Agnote

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Soybean Production Recommendations for the NT

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INTRODUCTION

Soybeans are traditionally grown in sub-tropical and temperate climates during the summer. The world's largest producer is the USA.

Most of Australia's production comes from Southern Queensland and Northern NSW. However, recent advances in soybean breeding at the University of Queensland, and agronomic research at the Department of Agriculture in Western Australia and CSIRO, have made it possible to successfully produce soybeans in low latitude tropical areas. The first large-scale commercial production of soybeans in the Northern (NT) Territory was in the 1982-83 season.

SOILS

Soybeans have been successfully grown in the NT in Tippera clay loams. Although there is very little history of growing the crop on sandy-surfaced Blain and Oolloo soils, successful production should be possible provided establishment is satisfactory and inherent nutrient deficiencies are rectified with fertiliser.

Crop establishment can be a major problem on sandy-surfaced soils if hot dry conditions occur just after sowing. The adoption of zero tillage and the use of surface mulch should assist in overcoming this problem. However, the use of conventional cultivation for growing soybeans is likely to be risky.

CLIMATE

Successful soybean production is possible in most agricultural areas of the Top End of the NT. However, to generalise on rainfall could be misleading. Essentially, the best conditions are likely to be moist, overcast weather during the establishment phase, followed by periods of warm sunny weather with some rain every three to four days during the growing season. The end of the wet season in late March is ideal for crop maturity, leading to harvest during April.

Soybeans can stand some moisture stress during the vegetative phase. However, yield will be reduced by stress during pod-fill. Hence, cessation of rainfall by the end of February will reduce yield. Similarly, yield will be reduced by poor early rains (late December-early January) due to poor crop establishment. Therefore, the best areas for

soybean production are likely to be those with the most reliable early and late rains. As such, it is likely that yield will be higher in the Douglas-Daly area than in the Katherine area.

VARIETIES

Buchanan is the recommended variety for the NT. This variety was bred by the University of Queensland for tropical areas. It is a semi-determinate variety with the ability to respond to good conditions. It will still produce reasonable yields under relatively adverse conditions. The growing period will depend on seasonal conditions and sowing time, but will generally be between 105 and 120 days. Flowering begins from 30 to 33 days after sowing.

SOWING TIME

Prevailing conditions will determine the optimum sowing time; however it should be between mid-December and mid-January. Sowing after mid-January is unlikely to be successful in most years. Essentially, sow as soon as possible after good rains. Good establishment is the key to top yield, which will only be achieved by sowing into a moist seed-bed. The effects of optimum conditions can be enhanced by applying fertiliser and herbicide prior to sowing.

LAND PREPARATION

The preparation of a weed-free seed-bed to allow rapid emergence is most critical. How this is achieved is immaterial, as long as soil erosion is minimised.

To facilitate harvesting, the land should be free of sticks, stones and other obstacles. As soybeans set their lowest pods close to the ground, it is essential that the header front operates close enough to the ground to maximise grain yield without damaging the header.

PLANT POPULATION

Farmers should aim for an established population of 450 000 plants/ha in 18-cm rows. The sowing rate will therefore depend on seed size, germination rate and field loss. It is absolutely essential that a good plant population is achieved for both weed control and maximum yield.

The following example illustrates how to calculate seeding rate to obtain a plant population of 450 000/ha:

Assume 100 seeds weigh	12 g
Assume germination rate at	80%
Allow for field loss of	15%

At 100% germination:

12 g of seed produce 100 plants
x g of seed produce 450 000 plants

Therefore,

$$x = \frac{12 \times 450\,000}{100}$$
$$= 54\,000 \text{ g or } 54 \text{ kg}$$

However, it is expected that only 65% of sown seeds will produce plants (20% reduction due to germination and 15% due to field losses).

Therefore, if we require 54 kg at 100% establishment, we will require x kg at 65% establishment.

$$x = \frac{100 \times 54}{65}$$
$$= 83 \text{ kg/ha}$$

INOCULATION

To enable the crop to produce its own nitrogen (N), it is essential to achieve effective nodulation.

As rhizobia that infect soybean rots do not occur naturally in our soils, seeds must be inoculated before sowing to facilitate nodule formation.

Soybean inoculant is available from several suppliers. The inoculant should be stored in a refrigerator until required.

Inoculation should be carried out immediately before sowing (within 4 hours) and inoculated seed should be kept away from the sun.

There are various methods and a range of gum adhesives that can be used for inoculation. Reasonable success has been achieved by applying the inoculant dry or with a little water. Mixing by turning on a cement floor is quite suitable.

It is very important to use plenty of inoculant. Standard packs of inoculant suggest the contents are sufficient to inoculate 100 kg of seed. We recommend inoculant be applied at four times the suggested rate, that is, four packs per 100 kg of seed. Inoculant is cheap and it is a good insurance against N deficiency. Once a well nodulated soybean crop has been grown in an area, it should not be necessary to inoculate for following crops as the rhizobia will persist in the soil indefinitely.

When ordering inoculant, specify soybean inoculant strain CB 1809 as inoculants which are suitable for other legumes are not suitable for soybeans.

FERTILISER

Phosphorus (P), sulphur (S) and zinc (Zn) are all recommended for Tippera clay loam soils. On virgin ground, super-phosphate should be applied at 400 kg/ha to provide both P and S. Zinc sulphate monohydrate should be applied at 15 kg/ha to provide 5 kg/ha Zn. In subsequent years, 250 kg/ha of single superphosphate is adequate. Zn should be needed only every second year.

On Oolloo and Blain soils, requirements are less clear; but some of these soils are low in P, S, Zn, copper (Cu) and potassium (K). Similar rates of P, S and Zn as for the clay loams should be used and in the initial year a basal application of 5 kg/ha Cu is recommended. The need for K on your farm should be discussed with DPIFM agronomists.

Soybeans do not require applications of N fertiliser unless they fail to nodulate.

WEED CONTROL

The best method to control weeds is to have a good even stand of plants at the recommended plant population.

Once established, soybean plants compete well with weeds, but they are susceptible to weeds during early growth.

Grass weeds, such as *Chrysopogon* sp. *Brachiaria* sp. and *Digitaria* sp. can be controlled with trifluralin (Treflan®) at 2 L/ha applied pre-planting. It is essential that Treflan® is incorporated immediately after application as exposure to sunlight will reduce its effectiveness.

A number of broad-leaf weeds species are likely to occur in soybean crops. The extent of their effect will depend on the soybean plant population. The main broad-leaf weeds are likely to be buffalo clover (*Alysicarpus vaginalis*), *Hyptis sauveolens* and *Sida* sp. Bentazone (Basagran®) at 2 L/ha sprayed post-emergent, when soybean plants are at the 3-4 trifoliolate leaf stage, will give good control of *Hyptis* sp. and *Sida* sp. but will not control buffalo clover. Bentazone will cause some leaf burn in soybean plants, but the crop will readily recover. It should not be applied when the crop is flowering as it can cause flower-drop. It is also advisable to apply the chemical early in the morning as several hours without rain are necessary for good results.

INSECT PESTS

Soybean plants are vulnerable to several insect pests. An astute pest management is necessary to maximise both seed yield and quality. In most seasons, soybean crops will require two applications of insecticide to achieve effective pest control.

Leaf-eating loopers and the cluster caterpillar (*Spodoptera litura*) are commonly found on soybean crops throughout the growing season. However, these pests rarely require control in the early stages of the crop but may be important during the pod development phase.

Regular crop inspections after flowering are essential to detect the rapid invasion of pod-feeding pests. Pod sucking bugs (*Piezodorus*, *Riptortus)* and Melanacan commonly migrate to crops towards the end of the wet season and together with *Heliothis* can devastate unprotected crops.

Growers should acquaint themselves with the insect fauna of legume crops. A book by M. Shepard, R. J. Lawn and M. A. Schneider, Insects *on Grain Legumes in Northern Australia,* is invaluable for this purpose.

There are a large number of products available for the control of insect pests. The grower should seek advice from you local DPIFM Agronomist for the most suitable chemical for your situation.

DISEASES

Several diseases affect soybeans in the NT, most of which do little damage to crops and do not require any control.

Bacterial pustule (*Xanthomonas phaseoli* var. sajense), **Bacterial blight** (*Pseudomonas glycinia*), **Wildfire** (*Pseudomonas tabaci*).

Bacterial blight has occurred in the NT but has not been seen here in recent years, while bacterial pustule is the most common disease of soybean plants in the NT and can be serious in some varieties. These bacterial diseases can be introduced through contaminated seed or can survive from season to season on crop residues and volunteer soybean plants. Subsequent spread within a crop is favoured by wet weather.

Bacterial pustule appears as minute irregular shaped spots on leaves, about 1 mm in diameter. On the underside of the leaf the spots (pustules) are slightly raised. The spots are brown and are surrounded by a yellow halo. In severe infections, spots may merge to produce a partial or total leaf death. The variety Buchanan is resistant to the disease.

Bacterial blight infection shows up as brown angular spots coalescing to form dark brown dead areas with yellow margins, which often tear, giving the leaves a ragged appearance.

Wildfire is typified by brown dead areas of variable size and shape surrounded by wide yellow holes with definite margins. Affected leaves fall readily.

Rust

Rust appeared in the NT in 1974 despite quarantine measures. The disease has not been seen in recent years because few soybeans have been grown and it is not known whether the disease is still present in the NT, although it can infect several other related legume species. Spread and infection is favoured by rainy weather. Spores of the fungus can be carried as external contaminants on seed. The symptoms are small spots on leaves, with raised pustules mainly on the under side of the leaf. The symptoms are very similar to those of bacterial pustule. Microscopic examination may be required to distinguish between rust and bacterial pustule. If infection does occur you will need to contact your local DPIFM Agronomist for the most suitable chemical recommendation in your situation.

Sclerotium stem rot and leaf spot

(*Sclerotium rolfsii*)

Sclerotium rolfsii causes disease in many plants. The disease is seen only occasionally in soybean plants during periods of high rainfall or humidity. The symptoms are stem rot accompanied by white fungal growth on the lower stem. Later, white spherical structures (sclerotia), about pinhead size, appear on the fungal growth. These turn pale brown as they mature. They are the means by which the fungus survives in the soil between crops. Occasionally, spots up to 1 cm in diameter appear on the leaves. These spots consist of alternate light and dark brown rings. No control is necessary.

Soybean mosaic

(Soybean mosaic virus)

The initial infection in a crop generally results from the use of diseased seed. The symptoms are light and dark green mosaic of the leaf blade. Leaves may be distorted, blistered, twisted, or crinkled. Plants may be stunted and produce fewer pods, some of which are malformed. Control measures are not warranted.

Charcoal rot

(*Macrophomina phaseolina*)

Charcoal rot is serious when stress conditions such as excessive heat or drought follow periods of good growth.

The first symptom generally noticed is an area of plants in poor condition or wilting. A diffuse light brown discolouration begins in the tap root and extends up the stem. Small black sclerotia can be seen when the bark is peeled away from the root. The disease is controlled by managing crops to minimise plant stress.

Little leaf

(Tomato big bud/legume little leaf *Mycoplasma*)

The disease is spread by the common brown leaf hopper (*Orosius argentatus*) from many weed hots. The disease is typified by a proliferation of axillary shoots, reduction in leaf size and often stunting. No control is required.

General disease control

The best method to control diseases of soybean crops is to plant resistant varieties where possible and rotate with other crops. It is important not to import seed from interstate so as to prevent diseases from entering the NT.

HARVESTING

Yields of 3.0 t/ha can be expected. However, after growing a good crop of soybeans, many growers ruin their product through poor harvesting. Soybeans are very susceptible to mechanical damage and extreme care is required during harvesting, particularly if the crop is to be used as seed.

The recommended moisture content for harvesting is 12%. Losses can be expected due to shattering and to lower pods being left on the stems. These losses can be minimised by a slow ground speed of 4-5 km/hr with the cutter bar as close to the ground as possible.

Soybeans can be readily damaged during harvesting as the seed coat is thin and the radicle which is just below the surface is very vulnerable to damage. Seed with low moisture content requires a slower drum speed than seed with higher moisture content. Drum speed is extremely critical if the crop is to be used as seed.

It should not be necessary to artificially dry soybeans in this region. Ensure you use low heat (no more than 50°C) as high drying temperatures will de-nature the oil in the seed.

Soybeans that are intended for seed should be handled with care as viability is easily reduced. Minor indiscretion, such as dropping seed from a truck, can have a serious effect on germination. Seed will require cool storage, particularly during the pre-wet months from October to December.

Additional information may be obtained from the DPIFM, Darwin or Katherine.

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www.nt.gov.au/dpifm

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