Environmental strengths and weaknesses of subtropical dairy farming systems

Findings from the "Sustainable dairy farm systems for profit" project

M5 Project Information Series - Studies on Mutdapilly Research Station and subtropical dairy farms 2001 to 2005

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Overview

DAIRY farms in northern Australia have used a number of strategies to drastically increase milk production to offset the lower milk prices of the past five years. Strategies have included:-

- increasing stocking rate;
- increasing supplementary feed and fertiliser;
- shifting emphasis from pastures to cropping.

Potential environmental side effects of these changes include:-

- nutrient and gaseous losses from the farm;
- reduced soil health through soil acidification;
- loss of organic matter and soil surface cover.
- Dairy farms are often located close to urban centres or regions of high environmental or recreational value, so management and monitoring need to ensure these changes are environmentally sustainable.

Lessons from the Mutdapilly M5 farmlets

THE *Sustainable dairy farm systems for profit* project at Mutdapilly Research Station and on associated commercial farms investigated the potential impact of five future subtropical dairy farming systems on business productivity, on the social well being of farming families and on the farm environment.

Further details about this project and the farming systems are available from other documents in the M5 Info series. This information sheet summarises some of the important environmental aspects of intensifying each type of farming system, and recommends how to avoid problems and to farm sustainably.

Tropical pasture-based farming systems

(represented by the M1 and M2 farmlets)

The M1 farmlet was based on raingrown tropical pastures + a small area of raingrown oats.

The M2 farmlet was based on raingrown tropical pastures + small area of irrigated ryegrass double-cropped with forage sorghum.

Environmental strengths

- Vigorous tropical pasture growth in summer provides excellent protection from erosion, maintains or improves soil organic matter, and minimises the loss of water or nitrogen below the root zone. Surface runoff was infrequent from these Mutdapilly farmlets during the project.
- Double cropping of the winter ryegrass area with forage sorghum (M2) also provides good soil protection for most of summer.

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Environmental weaknesses

- Higher stocking rates (2.0 cows/ha on the M1 farmlet and 2.7 cows/ha on the M2 farmlet) demand a higher level of supplementation with hay/silage. On the farmlets, neither farming system incorporated a feedout pad with associated effluent management, so manure build up in the feeding area posed a pollution risk to surface and/or ground water.
- Fallowed oats on the M1 farmlet left land open and vulnerable to erosion over the summer period. Minimal tillage - using herbicides in the early fallow period and cultivation in late summer/autumn was unable to provide sufficient cover to protect the soil from erosive summer rainfall.
- All forage systems were left with substantial nitrogen reserves in the soil profile at the end of the growing season - suggesting that fertiliser rates exceeded pasture/crop requirements. The N requirements of forages need re-evaluating to minimise nutrient wastage, the chance of soil acidification, and nutrient loss to ground water.

Recommendations

- Specialised feedout facilities are needed to reduce environmental risk.
- Fertiliser rates need to be reviewed for farms using high levels of supplementation - to minimise waste of nutrients and reduce the chance of soil acidification and nutrient loss to ground water.
- Oat crops need to be sown using zero tillage to retain stubble cover throughout the summer season - or a summer forage crop grown on the area for conserved feed in winter.

Dairying based on annual cropping

(represented by the M3 farmlet)

The M3 farmlet was based on raingrown forage crops (sorghum, lablab, and oats) + a small area of irrigated ryegrass double cropped with forage sorghum.

Environmental strengths

- A strong emphasis on fodder conservation provides flexibility and allows the cropping program to be matched with seasonal conditions - reducing the risk of nutrient leakage or soil erosion.

Environmental weaknesses

- Reliance on annual cropping makes this system more vulnerable to soil erosion, and to organic matter and soil structural decline than a pasture-based system - particularly with conventional farming practices (such as cultivation to control weeds and to prepare seedbeds, plus fixed fallow periods).
- As for the M1 and M2 farmlets, conserved forage was used to routinely supplement the herd. Without specialised feedout facilities, this system poses the risk of polluting surface and ground waters.

Recommendations

- Be flexible with the cropping program.
- Use agronomic and grazing practices that maintain ground cover - particularly over the summer period.
- Install a well-designed feed pad and effluent management system.

Irrigated farming systems

(represented by the M4 farmlet)

The M4 farmlet was based on irrigated annual and perennial temperate pastures and summer forage crops.

Environmental strengths

- There is no need for fallow periods with high access to irrigation - which enables good ground cover all year round, and soil organic matter to be maintained or improved. Incorporating an area of raingrown pasture (15% of the farmlet was under raingrown Rhodes grass) provides a good 'stand-off area' during periods of wet weather.

Environmental weaknesses

- Emphasis on temperate species and irrigation increases the risk of over watering and loss of nutrients below the root zone.
- High stocking rate on irrigated soils increases the potential for soil compaction and for water and nutrient runoff with heavy rainfall.
- As for the M1, M2 and M3 farmlets, conserved forage was used to routinely supplement the herd. Without specialised feedout facilities and associated effluent management, this system poses the risk of polluting surface and ground waters.

Recommendations

- Conserving large amounts of surplus forage in spring for later use requires a well-designed feedpad for feeding out.
- Animals need to be kept off arable land during wet weather.
- Shallow-rooted temperate annual species need to be grown in rotation with deep- rooted species (like forage sorghums, lucerne) to 'mop up' any surplus water and nutrients applied to the temperate annuals.
- Heavy emphasis on irrigation warrants attention to design and management to increase efficiency of water use.

Nutrient movement below the rooting zone of ryegrass was measured using lysimeters, in effect underground rain-gauges.

Feedlot farming systems

(represented by the M5 farmlet)

The M5 feedlot farmlet was based on lucerne and double-cropped maize/ barley with the herd housed in a feedlot.

Environmental strengths

- Not having to meet cows' daily requirements with paddock feed means the system has the capacity to 'best fit' forage production with climatic conditions.
- The forage systems provided good ground cover and minimal risk of nutrient and water leakage particularly by excluding grazing.
- Good management of animal wastes should be possible in a well-planned, constructed and managed feedlot.

Environmental weaknesses

- The system is only suited to semi-arid environments with sufficient irrigable arable land to grow the bulk of forage requirements.
- Good management of animal wastes and the ability to meet community expectations on amenity issues (odour, visual, noise, dust) require the system to be appropriately sited, designed, constructed and maintained.
- Cut-and-carry forage systems remove large quantities of nutrients, so require attention to detail to maintain soil fertility.

Recommendations

- All feedlots - whether for dairy or beef production - need to be approved by state government authorities. Operators also need to be registered. An understanding of the requirements and guidelines for feedlot operations can be obtained on the DPI&F website, www.dpi.qld.gov.au, or by contacting the DPI&F's Intensive Livestock Environmental Regulation Program, PO Box 102, Toowoomba Qld 4350. PH (07) 4688 1605.

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