

Harvesting and drying of soybeans



Queensland Government

*Information kindly provided by
the Department of Agriculture,
Fisheries and Forestry.*

Minimising harvest losses

It is important to start harvesting when seed-moisture levels reach 16% because harvesting at 12-13% moisture causes more grain loss and seed cracking. Harvesting when the crop is too dry, or when the harvester is operating incorrectly, can cause severe grain cracking and splitting.

To minimise losses consider:

- cutting as low as practical to gather as many of the pods as possible
- using reduced ground speeds to keep shatter loss to minimum (4-5 km/h)
- using relatively low cylinder speeds to reduce grain damage, and select relatively high fan speeds to effectively clean the sample
- using belt augers wherever possible to minimise cracking and damage to the grain.

Probably the greatest advance in harvesting legumes is the introduction of floating cutter bar tables. The cutter bar assemblies are flexibly attached to the table carcass and have some vertical movement independent of the table. When the table is lowered so that the cutter-bar skids touch the ground, ground contours are accurately followed, permitting very close cutting and minimising seed lost from low setting pods. Coupled with automatic table height control sensed by the floating cutter bar itself, a very effective crop gathering mechanism is obtained.

The maturity of the crop is dependent on the variety and time of planting. Early plantings take the longest to mature, ranging from 120-150 days.

Some varieties mature unevenly when planted early and can still be very green and difficult to manage at harvest time. Check the variety's suitability for early sowing prior to purchasing seed.

Pre-harvest desiccation

Growers aiming to maintain or improve grain quality, or simply speed up the harvest, may wish to desiccate the crop. Some crops are slow to drop leaves and some localities are prone to wet weather at harvest, which reduces yield through shattering or weathering damage.

Excessive weed growth can delay harvest and cause green staining on culinary beans during thrashing.

Two chemicals are registered for desiccation of soybean crops, namely diquat (Reglone®) and glyphosate (not all product labels are registered for this use and not for seed soybeans). Reglone® is generally the preferred product to gain maximum advantage in dry down and quicker responses on weed growth. Generally, experience has shown that using the higher recommended rates of Reglone provides the most efficient results. Beware of potential drift damage to neighbouring crops. Damage is usually only of a cosmetic nature but it is a significant concern for vegetable crops.

Grain quality standards

Moisture

The maximum moisture percentage for soybeans delivered for processing depends on the end use. Under the National Agricultural Commodity Marketing Assoc. (NACMA) standards the maximum for crushing beans is 13% and the maximum for edible beans is 12%. The moisture content of soybeans to be stored on-farm should not exceed 12%. Use an unground sample of whole beans when using the Marconi moisture meter.

The maximum safe temperatures for drying soybean seed will depend on both the likely end use of the soybeans and the seed moisture content of the sample prior to drying. The table below provides a guide to maximum safe drying temperatures. Caution: some processors prefer to dry seed themselves to avoid potential quality degradation. Please check with traders or processors prior to conducting any seed drying.

Where the crop is being retained for planting seed, it should be harvested around 15% moisture to avoid mechanical damage, and then dried down to 10-11% for storage. Avoid drying seed below 9% as the seed coats can crack during handling and small fractures can appear in the grain.

Maximum safe drying temperatures

Maximum temperature °C	Initial seed-moisture content		
	14%	16%	18%
Planting seed*	65	60	55
Edible trade**	37	37	37
Crushing	80	70	80

Note: These are recommended temperatures for input airflow, they do not refer to grain temperature.

* If in doubt about drying temperatures for seed or tofu grades, revert to the lower industry standard drying temperature of 43°C.

** Edible uses require lower drying temperatures to avoid the development of 'off' flavours.

Grain yield and weight

Dryland grain yields are commonly between 1-2 t/ha while irrigated crops generally achieve grain yields of 2-4 t/ha. Yields up to 50% higher than this have been recorded in favourable growing conditions. Grain weight is usually in the range of 70-75 kg/hL.

Oil and protein

Oil content varies from 18-22% in soybeans.

Grain protein is generally in the range of 32-40%, but culinary quality grades aim for protein levels up to 43%.

Both oil content and protein level are usually calculated back to a 12% moisture content basis. Oilseed processors prefer the soybean protein content to be above 36% to meet protein meal specifications. Protein levels below 36% are a concern to both the crushing and edible trades. Management practices that can influence protein levels include:

- choosing varieties based on their protein levels
- managing diseases that reduce protein such as phytophthora, charcoal rot and sclerotinia
- assessing the effectiveness of inoculation techniques

- applying side-dressed nitrogen during flowering and pod-fill to boost grain protein; however, the results of this approach are inconclusive since a well-noduled and healthy soybean crop has excellent capacity to generate adequate nitrogen requirements.

The agronomic conditions required for maximising grain protein are not well understood.

Delivery standards for edible and crushing beans

All producers and marketers of soybeans should check the current NACMA/Australian Oilseeds Federation (AOF) specification standard (including any revisions) required for each individual market destination. Processors may vary their intake specifications according to specific end use requirements, e.g. with respect to soil and sclerote contamination. AOF accepts no responsibility for any buyer or handler varying their purchasing specifications.

The below table summarises the AOF soybean standard for farmer-dressed beans and represents a minimum standard for soybeans for the food trade, across a range of applications. It applies to individual loads. Some buyers may have additional requirements depending on their end use and specific processing requirements. Growers must be aware of the specific requirements of their customers.

Summarised soybean commodity standards (AOF July 2007)

	Edible milling grade soybean*	Edible manufacturing grade soybean**	Crushing soybean***
Description	Clean, sound, whole soybeans of light hilum varieties suitable for milling into flour, free from uncharacteristic odours, infestations or any unacceptable contamination.	Clean, sound, whole soybeans of light hilum varieties suitable for tofu, tempeh, soymilk etc., free from uncharacteristic odours, infestations or any unacceptable contamination.	Soybeans free from uncharacteristic odours, infestations or any unacceptable contamination.
Genetic modification	nil	nil	n/a
Moisture (oven method)	12% maximum	12% maximum	13% maximum
Test weight	70 kg/hl minimum	70 kg/hl minimum	n/a
Protein	n/a	40% DMB	n/a
Seed retention	n/a	90% minimum	n/a
Germination	n/a	85% minimum	n/a
Defective beans	maximum % wt/wt based on a half-litre sample retained above a 4.75 round mm hole sieve	maximum % wt/wt based on a half-litre sample retained above a 4.75 mm round hole sieve	maximum % wt/wt based on a half-litre sample retained above a 3.175 mm round hole sieve
Discoloured ¹	1 bean maximum	1 bean maximum	n/a
Split / broken seed ²	10% maximum	5% maximum	20% maximum
Damaged seed ³	3% maximum	3% maximum	3% maximum
Sprouted seed	nil	nil	5% maximum
Green seed ⁴	2% maximum	2% maximum	n/a
Foreign seeds	tolerance varies from 0-10 individual seeds per half litre. See AOF standard for details.	tolerance varies from 0-10 individual seeds per half litre. See AOF standard for details.	tolerance varies from 0-65 individual seeds per half litre. See AOF standard for details.
Crushing soybean impurity tolerance			
Impurities ⁵	4% maximum		
Snails/stones	nil above screen; 1 stone snail per half litre below screen		
Field insects	10 large per half litre; 100 small per half litre		
Ryegrass ergot	0.5 cm maximum		
Objectionable matter	nil live or dead stored-grain insects, live or dead pea weevil, sticks, stones, glass, metal, specified weed seed, chemical contaminants, smut, degraded seed etc.		

Table key

- * AOF standard reference no. CSO 6.
 - ** AOF standard reference no. CSO 7.
 - *** AOF standard reference no. CSO 8.
- ¹ Excessive seed-coat stains.
 - ² Half or larger parts of a bean not classified as damaged.
 - ³ Includes bean pieces and insect or weather damaged, diseased, soiled, mouldy or stained beans.
 - ⁴ Beans where a cross-section shows an intense green colour or is of meaty or chalky consistency.
 - ⁵ All material other than soybeans that pass through the sieve. Includes pods but excludes cottonseed, canola and weed seeds.

Moisture content

Moisture content is determined on the seed as it is received from the grower. Rapid direct-reading moisture testers are used only as a guide for acceptance or rejection of a consignment by the crusher or his agent.

If the grain does not meet the moisture specification, a penalty is applied based on the results of the prescribed oven-test method expressed to the nearest 0.1% on an 'as received' basis.

Impurities (foreign material)

Foreign matter is all organic and inorganic material other than soybean seeds. Foreign matter is determined as anything that passes through a 3.175 mm round-hole screen. The impurity content is expressed to the nearest 0.1% on an 'as received' basis.

Damaged seed

Damaged seed is seed that is heat-damaged, frosted, green, weather-damaged or in any way materially damaged. Seeds that are surface-damaged only, are classified as sound. Soybeans are classified green when a cross-section shows an intense green colour, or when it is green in colour and of a meaty or chalky consistency. Sprouted seed (also known

as 'shot' or 'sprung') is seed that gives any indication of the commencement of growth.

Broken or split soybeans are those beans not otherwise damaged that are three quarters of a bean or less in size. Separated hulls are included.

Damaged seed is taken as a percentage of the clean seed expressed to the nearest 0.1% and a penalty applies if specifications are not met.

Weed seeds

See the NACMA standards for full details of prohibited weed species. There is 'nil tolerance' for seeds of the castor oil plant, coriander, crow or wild garlic, Darling pea, opium poppy, ragweed, rattlepods, common broomrape, star burr and St. Johns wort.