

## Using a model to assess the profitability of applying nitrogen to dairy pastures

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The Western Australian Dairy Farm Mode1 (WADFM) is a mathematical programming mode1 which determines the most profitable management, e.g. number of cows milked, calving pattern, milk production, feeding and fodder conservation, for dairy farms (1). The WADFM is being used to develop extension programmes, help evaluate research priorities and help assess the impact of industry policy decisions. Nitrogen fertilizer can be used to increase pasture production for grazing in winter and on areas closed for hay or silage in spring (2). The increase in farm profit expected by using nitrogen, and the changes in management necessary to obtain the most benefit, were determined by the WADFM.

### Methods

The expected profit for a hypothetical non irrigated dairy farm near Margaret River W.A., with 200 ha of pasture was determined using the WADFM. Runs were conducted with (a) the calving pattern restricted to that commonly used in the area, and fodder conservation limited to a maximum of 90 ha, with hay and silage each no more than 60 ha (restricted management), and (b) when these factors were allowed to be optimized (optimum management). The increase in profit expected from using nitrogen fertilizer at 50 kg/ha N on a third of the pasture area following germination of pasture in autumn, and/or on all areas used for hay and silage at the time of closing in spring, were determined for the restricted and optimum management. In the runs with restricted management, the number of cows was held at the number selected with no nitrogen, whereas with optimum management, the numbers of cows was optimized for each nitrogen application. The response in dry matter production of pasture due to nitrogen was assumed to be 10 kg/ha/d for 3 months and 15 kg/ha/d for 2 months from the autumn and spring applications respectively (2).

### Results and discussion

The increase in whole farm profit due to nitrogen when herd size, calving pattern and fodder conservation were restricted and when these factors were optimized is shown in Table 1. Autumn application of nitrogen was more profitable than spring application, but it was necessary to make changes to management factors such as herd size, calving pattern and fodder conservation to obtain the full benefit from the nitrogen.

**Table 1. Increase in profit (\$/yr) due to nitrogen and optimum management**

Management	Nitrogen application			
	Nil	Autumn	Spring	Autumn + spring
Restricted	0	10,600	3,000	13,400
Optimum	23,300	38,000	28,200	44,300

1. Olney, G.R. and Falconer, D.A. (1985). Mathematical programming mode1 of Western Australian dairy farms. Western Australian Department of Agriculture.

2. Arkell, P.T. (1987). Fertilising pastures with nitrogen, Catchment Extension Fertilizer Advisory Service Circular, Western Australian Department of Agriculture, February 1987.