

# PRODUCTION EFFICIENCY BENCHMARKS FOR IRRIGATED DAIRYING IN SOUTH EASTERN AUSTRALIA

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## ABSTRACT

Milk production from grazed irrigated pasture is an important industry in south eastern Australia. Irrigation water is essential for perennial pastures, but the efficiency with which the irrigation water is used to produce milk varies widely between farms.

As irrigation water is a limiting resource, future productivity increases will depend on increasing the amount of milk produced per unit of water applied. This research project estimates metabolisable energy utilised from grazed pasture, using energy values for animal requirements, products and feedstuffs. Efficiency criteria, in terms of production per hectare of irrigated pasture, per megalitre of irrigation water, and per cow were calculated. Data were obtained from a large random sample of farms by personal interview. Production benchmarks were established, and best management practices for water-use efficiency were derived from analyses of farm practices, especially irrigation, pasture and grazing management.

## KEYWORDS

Dairy, milk, pasture, irrigation, efficiency, benchmarks

## INTRODUCTION

A mild temperate climate enables pastures to provide year-round grazing for 0.5 million dairy cattle in a large flood irrigation region in south eastern Australia, resulting in a low production cost for milk by world standards.

Irrigation water is required to supplement the 450 mm annual rainfall to sustain perennial pasture, and the amount of water available to an individual farm is a primary limitation to its production. The efficiency with which this water is used is crucial to farm productivity and profitability.

A research project to examine the large range in water-use efficiency currently being achieved is described in this paper. The aim was to measure efficiency of forage and milk production for each farm according to a number of criteria, to analyse the reasons for the highest achievement and to establish best management practices from the most significant factors influencing efficiency.

Water-use efficiency is influenced by (i) forage production as determined by soil attributes, fertiliser inputs, irrigation management and pasture composition, (ii) forage utilisation, determined largely by stocking rate and grazing management, and (iii) the use of supplementary feeds and agistment since deficits in pasture forage supply, caused by seasonal variations in growth, need to be filled with appropriate supplements.

## EXPERIMENTAL

Production data and details of farm management practices were collected from 180 farms which were selected at random, and represented 6 % of the 3000 dairy farms in the irrigation regions of northern Victoria and southern New South Wales.

Data collection was by face-to-face interviews with farm managers

who, besides providing details of production and inputs, also answered questions relating to soil type, pasture performance and management, irrigation practices, drainage, water recycling and grazing management.

An important measurement was forage utilisation efficiency. The yield of grazed pasture was not measured directly, therefore, it was necessary to estimate it. The method used in this project was to measure farm outputs (milk production, maintenance requirements and liveweight gain of livestock) and to calculate, using accepted energy values for these products, the assumed energy intake from all feedstuffs. Any imported feed or off-farm grazing was adjusted for, to calculate tonnes of DM utilised per hectare of perennial pasture.

The formulae (MAFF 1976, MAFF 1982) used to calculate utilised energy in megajoules (MJ) are based on experimental animal responses and measured feed analysis as follows:

- Energy content of one litre of milk (MJ):  
=  $1.694 [(0.386 \text{ milk fat}) + 0.205(\text{milk protein \%} + 5.8) - 0.236]$
- Energy to maintain a cow during lactation (MJ):  
= Lactation length  $[8.3 + (0.091 * \text{liveweight})]$
- Energy required for pregnancy : whole lactation (MJ)  
=  $1205 - [(300 - \text{lactation length}) * 8]$
- Energy required for liveweight gain in lactating dairy cows (MJ)  
= Kilograms \* 34 MJ
- Energy released by liveweight loss (MJ)  
= Kilograms \* 28 MJ
- Energy in supplements eg. hay, silage or grain  
= Kilograms \* MJ/kg DM

A production efficiency analysis report was generated for each farm. This expressed production of milk fat, protein and volume in terms of total and net production per farm, per cow, per hectare and per megalitre of irrigated perennial pasture. Total pasture utilised per hectare, per megalitre, water-use per hectare and per cow were also calculated. The definitive measure for this water-use efficiency project is the amount of milk produced (net of imported feed) per megalitre of water applied in addition to rainfall received.

Other measures of productive efficiency such as production per cow, percentage of energy supplied by off-farm supplements and proportion of energy used by lactating stock, are also calculated.

Economic evaluation was done by allocating current values to both products and inputs to arrive at gross margins net of feed costs. Business overheads and individual trading differences were deliberately ignored to prevent confounding productive efficiency with trading expertise.

Sufficient information was collected in the survey to assess management practices for irrigation water, pastures and grazing, which together with physical details of the farms, enabled the most significant factors in achieving high water-use efficiency to be identified. These factors are described as 'best management practices'.

## RESULTS AND DISCUSSION

Table 1 presents the range and group means for a series of efficiency criteria. There is a large range in all efficiency criteria. The amount of pasture DM utilised per megalitre of irrigated water applied varied from 0.7 to 2.3 tonnes. When calculated as net milk production per megalitre, the range was from 526 to 2018 litres, the best farms being almost twice as efficient as the average.

Irrigation water is an essential but limiting resource on dairy farms in this region. For ecological reasons, there will be no further increase in supply, so to achieve future productivity improvements, more saleable product will need to be produced from the existing water allocations.

The highest standards of efficiency should become industry benchmark targets. As these are already being achieved commercially using existing knowledge, progress towards these standards should be generally well accepted by the industry. If the management practices of the most efficient producers (as described by them in the project survey) were widely adopted, a substantial improvement in regional water-use efficiency could be achieved.

Potential changes to dairy farming systems to improve on the present best practice will be a challenge for research. These may include using forage species that are more efficient in producing digestible energy from irrigation water than the temperate pasture species used at present.

## REFERENCES

**MAFF, Technical Bulletin 33** 1976. Energy Allowances and Feeding Systems for Ruminants.

**MAFF, Technical Bulletin 33** 1982. Utilised output from grassland.

**Table 1**

Efficiency criteria for pasture and milk production, and the use of irrigation water, for a representative sample of dairy farms in south eastern Australia

Efficiency criteria	Highest	Lowest	Mean
Pasture utilised per hectare (t DM)	15.5	5.6	9.4
Pasture utilised per megalitre (t DM)	2.3	0.7	1.2
Net milk production per hectare (x 000 litres)	16.0	4.2	9.2
Net milk production per megalitre (litres)	2018	526	1122
Irrigation water-use per hectare (ML)	16.6	4.3	8.1
Irrigation water-use per cow (ML)	6.0	1.6	3.6