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Title:

Increasing the profitability of the Australian grains industry through the provision of more accurate wheat grain quality information

Abstract:

Each year Australian farmers produce about 24 million tonnes of wheat, valued at over \$5 bn. The price paid per tonne to growers depends on the quality of the grain, which can be affected both by the environmental conditions under which the crop was grown and by the genetic make-up of the varieties. It is crucial that growers are provided with accurate information to allow them to choose the best varieties for their environment. The most comprehensive and independent information for growers is provided by the Grains Research and Development Corporation of Australia via their National Variety Trials (NVT) system. NVT is a national program of comparative crop variety testing with standardised trial management, data generation, collection and dissemination (via NVT Online). About 600 trials covering 10 crop types are sown at over 250 locations each year. The data obtained from the wheat trials (about 200 trials per year) relates to the key economic traits of grain yield and grain quality. All trials are sown by using experimental designs with 3 replicates but only grain yield is obtained from individual plots. Grain quality traits are assessed by using composite samples (that is, a single sample for each variety formed by mixing together samples from each replicate). The information that is provided on NVT Online for grain yield is obtained from weighted two-stage mixed model analyses of appropriate multi-environment trial (MET) data sets. This results in the best currently available predictions of variety yield performance. This is in stark contrast to the grain quality data since the use of composite samples precludes the application of any statistical analysis for individual trials.

In this talk we consider a study of 39 NVT wheat trials in which grain quality data were collected using a strategy in which some varieties were tested using individual replicate samples and some as composite samples. We show that with such data a fully efficient MET analysis is possible. The variety predictions from this analysis can be used by growers to help them select appropriate varieties for their environment. In terms of the grain quality traits, growers do not want to bear the unacceptable risk of being down-graded at receipt, thereby incurring significant financial losses. They aim to avoid this by choosing varieties that are superior to negative control varieties with which they have experience. We show, via simulation, that the error rates for such decisions are substantially lower when based on predictions from the MET analysis compared with the current approach of using “raw” composite data.

