

Farming systems research update

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Key Points

- Good cereal crops in 2020 resulted in high levels of crown rot inoculum which will need to be managed in future years.
- Levels of beneficial soil fungi varied depending upon cropping intensity, the crop type grown previously and how well it grew. Low levels of beneficial fungi can result in yield penalties and need to be managed.
- The low intensity system performed well financially over the five years of the trial but depended heavily on a good cotton crop.

Results are in for the 2020 season of the Grains Research and Development Council (GRDC)/ Department of Primary Industries (DPI) funded Nowley farming systems trial managed by the DPI.

As mentioned in the last newsletter six rotations are being used.

- **Baseline** – this system, based on local commercial practice using wheat/barley, sorghum and chickpea and planting when stored soil moisture was at least 50% of maximum.
- **Higher nutrient** – similar cropping sequence to baseline with higher nitrogen application to target greater yield and additional Phosphorus (P).
- **Higher crop intensity** – wheat/fallow/sorghum/double cropped chickpea planting on a minimum 30% moisture profile. Fertilized for an average yield.

- **Higher crop diversity** – use a greater range of crops, with crop choice to manage nematodes and herbicide resistance. Crops were planted on at least moderate soil moisture.
- **Higher legume** – one in every two crops being a legume, crops were planted on at least 50% moisture profile.
- **Lower intensity** – higher value crops wheat, barley, chickpea, sorghum or cotton are targeted and planted when the moisture profile is greater than 80% full.

In 2020 all rotations were at the wheat (Longreach Lancer) phase of the sequence, allowing for some interesting comparisons. Most systems had similar yields 5.2- 5.6 t/ha except the high intensity system which yielded 4.4 t/ha, possibly due to lower starting moisture (~<40mm) deep in the profile (30-120 cm) compared the other systems.



Image: Trial wheat plot

The high nutrient system began the winter 2020 season with approximately 40 kg N/ha of additional Nitrogen (N) in the profile compared to the baseline system, received the same N fertilizer treatment and yielded approximately the same indicating no yield benefit in 2020 to the higher fertility regime although protein was higher (14.5% versus 13.7 for the

baseline). It did however have an additional 40 units left over in the soil profile at harvest available for future crops. Interestingly this system also had an additional 46 units of N at the end of 2019. This indicates that during dry conditions higher N loads can carry over to the next crop, but growers need to be aware of the risk of demineralization during wet conditions.

The high legume and low intensity systems started 2020 with considerably more (70 – 80) kg N/ha in the profile compared to the baseline and received 70 kg N/ha less as fertilizer. All three systems ended the year with similar soil N levels indicating the effectiveness of soil sampling and budgeting to manage N.

The baseline, high nutrient, high diversity and high legume systems had medium to high levels of crown rot fungus at sowing in 2020. The low intensity and high intensity had low levels as a result of not having a wheat crop since 2015. By the harvest of the 2020 wheat crop all systems had high levels of crown rot. There was also a tendency to higher levels of crown rot in the high nutrient system. Levels of common root rot were all low at sowing in 2020 but were all either medium to high by harvest. These results indicate the fundamental importance of cereal root and crown disease management in our farming system and the fact that good crops can lead to high inoculum loads for future crops.

For some systems levels of beneficial soil fungi, Arbuscular Mycorrhizae Fungi (AM or AMF) were towards the low end of the scale at the start of the 2020 season. In some cases the reason was clear as with the low intensity system having insufficient crop frequency to maintain levels and the high diversity system having canola (a non host of AM) as the previous crop. The high diversity system had lower levels possibly as a result of a previous failed sorghum crop. Low levels of AM can result in yield penalties and/or greater responsiveness to P and Zn fertilizer.

Over the life of the trial (2015 to 2020) the baseline, high nutrient, high diversity and high legume all produced about 16t/ha of grain, the higher intensity system produced around 14t/ha of grain and the low intensity system produced around 11t/ha of product including 2.1 t/ha of cotton seed and lint. A double crop chickpea into sorghum in the relatively dry 2017 coupled with the 2018/2019 drought countered against the high intensity system. Despite only three crops in five years the low intensity system produced a gross margin close to the highest performing systems, however this result depended heavily on a good cotton crop. The trial continues this year and a field day is planned for August.

More information

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Fusarium crown rot fungus DNA - 2020

