

SOYABEAN GROWERS GUIDE

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Soils and climate

Soyabean is a legume plant suited to soils with a relatively high clay content, as they **do not** do very well on weak sands. The crop is also sensitive to soil acidity. Soyabean requires reliable rainfall, particularly from flowering to pod maturity. It is a good crop to grow in rotation with maize, cotton and wheat. The yields of these other crops are usually enhanced when following soyabean, as shown in the Table below. Soyabean is a nutritious addition to human and animal feed. It is also used in making cooking oil, margarine, soya chunks etc. It is the richest crop in terms of crude protein (ranges between 40-42 %) and contains 20 % oil.

The yields of wheat (t/ha) following either maize or soyabean at different levels of nitrogen.

Applied Nitrogen (kg/ha)	0	40	80	120	160	200
Previous Crop						
Maize	5.5	7.0	7.3	8.5	9.1	9.5
Soyabean	6.4	7.2	8.0	9.4	10.0	9.5

Fertilisation

Since soyabean is sensitive to soil acidity, check the soil pH (acidity or basicity) in winter. If necessary, apply lime at the recommended rate to bring the soil to a pH of 5,5 (CaCl₂ scale).

Soyabean grow well on residual fertiliser. However, a general recommendation is to apply a pre-plant application of 200 to 300 kg per ha of either a basal fertiliser (e.g. 7,14,7), Gypsum or Single Super Phosphate before planting, particularly where fertility is low. Soyabean respond well to manure application. Soyabean do not need much nitrogen in the basal fertiliser, and they do not require nitrogen fertiliser top dressing, since they are able to obtain their nitrogen requirements from the soil air.

For general application the following table gives a good guide:

Table 4: Average nutrient requirements of soyabean kg/ha

Nutrient	Nutrient status of soil		
	Good	Medium	Poor
N	Nil	20 - 30	30 - 40
P2 05	Nil	20 - 30	40 - 60
K2 0	Nil	20 - 30	40 - 60

On soils of poor to medium soil fertility, a small amount of fertiliser is recommended to sustain the crop for the first six weeks before effective nodulation occurs. The recommended fertiliser application is *150-200 kg of Compound L (Cottonfert) or Soya Blend* applied as basal fertiliser.

It is therefore essential to apply *Rhizobium* inoculant to the seed at planting. This inoculant is obtainable from Seed Co. It is a living culture and must be handled properly for it to work effectively. In particular, do not leave the inoculant in a sunny, hot place, but rather store it in a cool, dark place. When ready to plant, the inoculum is mixed with a little water and sugar, and applied to the seed immediately prior to planting. Directions on the inoculum packet must be followed. One packet of inoculant is required for each 100 kg of seed. However, a higher rate is preferable on sandy soils or in first year soyabean fields.

Varietal choice

There are two basic types of soyabean cultivars: determinate and indeterminate. This refers to the way the plant grows. Determinate cultivars grow vegetatively for about six weeks and then begin flowering, having put on 10 to 12 leaves. Once flowering begins, no further new leaves are produced on the main stem. Indeterminate cultivars, on the other hand, grow vegetatively for about six weeks, then begin flowering when the main stem has about 10 leaves, but at the same time as flowering, the stem continues to grow for another three weeks or so, producing another five to seven leaves. Thus, the vegetative and reproductive growth periods overlap in indeterminate cultivars but not in determinate cultivars. Indeterminate cultivars also tend to grow taller than determinate cultivars. For these reasons, determinate cultivars are better suited to

warm fast growing environments where irrigation is available, like the lowveld, whilst on the middleveld and highveld, both types are suitable. Under drought conditions, indeterminates may have some advantage over determinates. highveld, both types are suitable. Under drought conditions, indeterminates may have some advantage over determinates. Apart from the growth habit of the cultivars, farmers must choose cultivars that have a high yield potential, do not lodge, have a high clearance of pods from the ground, good resistance to disease and take a long time from maturity to pod shattering.

Choosing the right soya bean variety

When choosing a variety to grow in your particular farming area the following points are very important:

- The variety must fit in a growing season of 4 to 4 ½ months.
- The variety should give the highest yield for that particular area and season.
- The must be resistant to lodging especially where combine harvesters are used
- The variety should have a longer period between physiological maturity (time when no more dry matter is added to seed) and pod shattering.
- High pod clearance to reduce losses when harvesting with a combine harvester.
- Rapid stem dehydration.
- Resistance to diseases, especially Red Leaf Blotch (*Pyrenochaeta glycinis*) Frog-eye (*Cercospora sojina*), Soyabean Rust (*Phakospora pachyrhizi*).

Some of the farmers' choice varieties available at Seed Co include:

Indeterminate

SC Serenade

SC Safari

SC Squire

SC Saga

Determinate

SC Status

SC Sequel

SC Sentenel (New)

SC Santa

New varieties are continuously being produced, and therefore it is important to keep up to date with these, as the new ones always have an advantage over the old varieties in yield and agronomic traits.

Varieties	Squire	Saga	Serenade	Safari	Santa	Siesta	Sequel	SC Spike	Status
Growth habit	Indeterminate	Indeterminate	Indeterminate	Indeterminate	Determinate	Determinate	Determinate	Determinate	Determinate
Recommended areas of production	Highveld & Middlelevel in Zimbabwe	Highveld & Middlelevel in Zimbabwe	Highveld & Middlelevel in Zimbabwe	Highveld & Middlelevel in Zimbabwe	All areas of Zimbabwe and Zambia	All areas of Zimbabwe	All areas of Zimbabwe	All areas of Zambia	All areas of Zimbabwe
Plant heights in centimetres	105.0	95.0	102	100	92	77	83	105	88
Pod clearance in centimetres	18	16	17	16	17	14	16	20	16
Lowveld	N/A	N/A	N/A	N/A	115	115	120	126	119
Middleveld	122	121	122	120	125 (118 in Zambia)	125	125	130	124
Highveld	128	127	128	125	130	129	128	140	127
Number of days to pod shattering	25	26	26	28	26	25	25	27	26
Seed Hilum colour	Yellow	Brown	black	Yellow	Brown	Yellow	Black	Brown	Brown
Mass of 1000 seeds (g)	230	215	230	210	216	255	210	190	136
Bacterial blight	2.5	2.0	2.6	2.0	1.9	1.8	2.5	1.2	2.1
Wildfire	2.1	2.0	1.0	1.0	2.0	1.0	1.6	1.5	1.5
Downy	1.0	2.0	1.2	2.0	1.3	1.4	2.0	1.3	1.8

mildew									
Red leaf blotch	2.1	2.5	2.1	1.6	1.9	3.5	2.5	1.8	2.5
Frogeye leaf spot	1.2	1.3	1.2	1.2	1.5	1.5	1.3	1.4	1.5
Soyabean rust (see Note 1 below)	1 1.5	1.2 1.6	3.0 4.0	3.0 4.0	3.0 4.3	3.0 4.3	1 1.7	3.0 4.0	2.0 3.0

Notes: 1st Digit 1= Bottom third of leaf canopy on the plants 2nd Digit 1= No lesions
2= Middle third of leaf canopy on the plants

Planting and crop management

The seed rate is about 90-100 kg per ha. The desirable plant population is around 350 000 plants per ha, but soyabean are capable of adapting to a wide range of plant populations. A minimum plant population is 200 000 plants per ha, while a maximum is 550 000 plants per ha. The higher the plant population, the greater is the danger of lodging, but the higher is the pod clearance. Shorter stature varieties like Status and sequel should be planted at a higher population than taller varieties.

The row spacing may be from 25 to 90 cm. The closer the row spacing, the higher the yield, but the yield advantage is not great (about 5 to 10 %). The wider the row, the closer are the seeds placed in the row, and this sometimes helps, especially for emergence on soils that have a tendency to cap (seal on the surface). Do not plant seed deeper than 5 cm. Be careful not to plant soyabean in such a way that when covered with soil they are in a furrow; rather the soil should form a slight mound over the row, as this makes it easier for the seedling to emerge. It is essential not to plant too deep. Seed should be planted 25-50 mm deep, depending on soil texture. If soil crusting occurs before emergence, wetting the soil with irrigation or breaking the crust with a 'millipede implement' will improve emergence.

The time to plant soyabean is after planting maize, but this should preferably be before mid-December.

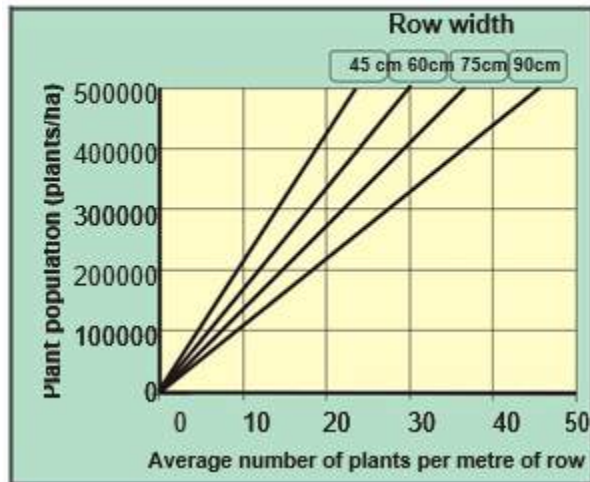
A fungicide seed dressing of, for example, Thiram 80 WP (85 g/50 kg seed) or Flusilazole (Captan 50 WP at 125 g/50 kg seed) will help ensure good emergence.

Soyabean particularly sensitive to weed competition during the first six weeks of the season. Control weeds adequately during this period.

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Target Harvest Population per ha	Required Planting Population per ha	Required average number of seeds				Seeding rate (kg/ha)		
		per metre of row						
		Row width (m)				Thousand seed weight (g)		
		0.4						
		5	0.60	0.75	0.90	250	220	190
200000	248000	11	15	19	22	62	54	47
240000	297000	13	18	22	27	74	65	57
280000	347000	16	21	26	31	87	76	66
320000	396000	18	24	30	36	100	87	75
360000	446000	20	27	33	40	111	98	85
400000	495000	22	30	37	45	124	109	94
440000	545000	25	33	41	49	136	120	104

Simple method of determining the plant population of soybeans from the average number of plants per metre of row.



Mid-season crop management

Soybean are very susceptible to drought during the flowering and pod-filling stage. The pod filling stage occurs in the last third of the crop's life, and the beginning of this stage is identified when the pods on the upper nodes of the main stem are 2 cm long and the small seeds are visible in the pods. If supplementary irrigation is available, this is the time to apply water, as it can produce large yield increases.

Supplementary irrigation (if available) should target these critical stages (i.e. if they coincide with dry spells):

For a crop taking about 125 days from planting to physiological maturity these critical periods will be as follows:-

Germination	-	day 1 to day 6
Flowering	-	day 55 to day 75
Pod fill	-	day 95 to day 125

Pests and Diseases

Semi-looper caterpillars are often a problem during the flowering and seed-fill period. They eat the leaves and sometimes the pods. Semi-loopers are controlled in most seasons by a naturally occurring virus disease, which kills the caterpillars. Caterpillars that have died from the disease are black and hang from the leaves. These may be collected, crushed, mixed with water and sprayed around the field to help control other caterpillars. If the virus is not killing the semi-loopers then an insecticide spray may be required.

Two diseases have become prevalent in the region. The one is Frog Eye Leaf Spot (*Cercospora sojina*) and the other is Rust (*Phakopsora pachyrhizi*). Most cultivars available today are resistant to Frog Eye Leaf Spot, whilst latest varieties have shown some tolerance to Rust. The Rust disease may be recognised as numerous small grey to russet coloured tufts on the underside of leaves. They may appear similar to red spider mites. In advanced stages the leaves become distinctly yellowy-brown, and a light brown cloud of spores, like dust, may be seen in and above the canopy when the plants are shaken. Since none of the present cultivars are tolerant none of the present cultivars are tolerant of the disease, it is usually necessary to control Rust with a fungicide spray. A number of chemicals are available, such as Carbendazim / Flusilazole (Punch® Xtra at 350 to 500 mL/ha) and Triadimenol (Shavit® at 500 mL/ha). Two, and even three, fungicide sprayings will be required at 3 week intervals beginning at first flower. When spraying, it is important to achieve good cover of all leaves, but especially the upper leaves of the canopy. The detrimental effect of Rust is severe: an unsprayed crop may yield less than one third of a sprayed crop.

A third disease of importance is Red Leaf Blotch (*Pyrenochaeta glycines*). Severe infections can reduce seed yields by 30% - 50%. Use of resistant varieties is the smartest control measure against this important diseases. Seed Co varieties have shown some resistance to this disease.

Harvesting

Soyabean should be harvested as soon as the plants have dried. If harvesting is delayed, the pods may shatter with a consequential loss of yield.

a) Hand harvesting. This method is suitable for small areas, or where a large labour force is readily available. The advantages of hand harvesting are that losses can be reduced to a

minimum, soyabean of a high quality are produced, and the beans normally have a high viability. Therefore, hand harvesting is suitable for seed production. The usual system of hand harvesting is to allow labourers to cut or pull as much plant material as they are able to thresh in a day. For hand cutting, labourers require sickles or sharp hoes. A labourer should be able to cut and thresh at least 50 to 90 kg of clean beans per day.

b) Mowing or cutting by hand and shelling. A variation is to use a mower to cut the plant material, and a mechanical winnower for the final cleaning. This method should enable an output of ± 150 kg (3 bags)/labour/day. This method enables harvesting to commence before the pods split, but allows sufficient moisture to be lost, thereby preventing mould developing in the established cocks or stacks.

c) Swather plus combine. This method involves the use of a swather to cut and wind-row the crop before it is combined. A pick-up attachment (picker) is required to be fitted to the combine table.

d) Combine harvesting. Large areas are usually reaped by combine harvester and losses are inevitable. The degree of loss depends on the efficiency of the machine and operator, the evenness of the land, the height of the pods off the ground, lodging, the moisture content of the beans, and weed control. Machines must cut very close to the ground, and losses must be minimised by cutting at the correct moisture content and paying attention to machine adjustments. The golden rule for combining is to “take it low and take it slow”. Soyabean seed is delicate and can be easily damaged by the threshing mechanism which must be carefully adjusted and run slowly.