Oaten hay as rotation crop in WA cropping systems – A Dynamic Cropping System approach

Raj Malik and Mark Seymour

Department of Agriculture and Food Western Australia, Katanning and Esperance
e-mail: raj.malik@agric.wa.gov.au

Cropping systems in Western Australia are dominated by cereals and canola largely due to economic consideration. However, there are concerns that such monoculture systems could result in increased herbicide resistance, disease persistence and serious decline in soil quality. Thus, there is need for developing cropping options not only for effective management of these agronomic constraints but that are profitable and sustainable also. Each year farmers decide what crop to grow based on previous history and experience and market outlooks. Therefore, what farmers often actually want to know is - what is the best crop to sow after the last one or two - meaning what is the best crop sequence. We initiated a Dynamic Crop Sequence trial at Katanning Western Australia, which approaches this question, amongst others, in a different way by laying out the trial in such a way so that in the third year we can look at the effect of 100 different crop sequence combinations generated from 10 crop options on wheat crop. The ten treatments included – wheat (treated with fungicide Jockey® and Vincit®), barley, grain oats, oaten hay, green manure, lupin, canola, field pea and fallow. The trial is unique in the sense that for the first time it compares oaten hay and a manure crop in such a large number of crop sequences. This 'effect' has been largely overlooked by past crop rotation studies.

The trial demonstrate that land use can have important effects on the productivity, sustainability, and profitability of crop sequences and these effects can last at least two years. However, they depend very much on the specific conditions at a particular site. We identified "synergism" and "antagonism" of the crop sequences. The crop biomass and grain yields were higher (synergism) when crops were grown on the residues other than their owns which produced lower yields (antagonisms). Wheat treated with the Jockey® consistently out yielded wheat treated with the conventional seed treatment Vincit® in majority of sequences. Lupins grown as a break crop increased wheat yields significantly above wheat following wheat and the wheat yield after lupins was 26 and 28 per cent higher than after wheat with and without the Jockey® treatment. The break crop benefit from lupin were larger than from canola whereby grain yield of 4 out of 7 second year crops was significantly higher following lupin whilst following canola it was only oats that produced higher yields.

Although wheat yields were higher after lupins, the most profitable three-year crop sequences included wheat and oaten hay in either first year or second year. Continuous wheat had a higher gross margin over three years than all other sequences, except those containing oaten hay. All of the more profitable sequences had oaten hay somewhere in them, and the most profitable cut hay in each of the 3 years of the sequence. It would be impractical however to cut hay on a third or more of most farms, and such a practice would rapidly deplete soil nutrient levels, so it is clear that identification of optimal crop sequences requires more sophisticated approach than purely on the basis of gross margins.

The study suggests that if the growers are looking just at the short term financial returns, they can continuously grow wheat, or sequences including wheat and oaten hay. However if the goal is to improve soil fertility and better management of weeds and diseases for long term sustainability, they should consider using break crops such as lupins in their crop sequences. It is anticipated that research findings will provide farmers with crop choices that fit in their individual needs for responding to short term changes in prices and seasons for profitability but also meet their long term strategy for sustainable cropping systems.