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Legumes are here to stay . . .

Better pasture legumes are constantly being developed to support the ley farming system.

Merredin agricultural adviser M. A. Ewing sees compelling technical, economic and social factors favouring the retention of legume-based pastures and livestock throughout most of the wheatbelt. The increasing emphasis on cropping is changing the feed availability pattern, but he believes the basic ley farming system will remain.

Factors favouring pastures in the system

Leguminous pastures have become part of our farming system because they provide high quality feed for livestock and at the same time build up soil fertility and soil structure. Also, they play a part in the control of cereal diseases and weeds in the cropping phase.

Nitrogen fixation

The build-up in soil nitrogen with leguminous pastures has been measured experimentally on a number of occasions in Western Australia and annual increases in the range 40 to 70 kg per ha per year can be expected. Substantial crop responses to nitrogen have been recorded throughout most of the wheatbelt, and especially on the lighter soils. If nitrogen is not provided by leguminous pastures then fertiliser nitrogen will have to be used to maintain crop yields. The cost of this fertiliser nitrogen will be the major factor in reducing the profitability of a continuous cropping system. Because of its manufacturing association with the petro-chemical industries it seems likely that the price of nitrogen will rise as fast as other farm costs, possibly faster.

Soil structure

Continuous cropping by conventional cultivation methods will lead to a deterioration in soil structure. The main results of degraded soil structure are increased susceptibility to erosion by both wind and water, an increase in surface sealing, a reduction in water-holding capacity and reduced water availability to the plant.

Disease

Continuous wheat cropping leads to rapidly declining yields through disease build-up, in areas where root rot diseases are a problem. A pasture phase, especially a short one in which little or no grass builds up, provides an ideal “cleaning phase”.

Income stability

Overall enterprise profitability is important, but so too is income stability. Some farmers are prepared to forego some total income in exchange for increased income stability from year to year. The retention of pastures and hence livestock assists this aim in two ways:

- As a means of reducing reliance on income from one source. The grain market is subject to considerable fluctuation as a result of international marketing conditions. The maintenance of a mixed farming system allows the farmer to respond more quickly to changes in the relative profitability of the grain and livestock enterprises.
- By providing in the mixed system a cushion against seasonal variation, especially in drier areas. In a poor season, returns from the sheep enterprise are usually reduced by a smaller percentage than from the crop enterprise.

This occurs because of the option to hold feed reserves as grain or hay and as condition on the animals.

Also, if poor conditions occur from the start of the season, the farmer often sows less crop, leaving a larger area of pastures available for livestock.

A third factor is the high nutritional value, and hence high utilisation, of poor or failed crop as a source of summer feed.

Under-utilised resources

A trend towards a cereal monoculture would leave vast areas of unutilised stubbles. This represents a considerable waste. Those farmers who want to utilise at least the higher quality components of the stubble will need an area of pasture to run the sheep during winter and spring.

Also, there is often enough labour available on farms to carry out sheep management functions without seriously curtailing cropping activities.

Implications of current trends

Herbicides

The current trend towards greater use of a range of increasingly efficient herbicides in crops is leading to a reduction in volunteer species in the pasture phase. At present this tends to result in bare paddocks. It emphasises the need for build-up of legume seed reserves in the soil to provide adequate plant density and feed early in the growing season. In the longer term, reduced competition from volunteer species will lead to increased legume seed production and increased legume dominance of pastures. This trend also could be consolidated in the future as we assemble knowledge on the control of broad-leaf weeds and grasses in pastures, using herbicides. The transfer of weed control to the pasture phase has several valuable potential effects. It could improve legume dominance (hence nitrogen fixation) and pasture persistence. At the same time it could allow more crop management flexibility by reducing weed control problems in the cropping phase.

Minimum tillage

The trend towards minimum tillage and away from the use of disc ploughs has implications for the pasture phase. Seed will tend to remain in the soil layer close to the cropping Revolution....Cropping Revolution
surface rather than being mixed with the soil to the depth of conventional cultivation.
The seed will therefore be subject to more intense fluctuations of temperatures during summer, which could more-rapidly break down hard-seededness. This would encourage denser stands of clover in periods of good seasonal conditions, but would make the system more susceptible to bad seasons when combined with intensive cropping regimes. This is a further reason why plant breeders will be looking for harder-seeded varieties in the future.

Pasture management
The most obvious way to maintain legume dominance is to re-sow the pastures. This can be done either by conventional establishment techniques involving sowing into cereal stubbles, or by under-sowing. Today's low level of clover in wheatbelt pastures provides an ideal opportunity to introduce the new cultivars Northam and Nungarin into existing pastures either singly or as mixtures. The breeding programme should continue to provide improved varieties, measured in terms of seed production, hard-seededness and low oestrogen content.

High intensity rotations can optimise returns from the whole farming system. The 1:1 rotation is commonly considered desirable, but there are other intensive cropping alternatives worth consideration, for instance, a 2:2 rotation with regular under-sowing in the second crop year. This probably would result in a reduced crop yield in the second year, but it could give overall economic benefits when assessed as a system.

The use of herbicides in the pasture phase could have a place in pasture maintenance.

Grazing management is important to control volunteers in the pasture, for the benefit of both crop and legume. Also, grazing management has considerable pay-off through better legume seed set.

A likely problem arising from legume dominance in pastures would be the shortage of feed in the late-autumn, early-winter period.

Stubble . . . food for thought

More than six million tonnes of cereal stubble remain after each Western Australian harvest. How much of it would our farm stock be able to eat if it were more palatable?

This question is the basis of the present interest in the chemical treatment of stubble. But as the Officer in Charge of the CSIRO's Division of Animal Production Dr D. B. Purser pointed out, it will not be possible to evaluate the economic prospects of chemical treatment until the potential utilisation of stubble has been determined, and the potential animal response has been measured.

He referred to some of the problems likely to be encountered in assessing stubble value, including the variation in quality between wheat, oats and barley, as well as between stubbles from high and low rainfall areas, and between stem and leaf.

He explained also that even when stubble had been treated chemically, as with hydroxides, a source of supplemental nitrogen, and perhaps certain minerals, had to be added.

The treatment most likely to be used in Western Australia could be expected to improve stubble digestibility by 10 to 15 per cent units. The difference in percentage digestibility between samples before treatment was likely to remain after treatment.

Dr Purser referred to an experiment in which sheep eating untreated stubble from the 300, 350 and 500 mm rainfall areas lost 1.5, 4.0 and 5.0 kg of bodyweight respectively in four weeks. Sheep fed "treated" stubble all retained weight over the same four-week period without any apparent effect from its area of origin.

The value of the energy which could be made available from Western Australian stubble each year could support 10 to 15 million sheep for 100 days if all the low rainfall area stubble and half the high rainfall area stubble were treated chemically.

The potential benefit, Dr Purser considered, would seem to be that a reasonable quality hay-equivalent could be produced from land that had not been withdrawn from the grazing system. It could be fed when grazing pressure was strongest at other times of the year.

Stubble digestibility trials in progress at the CSIRO's animal house.
—Photo: W. Van Aken.