Baking Quality Trial

Project title	Baking Quality Trial
Project partners	FarmLink Research, Allied Pinnacle, Ayrzta
Funding partner	Allied Pinnacle, Aryzta
Trial Site Locations	TAIC, Tallimba NSW
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INTRODUCTION

Agronomic management has proven to have just as much influence on wheat milling and baking quality as genetics. The main agronomic management technique is nitrogen application rate and timing as this will affect the protein composition of the grain.

Protein concentration is an important parameter that must be met for wheat to meet a quality classification. For example, Australian prime hard (APH) must have a minimum of 13% protein. However, this can be a source of frustration for millers and bakers because even if APH wheat is 13% protein, there can still be a large variation in milling and baking quality. For a variety of wheat to have a APH classification it must go through rigorous baking quality testing so that it meets the specifications of different parameters such as viscosity and dough rheology. However, because agronomic management has such an effect on baking quality as well, a particular variety of wheat with an APH classification might still not be consistent milling and baking quality.

An observation that has been made by millers at Allied Pinnacle, is that wheat that has been grown on paddocks with a strong legume history have a better baking quality than wheat that comes from paddocks which only have N applied through synthetic fertiliser such as urea. Through a partnership between FarmLink, Allied Pinnacle and Aryzta, FarmLink have set up a project as a proof-of-concept trial to see if this idea can be proven through small plot research.

METHODOLOGY

To test whether nitrogen source affects the baking quality of wheat, two-year trials were established so that different rotation crops could be grown in the first year of the trial and wheat in the second. 2022 was the first year of the trials meaning that it was a setup year for wheat to be grown in 2023. The different rotation crops were canola, where urea was applied, and grain legumes with no additional N fertiliser to try and build up soil N by an organic source. In 2022, there were two separate trials established with differing trial designs.

TAIC Trial

The TAIC trial, consisted of canola, faba beans and lupins grown in blocks of small plots. There was enough area planted in these blocks so that in 2023, 4 different wheat varieties could be grown in each block to test first whether there would be a difference between the canola and legume history on baking quality, but also determine if there is any varietal differences that can change this result.

Unfortunately, 2022 was a difficult season for cropping at Temora where very high rainfall through the growing season caused significant issues such as waterlogging. This meant that yields were severely impacted, and the lupins were completely unsalvageable. However, the trial could continue mostly as planned.

Soil testing was undertaken after the rotation crops were grown to determine if there was any difference in soil mineral N between the faba beans and canola. These test results will also be used to calculate fertiliser application rates to the wheat grown on the canola stubble so that the soil mineral N between faba beans and canola stubble would be matched. This means that if there is still a difference in yield and baking quality of the wheat, it could be due to the difference in N source and not amount of N available.

Tallimba Trial

A second trial was setup at Tallimba in 2022 to compare both, N source effect on baking quality, and also look at different management techniques that growers need to consider when growing legumes in their cropping rotation. These include what is the end-use of the legume and where does it fit in the rotation.

The trial consisted of vetch and canola grown in 2022 however, the vetch had three different end uses as treatments. These were brown manure, hay and grain which would represent different end-use strategies. Each of these end-use strategies would also influence residual soil N. These treatments were repeated so that both canola and wheat could be grown in 2023 in these areas. This is because it may be more common practice for growers to follow a legume with canola than wheat. Therefore, both crop types are grown in 2023 but than in 2024, canola and wheat will be grown again on the opposite ground to see if there could still be a legume benefit to the wheat two years after the legume was grown.

2022 RESULTS

The results recorded are just preliminary because the wheat component of the trials will be completed in 2023. This means the full results will not be recorded until after this wheat is harvested and undergone baking quality testing. Preliminary results shown below include the soil testing results which were taken pre-sowing 2023.

TAIC Wheat Trial

Figure 1 - Faba beans plots at the TAIC trial during the 2022 season which where wheat will be sown in 2023

During the 2022 growing season (April-October), there were 609mm of rainfall. This made for extremely wet conditions which caused significant damage to the trial site. This meant that only the Faba beans and the canola were harvestable at the end of the season and will be used for the 2023 wheat trial.

The canola had an average yield of 1.9T/ha and faba beans 0.6T/ha. These yields are much lower than anticipated but reflect the difficult growing conditions experienced.

MAP was applied at sowing to all crop types. No additional fertiliser was applied to the faba beans and the canola had 500kg/ha of top-dressed urea applied.

Pre-sowing soil tests indicated that there were similar levels of soil mineral N at the start of the 2023 growing season. These were 92kg/ha for the canola plots and 96kg/ha for the faba beans. This means that no additional nitrogen fertiliser will be applied in 2023 and if there are significant differences in crop yield and baking quality between the canola and faba bean blocks, it may be because of N source.

2022 RESULTS

Tallimba Trial

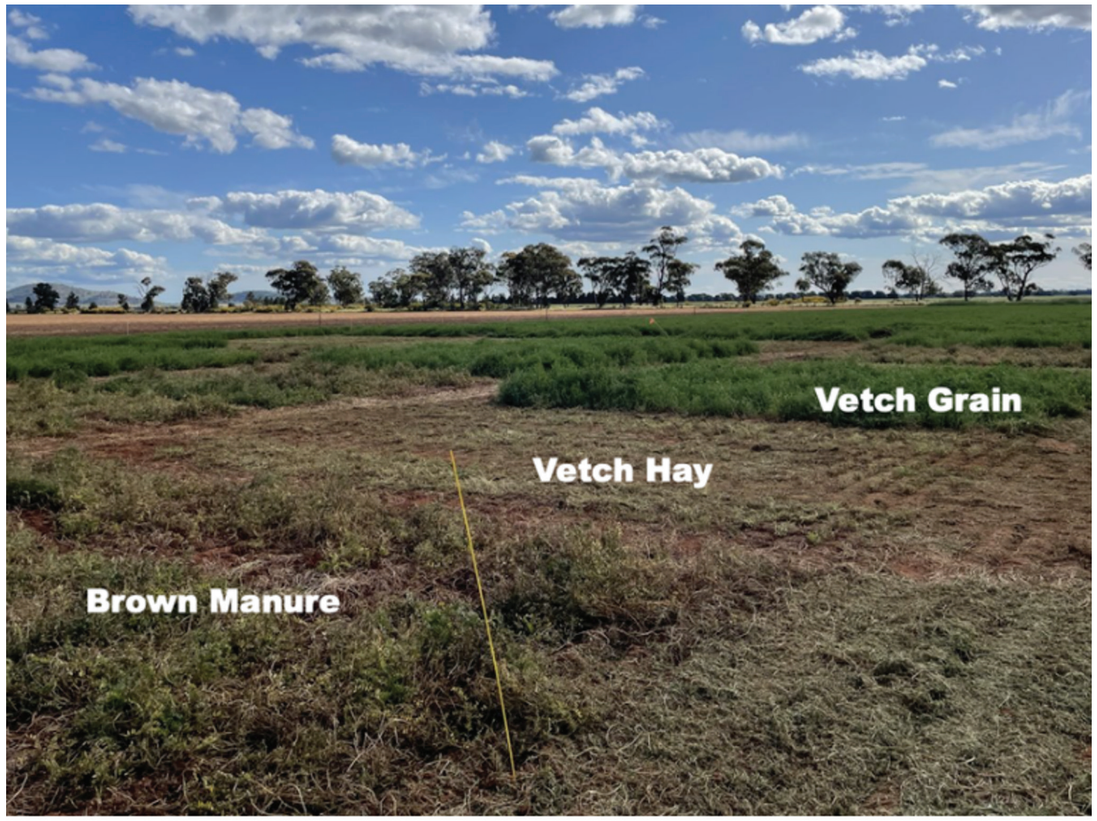

Figure 2 - Vetch plots at the Tallimba trial shortly after the brown manure plots have been terminated and the hay cut has been completed.

The Tallimba trial successfully grew vetch plots that could have different end uses applied as treatments. The different vetch end use strategies can be seen in Figure 2. The brown manure was terminated by a knockdown spray at peak biomass with all residue left on the plots. The hay cut was completed at the same time and the mean dry matter yield for all plots was 2.7T DM/ha. The grain treatments had multiple fungicides applied and were taken through to harvest. The average grain yield across all plots was 1.9T/ha.

Prior to sowing the trial in 2023, soil tests were taken to determine soil mineral N levels across the different treatments as well as a canola check treatment. The canola had 300kg/ha of N applied during the 2022 season. Figure 3 shows that the urea application to the canola increased soil mineral N much higher than any of the vetch treatments which is even with the nutrient removal that the canola would have exported. This is because there was only a maximum of 2.7T/ha of biomass residue remaining from the vetch that would contribute to increase in N levels. Although this may have contributed to organic N bank in the soil there would not be a significant increase in the soil mineral N in the first year after legumes with this amount of biomass grown. There was a difference in soil mineral N shown between the different end-use strategies for the vetch with brown manure being the highest due to it having the most residues left behind. However, this difference was not significant (P Value >0.05) and therefore, will not significantly impact the results in 2023.

2022 RESULTS

Tallimba Trial

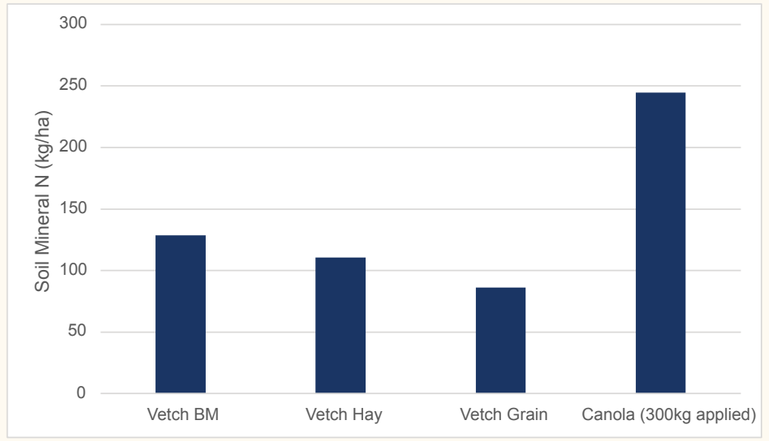

Figure 3 - Soil mineral N test results taken prior to the 2023 season. The canola plots had 300kg/ha of N applied during 2022 but the vetch had no additional N fertiliser applied.

CONCLUSION

The 2 separate trials were successfully established in 2022 which means that the wheat trials can be undertaken in 2023. These wheat trials will determine if there is a difference in baking quality between the wheat grown on legumes compared to wheat grown only with synthetic fertiliser. This trial has been possible through collaboration between FarmLink and its partners, Allied Pinnacle and Aryzta and will provide a greater understanding for both grain growers and millers about how different factors can influence the baking quality of wheat.