The Expanding Pulse - Adapting Pulses to Mallee environments

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Northbound – Pulses on the march into the semi-arid Mallee region

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Pulses are an important driver of productive, profitable and sustainable farming systems in south eastern Australia. Local applied research has demonstrated the benefit legume crops such as pulses provide to Mallee farming systems. Grain yield increases of 0.5 – 1.5 t/ha in cereal following a pulse, with an increased profit up to $100/ha per year has been recorded in low rainfall pulse break crop sequences, relative to maintaining continuous wheat (McBeath et al, 2015; Moodie et al.2017). Improved grain yield and profitability was attributed to beneficial effects on the cycling and supply of nutrients, improved grass weed control and reduction in cereal disease.

A roadside survey in 2017 of approximately 800 paddocks across an 1100 km transect has shown that the adoption of pulse crops in the Victorian Mallee region has increased dramatically, from 7% of paddocks in 2006 to 24% in 2017. Lentil (10.6%) was the dominant legume crop in 2017followed by field pea (6.2%), vetch (including for hay) (5.3%), lupin (1.6%) and chickpea (0.7%). The increase in pulse area came at the expense of fallowed paddocks which declined from 18.4% in 2006 to 2.4% in 2017 or regenerating pastures which declined from 18.0% in 2006 to 12.4% in 2017.

Significant agronomic changes in Mallee farming systems have also supported the adoption of pulses in the Mallee. The widespread adoption of no-till and stubble retention farming practices (Llewellyn and D'Emden, 2010) have allowed for successful establishment of pulse crops on coarse textured soils, while summer weed control practices increase stored soil water, which moderates risk in semi-arid environments. Strategic and careful use of herbicides across the cropping sequence has helped to avoid problems from herbicide residues in high risk alkaline, low organic matter Mallee soils. These farming systems also have a strong focus on early sowing to ensure effective utilisation of in-crop rainfall, while minimising effects of drought and heat stress at the end of the growing season. Often a 'sow by the calendar' policy is implemented, which can bring about its own challenges, such as successful inoculation practices in dry soils. There can also be increased frost risk if crops emerge early. Advancement in pulse breeding has also supported the adoption of pulses in the Mallee. Improved traits such as herbicide tolerance, disease resistance, tolerance to subsoil constraints, improved phenology and architecture have provided Mallee farmers with better adapted pulse crop varieties resulting in lower production costs and reduced risk.

To ensure the sustainability of growing pulses in the semi-arid Mallee there are environmental, biotic and abiotic challenges which need to be overcome through improved genetics and crop management. Rainfall is slightly winter dominant, generally low (annual <350mm; GSR < 250mm) and variable, with terminal drought often experienced by crops. Temperatures can vary dramatically throughout the cropping season and particularly in the critical reproductive phase of pulses. Both frosts and heat stress can result in significant grain yield and quality losses. Soil variability is extreme which provides challenges for both crop and variety selection as soil types within paddocks vary from deep infertile sands to clay loams with subsoil constraints.

Diseases above (eg. *Ascochyta sp*. and B*otrytis sp*) and below ground (eg. *Pythium* and *Rhizoctonia*) can pose a significant risk, causing substantial yield loss in these regions depending on seasonal environmental conditions and soil types. Improved tactical disease control strategies are required, as disease outbreaks are infrequent, and the extensive nature of low rainfall farming systems mean expensive inputs are often wasted

when farmers follow routine preventive disease control programs. Weed management is also incredibly challenging due to the environmental variability and changing soils, combined with a limited range of registered products, particularly for broadleaf weed control. Moreover, there is a high risk of crop damage from commonly used group C herbicides or herbicide residues in the soil on sandy, low organic matter soils.

There is a significant role for innovative research and development to create solutions that overcome constraints to growing pulses in the Mallee and other low rainfall farming regions. This will see pulses continue their march into the Mallee which will both grow the pulse industry and increase the profitability of low rainfall farming systems.