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Profit from pastures

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Dairy farmers have the potential to reap great benefits from research into ways to increase pasture production and improve utilisation. With feed being the major cost in milk production and pasture being the cheapest feed, the Dairy and Apiculture Program of Agriculture Western Australia spent the past five years investigating ways to increase pasture production and improve utilisation. Dairy farmers have the potential to reap great benefits from the research. Mark Callow and Dr Martin van Houtert report on the experimental program.

Research began five years ago with the objective of developing a profitable and sustainable feed base that minimised economic risks for dairy farmers. It was decided a detailed understanding of the biology of annual and Italian ryegrasses, and of subterranean clover would allow for the development of management strategies to optimise pasture production and pasture utilisation.

The specific objectives of the research work were to:

- **Determine the economic value of pasture and estimate the amount of pasture produced and the proportion utilised.**
  
  An analysis of the Dairy Farm Performance Program database for the years 1993 and 1994 showed that, on average, gross margin increased by $150 per hectare for each additional tonne of pasture dry matter utilised. On many dryland and irrigated farms, only 3.5 tonnes of dry matter per hectare were being harvested by the cows or as conserved fodder, compared with a production of 7-10 tonnes on monitor farms.

- **Define factors limiting pasture production and utilisation.**

- **Develop strategies for grazing management to overcome these limitations.** The emphasis was to develop strategies which took into account the growth cycle of pasture plants.

**The research program**

The six research projects addressed specific stages of the life cycle of annual and irrigated pastures (see numbers 1 to 6 in Figure 1), and a key output was to describe best management practices to optimise pasture production and utilisation for each of these stages.

![Figure 1 - Schematic diagram showing relative rates of pasture growth for typical annual dryland pastures in the dairying zone of Western Australia. Numbers in the diagram refer to six research projects, each addressing a specific stage of the life cycle of annual pasture.](image)

1. **Establishment of annual/Italian ryegrasses and subterranean clover**

Annual and Italian ryegrasses persist in a Mediterranean climate by completing their growth cycles and producing seed in late spring. This seed remains dormant during
the hot and dry summer season and germinates in the next autumn with the opening rains.

In the Busselton-Vasse region, some dairy farmers mechanically reseed 50 per cent to 100 per cent of their farm annually, while others rely completely on natural seed set. With reseeding being a high cost operation, it was decided to determine which combination of method and time of reseeding and which rate of seed sown, would maximise pasture establishment and dry matter production during the subsequent growing season.

It was found that reseeding did not increase pasture production in the subsequent season. This was probably due to the high level of natural seeding in the year that the experiment was undertaken.

Mechanical reseeding will be successful only when seed production has been reduced in the previous spring. Reduced seed can result from grazing, hay-topping, or by using a late maturing cultivar in conjunction with a short growing season. Where there are greater than 3000 ryegrass seeds per square metre, mechanical reseeding is not required.

2. Timing and intensity of first grazing

When the growing season commences, farmers must make decisions about grazing management, including when to graze the newly germinated pasture and at what intensity.

When young plants are grazed too hard or too early, subsequent growth rates are likely to be reduced. On the other hand, delaying the start of grazing until individual plants are larger, may reduce pasture utilisation, particularly in paddocks which are to be grazed towards the end of the first rotation. The reduction results from the death and decay of mature leaves on ryegrass tillers once they develop more than 3 to 4 leaves.

The research set out to determine how mixed pasture yield responded to different heights of defoliation above ground level, and defoliation at different times after germination (based on differing numbers of leaves per ryegrass tiller).

Changes in the timing and height of the first defoliation did not influence total yield of mixed pasture or yield of its components (ryegrass, clover or weeds) during the growing season.

Newly germinated ryegrasses can be defoliated when relatively juvenile (2 leaves per tiller) and to a height of 3cm above ground level without reducing total production for the growing season. However, subsequent grazing must not occur before ryegrass tillers have 3 new leaves and defoliation height is more than 5cm above ground level.
3. Grazing frequency during winter

Low temperatures and waterlogging in winter reduces the growth rates of annual and Italian ryegrasses. To compensate for the reduction in pasture growth, farmers often increase grazing frequency and offer a larger pasture area per cow. This leads to poor pasture utilisation, a decline in pasture quality and increased senescence and decay. By mid-winter there is little or no pasture on offer.

In two pot experiments, the research looked at defoliating plants at 1, 2, 3 or 6 leaves per tiller. Defoliation height for the initial harvest was at the base of the eldest leaf or at 3cm, and at 5cm for the subsequent harvest.

Defoliating, when there were less than 3 leaves per tiller, reduced leaf, stem, and root yields. Delaying defoliation from 3 to 6 leaves per tiller maximised yield during the defoliation period.

These rules apply regardless of the cultivar used. Changing a pasture cultivar will not compensate for poor grazing management.

4. Pasture management during spring

Daily growth rates of annual pasture are highest during spring and usually exceed the daily feed requirements of a herd. This provides an opportunity to conserve the surplus as high quality silage or hay for use in the summer.

While conservation in effect increases pasture utilisation, it may reduce seed production and compromise self regeneration of the annual pasture in the subsequent growing season. This may increase the need for costly and time-consuming mechanical reseeding.

Grazing or conservation late in spring was found to increase pasture utilisation by removing ryegrass stem tillers and stimulating the development of new daughter tillers. In contrast, where reproductive tillers were uncut during spring, production of seed was increased while pasture utilisation was reduced.

In the following autumn, pasture managed for high utilisation and low seed production, had low initial ryegrass tiller density and reduced total herbage and ryegrass yields. In contrast, pasture managed for high seed production had high ryegrass tiller density and increased total herbage and ryegrass yields.

However, it was found that total dry matter yield in the full subsequent season was not affected by either method of pasture management. In fact, as the growing season progressed, pasture managed for high utilisation compensated for low initial tiller count by producing daughter tillers heavier than those produced in pastures with high initial tiller count.

While the digestibility of ryegrass decreases during the reproductive stage, the reduction can be delayed by defoliation. Defoliation removes the less digestible reproductive tillers and replaces them with more digestible daughter tillers. It was found that dry matter yield and digestibility could be optimised by harvesting for conservation when 10 per cent to 20 per cent of seed heads had emerged, regardless of the maturity type of ryegrass cultivars.
5. Fertilisers and pasture growth

This experiment assessed fertiliser requirements for pasture under the new improved grazing management techniques.

While the application of 50 kilograms of urea per hectare in autumn and spring significantly increased pasture production, additional nitrogen did not substantially increase yield.

Similarly, the effect on herbage yields from phosphorus, potassium, and sulphur was greater when using application rates based on soil tests rather than using application rates above the regional recommendations. In fact, the effectiveness of phosphorus, potassium, and sulphur decreased as the application rate increased above the regional recommendation.

6. Irrigation, grazing and mulching

Irrigation of pastures during summer can successfully maintain production of perennial ryegrass and white clover, which have a high feed value for lactating dairy cows. However, within two to three years, these pastures become dominated by faster growing but less digestible tropical pasture species such as kikuyu and paspalum.

Studies in the Eastern States have shown that ryegrass and clover dominance can be maintained for longer by increasing the frequency of irrigation and by increasing grazing intensity. In addition, experience in Western Australia suggests that mechanical mulching or slashing in early summer can reduce kikuyu and paspalum dominance.

The research looked at the effects of irrigation frequency and defoliation height on the growth of kikuyu and paspalum in irrigated perennial pasture, as well as the effects of mechanical mulching or slashing on the proportion of perennial ryegrass and white clover. The quality of total herbage on offer was also considered.

It was found that irrigation, mulching, and slashing treatments encouraged clover growth, while kikuyu and paspalum growth rates remained low.

Conclusion

The research program has made a major contribution to the improvement of pasture management techniques, which has, in turn, led to a gain in productivity for dairy farms in the south-west of Western Australia.

Analysis has shown a 25 per cent improvement in pasture utilisation, an increase in the average number of cows milked from 155 to 192, an increase in average stocking rates from 0.9 to 1.2 cows per hectare, and increased income from milk sales by $600 per hectare.

There are still areas for improvement in sustainability, productivity, and profitability, but the success to date is a credit to all involved.