

KIT 4.3

Improve the reliability and cost-effectiveness of on-farm grain storage to reduce handling costs and capture market opportunities.



Impact	Grain growers optimise the use of grain storage to maximise operational efficiencies and business profitability.
Summary	<ul style="list-style-type: none">• Providing growers with access to knowledge, technologies, tools or equipment to ensure that current and new on-farm grain storage infrastructure, processes and handling systems are fit-for-purpose and maximise on-farm efficiencies.• Supporting the development of industry knowledge, tools and skills to enable grain growers to maximise seed viability, and quality as well as capture market opportunities from application of fit-for-purpose grain storage and handling systems.

OVERVIEW

Grain growers are investing in on-farm grain storage systems, processes and infrastructure to optimise operational efficiencies during harvest, to ensure viable seed for future cropping and to increase profits on harvested grain wherever possible. Grain growers can currently store 50–60 per cent of the annual crop on-farm (GRDC 2017) suggesting that about 23–27m tonnes of grain can be stored in existing fixed and temporary facilities (ABS 2013-18). GRDC's 2017 farm practices survey found that average on-farm storage per grain growing business is: 2,600 tonnes in the northern region; 1,200 tonnes in the Southern Region and; 900 tonnes in the western region.

The use of on-farm storage by Australian grain growers has increased significantly over the past decade. The primary drivers behind this continued increase in the use on-farm grain storage include:

1. Improved harvest efficiencies and logistics (i.e. shorter truck turn around, ability to dry grain, reduced harvester down time due to grain storage and handling logistics, and lower labour requirements);
2. Freight and handling cost efficiencies;
3. Price upside opportunities when marketing grain ex-farm gate;
4. Ability to value-add, blend, or improve the quality of the grain (grading and segregation) for a premium target grade or market;
5. On-farm use and value adding through alternate products (e.g. malt production or on-farm feedlots); and
6. Retaining high quality seed for future cropping.

In the Northern and Southern Regions, 60–70 per cent of growers store grain with the aim of improving the marketing/price opportunities and managing income/cash flow, and between 20 per cent and 30 per cent use on-farm storage to improve harvesting efficiency. In the western region, on-farm storage is mainly used for seed retention (53 per cent) and animal feed (49 per cent), while close to 40 per cent of western grain growers store some grain for marketing or price increase opportunities.

Designing and managing an on-farm grain storage system that best meets both the businesses needs and value chain expectations is an important factor in driving both operational and financial value in grain growing businesses. Well-designed grain storage and handling systems give grain growers options for improved grain marketing and can reduce the potential impact of grain pest infestations as well as the deterioration of grain quality and/or seed viability.

Current best practice is for fixed grain storage infrastructure to meet the Australian Standard AS2628 but maintaining these sealed silos is an on-going challenge for grain growers. Properly sealed grain silos allow for fumigation as part of the management strategy. By adding aeration growers can also manage grain temperature and in-silo humidity. About 65 per cent of Northern Region grain storage, 40 per cent of Southern Region storage and 25 per cent of Western Region storage include aeration for the purpose of drying, cooling and/or fumigating grain.

Key Investment Target (KIT) 4.3 focuses on enabling grain growers to design and actively manage reliable, fit-for-purpose and cost effective on-farm grain storage and handling systems and assets (fixed assets – silos and sheds; or temporary assets – field bins, mother bins, bunkers and silo bags). The purpose of KIT 4.3 is to enable grain growers to optimise profit from every tonne of grain by reducing costs and capturing greater value from additional market opportunities. Through this KIT strategy GRDC expects to invest in RD&E that aims to improve:

- Grain storage practices, aeration and drying, and pest management for greater cost effectiveness;
- Grain quality to support next use requirements (including seed viability, and market opportunities); and
- The capture of additional value from opportunities associated with quality assurance, traceability and sustainability.

KIT 4.3 aligns and informs RD&E on marketing and market access (see KIT 4.2). It does not include off-farm freight infrastructure (see KIT 4.1 and KIT 4.4). GRDC expects to engage broadly including non-traditional providers when making investments. GRDC also intends to make these investments in the context of market, technology, social and environmental needs.

FUTURE RD&E FOCUS

SCOPE – Effective grain handling and storage systems

Grain growers have access to the knowledge, understanding and tools to develop fit-for-purpose on-farm grain handling and storage systems to meet current and future business needs.

The ability of grain growers to manage harvest logistics and hold grain on-farm depends on having a handling and storage system that is appropriate to the needs of the farm business. Growers should also consider strategies to optimise grain logistics and grain marketing as part of grain storage system design (see Investment Outcome 4.3.3).

As discussed previously the main drivers for use of on-farm storage are operational efficiency (particularly harvest logistics efficiency), enhanced marketability/price and ensuring optimum seed viability. Improving marketability and/or price may require access to local storage options appropriate for segregations (crops and varieties grown by grain quality classification or receival standards). Segregation of grain on-farm by variety or quality type will be based on specific market opportunities and the capture of maximum benefit will often be a function of the capacity to blend or actively manage grain stacks on-farm. This most likely means that an individual grain growing business will use a diverse combination of temporary and fixed on-farm storage infrastructure as well as off-farm options to optimise the marketability or price of harvested grain. Optimum on-farm handling and storage systems must enable:

- Efficient on-farm harvest and post-harvest handling logistics to capture maximum profit and return on investment for the farming business.
- Efficient segregation and handling of specific grain qualities (including traceability related options) sought by domestic and export grain markets.

Effective grain handling and storage systems RD&E is expected to include the development of technologies and equipment aimed at improving the structural integrity of existing storage structures, updated knowledge to inform grower decisions when planning to build or expand new storage infrastructure, novel pest management options and novel on-farm grain storage, movement, sensing, and handling approaches (IOT, robotics & other new technologies).

Investment Outcome 4.3.1 – Grain growers can improve their existing on-farm grain handling and storage systems using current knowledge, tools and technologies.

On-farm grain storage and handling has become an increasingly important part of most grain growing businesses. Australia is a world leader in the development of grain storage infrastructure and management systems. However, there are several challenges and opportunities that, addressed through RD&E, could enable grain growers to reduce storage and handling costs as well as capture higher value market opportunities from their current storage and handling systems.

GRDC will support RD&E focused on improving current on-farm grain storage infrastructure and handling systems. Some of the RD&E opportunities include the delivery of enhanced sampling and grain quality monitoring systems and increased knowledge about cost-effective retro-sealing (to AS2628) or retro-aeration of existing storage facilities (where the practicalities and financial return-on-investment of retro-sealing or retro-aeration can be justified).

GRDC will invest in RD&E to assist growers to create greater value from existing infrastructure. Other opportunities include new engineering options and/or alternative or novel pest management options. For example, effective cooling of stored grain creates an environment that is undesirable for many grain pests. Activities are likely to include the extension of information about aeration and retro-sealing silos, as well as the development of other technologies that enable growers to upgrade their existing facilities and systems.

Investment Outcome 4.3.2 – Grain growers can create and effectively manage new purpose-designed on-farm grain handling and storage systems based on world-leading best practice knowledge, tools and technologies.

Growers should be applying best practice when planning, building, expanding and implementing an effective and efficient on-farm grain handling and storage system. To do this, manufacturers and on-farm grain storage consultants may need to play an increased role in assisting growers to plan and construct on-farm storage facilities appropriate to the individual requirements of their farming business (small or large). This is seen as a growth opportunity for the industry given that few manufacturers currently meet AS2628 once silos are installed on-farm. The location and integration of various storage facility options across a grain growing business is also important. With this in mind, best practice infrastructure improvement planning should consider whole farm operations, harvest logistics, on-farm handling logistics, out loading, on-farm grain storage management as well as pest and quality control.

The GRDC will invest to define best practice options for grain growers to plan, build, expand and manage effective and efficient on-farm grain handling and storage systems. GRDC also expects to invest in the identification of new engineering solutions across fixed storage infrastructure, short-term temporary storage options and associated grain handling systems. New engineering solutions for improved grain handling and storage could include integrated grain diagnostic and monitoring systems, integrated technologies and remote and/or automated system operation technologies. On-farm IOT enabled technologies will likely form an important part of these future systems.

GRDC also expects to invest in enabling grain growers to make more informed decisions on their investment in fit-for-purpose grain handling and storage systems. This means assisting grain growers to attain the skills and tools to make comparisons between storage options, fumigation options and alternatives to phosphine (given pest resistance and regulatory risks), and between the range of storage requirements of different commodities (e.g. heat/cooling, drying, aeration, moisture, pest treatments, storage duration). GRDC could also invest in exploring mechanisms that enable grain growers to manage quality assurance and traceability, occupational health and safety as it relates to storage and handling, automation and early pest infestation or other quality related issue detection systems in grain storage.

SCOPE – Optimisation of grain handling

Grain growers apply best practice to optimise grain quality and seed viability and have the ability to capitalise on marketing opportunities.

Opportunities to enhance the marketability of harvested grain using on-farm grain storage are realised only where best practice storage and handling systems are efficiently integrated into on-farm operations. Growers often wish to store grain for up to 12 months and under certain situations this may extend to longer periods including where storage is used for retained seed or cash-flow management. This means that growers need an active management strategy for grain handling (on-farm logistics), grain quality management, segregation, grading and blending, as well as an Integrated Pest Management (IPM) plan that addresses pests in storage as well as mitigating against the evolution of chemical resistance.

The benefit of an actively managed best practice grain handling and storage system includes the ability to maintain and, in some situations, improve grain quality and viability for targeted markets through testing and segregation, grading and blending. This means that growers need functional tools and technologies for diagnostics both at entry into storage (e.g. blending and/or active stack management) and 'in storage'. This includes the need for grain growers to access knowledge and tools to monitor changes in functional quality (next use considerations) for different commodities based on temperature, humidity and storage type. It also includes timely best practice diagnosis and treatment of storage pests. This means that grain growers need to have the knowledge and tools to predict and manage the development of resistance within pest populations in grain storage facilities. This knowledge is important to ensure good storage hygiene and is critical for ensuring that the needs of domestic and export grain markets are met.

Investment Outcome 4.3.3 – Grain growers have access to knowledge, tools and technologies to manage and/or improve seed viability, grain quality and the marketability of harvested grain.

On-farm grain storage is a critical long-term investment for many grain production businesses. As long term on-farm storage capacity increases so has the use of sealable silos (KG2 2013, GRDC 2017). Many grain growers have also invested in equipment for short-term storage solutions (including silo bag in/out-loaders). However, there are a number of opportunities and challenges that could be addressed through RD&E to assist grain growers maximise grain quality and seed viability, enhance marketability for greater value capture, and in turn realise their optimum return-on-investment for these grain handling and storage systems.

GRDC will invest to improve current and develop novel knowledge, tools and technologies for the management or improvement of grain quality, seed viability and enhanced marketability. The RD&E opportunities include improving grain grower knowledge of the market options that could drive increased profitability through tactical segregation, blending and/or timing of sale. Grain growers would also benefit from an improved understanding of the impact of storage conditions and time-in-storage on seed viability (germination) and on end-use grain functionality (e.g. for milling or malting). An improved understanding of the impact of storage conditions and timing on grain functionality may lead to opportunities for market differentiation and ultimately capture of greater value. Other RD&E investments may include:

- Providing grain growers with access to effective diagnostic technologies and efficient approaches for managing segregation, grading and blending where on-farm storage could be in a single location or across multiple locations within the business.
- Options that predict grain quality before harvest where these could facilitate more effective and efficient on and off-farm storage decisions.
- Enabling grain growers to take up new market differentiation solutions that improve quality assurance, traceability and sustainability.

GRDC will continue to consider RD&E investments that explore pest infestation, pest prevention, pest elimination, non-chemical pest control solutions, sampling and diagnostics for pests and grain quality/functionality characteristics as well as new and novel pest and quality management solutions. There is also an ongoing need for grain growers to have knowledge of and access to active IPM technologies that address key problems (e.g. increasing phosphine resistance, and the suitability and efficacy of diatomaceous earth) to meeting market requirements. This will become an increasingly important part of quality assurance, traceability and market access.

