

Silo bags put to the test as a short-term, cost-effective storage solution

By South East Premium Wheat Growers' Association

At a glance...

- Grain silo bags have the proven advantage of providing a cheap, short-term storage solution to enable rapid harvest and avoid yield loss and quality degradation, especially in high yielding years.
- Like any grain storage system, bags need to be used properly with storage guidelines adhered to.
- A two-year project on the south east coast of Western Australia found that export barley stored within guidelines in the short term, showed negligible decline in germination energy or malting quality.

Silo bags provide efficient and effective storage for cereals, particularly in high-production regions that regularly experience quality damage and yield loss due to delays in harvest and exposure to inclement weather. But there have been concerns expressed by maltsters as to the impact that silo bags are perceived to have on the quality of barley (particularly germination).

Growers in the Esperance port zone region of WA have found that the seasonal benefits of silo bags very much outweigh the risks. Post-harvest seed cleaning and grading on farm as well as capturing freight cost and grain marketing peaks

have been additional reasons for continuing to use them with few issues when managed well.

In southern coastal WA, mainly wheat, barley, and more recently some pulses have been stored for on average up to three months in bags. As growers have started planting more legumes, these have also been stored successfully sometimes up to twelve months in more recent years. By constant monitoring and using good quality bags, experienced silo bag users have reported minimal issues.

Testing grain quality in silo bags

A project undertaken by the South East Premium Wheat Growers' Association (SEPWA), Bagging Grain Profits – Technical Assessment of the use of Silo Bags in the WA Supply Chain, set out to test the quality of grain stored in bags over time.

The project monitored storage conditions (namely temperature and humidity) in the bags over time, as well as the grain moisture, germination, malting (through micro-malting) and brewing (pilot brewing) quality of barley that was stored in bags.

- Temperature of the grain within the silo bags was largely unaffected by diurnal fluctuations in ambient temperature (Figure 1), with temperatures inside the silo bags trending towards the average ambient temperature over time. As expected, temperature fluctuations were larger at shallower depths within the bag.
- Grain moisture (Figure 2), was largely unchanged over time or by sampling depth.
- Germination (%) was unaffected by silo bag storage, with grain samples taken prior to and

after silo bag storage showing almost 100% germination (Table 1).

- Malt quality on barley correctly stored in bags for up to two months was also unaffected. Farmer practice on the south coast of WA is to store the barley for only a few months prior to delivering to CBH for export. The barley is tested as it goes



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Overview: SEPWA is a farmer initiated group that was started in 1993 to represent wheat growers in the Esperance Port Zone of Western Australia. The group currently has an active membership of around 340 farming entities which represents some of the most progressive growers in the region. This makes SEPWA one of the largest grower groups within WA.

The group was originally formed to address the perception that wheat from the south east of WA was of inferior quality to that of wheat from other regions. An energetic group of farmers, advisers and researchers set about assisting local growers to produce a premium quality product and to improve the marketing prospects of grain from the region.

SEPWA has moved on since this original aim but still strongly retains the production of premium grain as one of its major objectives. In more recent times, the group's interests have expanded into canola, grain legumes and break crops.

Today SEPWA's role is to improve profitability and sustainability of Esperance Port Zone grain growers.



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Silo bags are an alternative short-term storage option for wheat and malt barley to support harvest logistics if management guidelines are followed.

Table 1: Germination results of barley stored in bags showed no variation over time

	Initial sample (%)	Final sample (%)	Days in bag
Salmon Gums North	100	100	32
Salmon Gums West	100	100	74
Cascade	100	100	61
Munglinup	99	100	60

into the bags and then again on delivery. Barley that is destined for export markets needs to meet the minimum 98 per cent germination standard.

In March 2020, Barley Australia updated guidelines for malt barley stored in silo bags to raise concerns of using them for long periods, but as a short-term option they could be used to assist with harvest logistics.

Growers need to be aware that maintaining end use quality for malting barley is paramount to retaining its germination capacity in the malthouse and bags still pose a higher risk than other storage options. The process of making malt is dependent on live barley grain capable of vigorous germination.

So when storing barley for malt purposes, it is vital that optimum storage conditions are achieved.

To sum up

- Handling barley at harvest and avoiding delays is critical as viability of the grain must be maintained. Silo bags have been a proven tool in quality management for growers in high yielding years. The potential for a premium price and the possibility of lodging, head loss, grain swelling, colour staining, hardness and sprouting risk means malting barley should be harvested as soon as the crop is at the specified moisture content of below 12.5 per cent.
- A two-year trial to test the germination and temperature effects of storing grain in silo bags found that moisture and temperature conditions in bags remained stable and if stored in good condition, barley quality over time was stable.
- Barley Australia still cautions that bags are a risky option and they are to be used for short-term only, to minimise risks of germination vigour decline.

Useful resources: [Grain Storage Fact Sheet](#); [Successful Storage in Grain Bags, GRDC 2014 \(Project PAD00001\)](#)

Barley Australia: www.barleyaustralia.com.au/update-on-silo-bag-use-for-malting-barley-27-march-2020/



Tinytags were used during the trials to monitor the temperatures outside and inside the silo bags.

Figure 1: Ambient (orange), shallow (30 cm depth, purple) and deep (1.2 m depth, blue) temperature readings over eight months from multiple grain bags at various sites across the Esperance port zone

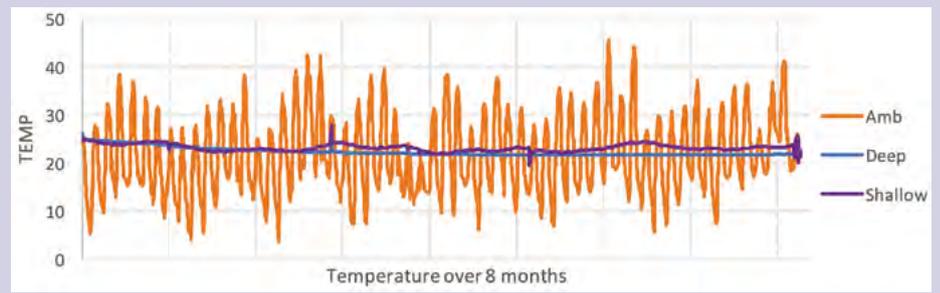


Figure 2: Moisture readings from grain sampled from shallow (30 cm depth, red) and deep (1.2 m depth, blue) depths within a grain bag at Salmon Gums showing little variation over time



Updated recommendations and further research

The findings from this research created vigorous debate within the Australian barley industry.

Following a presentation by SEPWA project officer, Aidan Sinnott at the Barley Technical Symposium in Perth in September 2019, Barley Australia updated recommendations in March 2020.

The recommendations now state that bags can be a useful tool for supporting harvest logistics and maintaining quality through rapid harvest storage, especially in coastal areas prone to wet spring conditions.

Further research

As most growers in Western Australia use bags for short to medium term storage, this project only investigated grain stored for less than eight months – and mostly only three months.

Additional research could be done to further explore the thresholds (upper limits of moisture content, storage time, temperature etc) for bag storage of barley and other grains in varying climates. These thresholds could be tested in comparison to grower best practice – the technique which was used in this research.

SEPWA also proposes further studies be done on the correct disposal of grainbags as this is still an issue for many growers. The local shires are unable to accept bags for disposal or recycling and recommends they are wrapped and stored on-farm until a solution is found.

