, and the pigeonpea remains the only crop in the field.

- Pigeonpea contributes to next year's crop (usually maize) through the large amount of pigeonpea leaves that fall as the plant matures, thereby adding organic mulch that enriches soil fertility.



Photo: Regis Chikowol Michigan State University (MSU)

Groundnut-pigeonpea doubled-up cropping

Step 1: Plant groundnut first

- If maximum yields are to be realized, groundnuts must be planted early, with the first effective rains—a delay in planting will cause a marked reduction in yield.
- Make ridges which are 75cm apart (just as for maize and soybean), so that the normal ridging system is not disrupted by the production of groundnuts. Avoid ridges wider than 75cm as this wastes precious land.
- Plant two rows of groundnut on either side of each ridge, about 5-8cm deep. If planted too shallow germination may be patchy as the surface soil may dry out if there is no further rainfall. If planted too deep, germination may be delayed.
- Within each row, plant groundnut seeds at 10-15cm apart. Double rows on each ridge, using this seed spacing, will ensure large plant populations (> 200,000 plants/ha), and good harvests.
- Seed requirements per hectare range from 80-100kg, depending on the groundnut variety and seed size.
- A farmer planting 30 x 40 field size requires only 10kg groundnut seed.
- Keep fields weed-free by carrying out early weeding and subsequently pulling out other weeds by hand.

Step 2: Plant pigeonpea on the same day

- On the ridges where groundnuts have already been planted, plant three pigeonpea seeds per planting station 90cm apart from each other. This results in about 44,000 plants/ha.
- This single row of pigeonpea should be at the centre (top) of the ridge.
- A farmer planting 30 x 40 field size requires only 1kg pigeonpea seed.
- In this intercrop, groundnuts are harvested earlier, and the pigeonpea remains the only crop in the field.
- The following year's crop on the same field (usually maize) benefits from the large amount of pigeonpea leaves which fall to the ground, as the crop matures and adds a lot of organic mulch enriching the soil fertility.

Fertilizer management

- When a doubled-up intercropping of soybean or groundnut is grown in rotation with a crop that had received NPK fertilizer the previous season, there is no need to apply any fertilizer that year.
- On poor soils, apply a 50 kg bag of NPK (23:21:0) fertilizer per hectare at planting. This will supply some nutrients (especially phosphorus) for the 'small factories' on the roots to work better. This process is called biological nitrogen fixation. For more details on this subject, the guidelines on soybean and groundnut production should be read.
- There is no need to apply UREA fertilizer on doubled-up legumes. These are magic crops, manufacturing their own UREA. Save the urea for maize that desperately needs it!

Harvesting and residue management

- Harvest pigeonpea when the pods are brown and sometimes when they make a rattling sound upon shaking.
- At maturity, there will be a carpet of pigeonpea leaves on the ground. This is the magic. The factories in the soil have done a great job. They have made the crop produce a lot of leaves (as well as protein rich grain for food).
- The leaves on the ground will be the UREA fertilizer for the next crop. Next season, ensure **maize is planted on this plot**. Less fertilizer will be required.
- So **never burn these residues**—this would burn a good source of soil enrichment.
- Wise farmers never burn crop residues—they use the residues to produce more manure through composting.



The Africa Research In Sustainable Intensification for the Next Generation (Africa RISING) program comprises three research-for-development projects supported by the United States Agency for International Development as part of the U.S. government's Feed the Future initiative.

Through action research and development partnerships, Africa RISING will create opportunities for smallholder farm households to move out of hunger and poverty through sustainably intensified farming systems that improve food, nutrition, and income security, particularly for women and children, and conserve or enhance the natural resource base.

The three projects are led by the International Institute of Tropical Agriculture (in West Africa and East and Southern Africa) and the International Livestock Research Institute (in the Ethiopian Highlands). The International Food Policy Research Institute leads an associated project on monitoring, evaluation and impact assessment.

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