

DPI&F note

Grain Storage - Early harvest for yield, quality and profit

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Any grain farmer who has ever thought, "If I'd finished harvesting a few days earlier the crop wouldn't have been affected by the storms that caused sprouting and downgrading", should consider investing in equipment to allow earlier harvesting.

Grain drying in the paddock

Allowing grain to dry in the paddock to the moisture receival limit might seem the cheapest drying method.

But while the grain is drying in the paddock:

- grain quality is falling
- yield is falling as grain is shed from the heads
- susceptibility to rain damage and sprouting increases
- drymatter yield can decrease by up to 2% with each day's delay in harvest past grain maturity

The longer grain stands in the paddock, the more likely it is that rain will fall on it. So the costs of drying in the paddock are reduced quality and yield, and in some years downgrading because of sprouting, fungal staining and other rain damage.

Grain is at its peak quality and weight when it reaches physiological maturity in the field, generally at 30-50% moisture content. As grain dries in the paddock it loses quality and weight, especially if exposed to rain. Protein content drops by an average of 0.2% per week in southern Queensland, so there can be a drop in protein content of 1% while grain dries down to 12% moisture in the paddock.

Severe wet weather can result in sprouting and subsequent downgrading of the grain and a big drop in the price paid for grain.

The number of hours that headers can work each day in naturally dried grain is restricted. The grain moisture increases each evening and takes a while to dry down each morning. This restriction slows harvest, thus increasing the risk of weather damage.

Harvest early at higher moisture

Harvesting early at moistures above the receival limit maximises quality and yield and minimises risks of rain damage. Harvesting at higher moisture allows:

- the harvest to start earlier than normal
- more hours of harvesting each day
- earlier resumption of harvesting after rain.

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Increasing harvest hours per day can be just as effective in speeding up the harvest as using another header, and is much cheaper.

However, the advantages of harvesting early can be lost if the high moisture grain is not handled and stored carefully. Under hot, moist conditions grain quality deteriorates rapidly, mould problems can develop within days and insect problems in a month or two.

The advantages of early harvesting must be balanced against the extra costs of holding the higher moisture grain. For example, if wheat is harvested quickly and early at 14-18% moisture content, harvesting can proceed for many more hours each day than if field drying is used. However, the grain must then be artificially dried for safe storage.

Studies have shown in Queensland that the increased returns due to better quality and yield for an early harvest exceed the capital and running costs of artificial drying in most years, for crops of greater than 300 hectares. With the increase in hours for heading each day, a dryer effectively increases header capacity. A dryer is a cheaper option for increasing header capacity than upgrading the header.

Handling over-moisture grain

Strategies for handling over-moisture grain, starting from the least cost option and progressing to the most expensive option, are:

- blending with dry grain to meet moisture specifications
- aeration cooling to prevent mould development until the grain is used or dried
- aeration drying
- hot air drying

All strategies require sufficient on-farm storage to hold the over-moisture grain.

Refer to more detailed information on aeration of stored grain at the GRDC website www.grdc.com.au/growers/as/

Who should harvest early?

Choice between early- and later-harvest strategies depends on balancing the risk and cost of downgrading due to weather damage against the cost of installing and running drying and cooling equipment. Investment in hot-air drying is generally not economical for smaller farms or farms in areas where rain at harvest time is rare. For larger farms the cost of early harvest and drying for 5-10 years could be repaid by avoiding the cost of downgrading in one wheat harvest.

Grain Quality and Damage

Most damage and quality loss in grain is caused by drying at excessively high temperatures. Damage varies between grain types, and acceptable limits depend on the end-use of the grain. Stricter quality standards apply to grain for processing and human consumption (eg, gritting maize, bread and noodle wheats, malting barley) than to grain for animal feeds.

When considering the effect of drying on grain quality remember that *grain temperature is critical*, not air temperature. Safe drying air temperatures vary widely but are highest for continuous flow and recirculating dryers, and lowest for a simple batch dryer. They depend on:

- Grain type and moisture content
- Relative humidity of the drying air
- Contact time between air and grain
- Dryer type

Table 1 summarises recommendations for maximum grain temperature (not air temp.) to avoid damage during drying. These figures are conservative, but ensure safe drying under most conditions.

Grain type	Grain temperature (°C)
Seed grain	43
Malting barley	43
Grain legumes (pulses)	43
Maize for gritting	43
Oilseeds	43
Cereals for milling (human consumption)	54
Feed grains, including sorghum	80

Further information

If you require further information,

- DPI&F website www.dpi.qld.gov.au/fieldcrops/3947/html
- DPI&F Call Centre open from 8.00am to 6.00pm Monday to Friday (telephone 13 25 23 for the cost of a local call within Queensland; interstate callers 07 3404 6999) or email callweb@dpi.qld.gov.au
- GRDC Update Advice www.grdc.com.au/growers/as/ ('Aeration in on-farm storages-what's possible', and 'How aeration works')
- Or, contact one of the National Grain Storage Extension Team

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