Sustainable Land Use for Dairying in the Limestone Coast, SA

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Key messages:

- Profitability of dairying is directly correlated to kg/ha pasture utilised, which ranges from 2,000 kg/ha on dryland lucerne in the upper Limestone Coast to 6,000 kg/ha on farms in the lower Limestone Coast with mixed dryland and irrigated pastures.
- Management strategies can be implemented to increase pasture utilisation, however there are also soil constraints that impact pasture utilisation.

Introduction

Dairying is undertaken in all sub regions of the Limestone Coast, from Meningie and the Lakes in the north to Donovans east of Port MacDonnell in the south.

Australian dairy farmers are among the most efficient dairy producers in the world. To survive in this competitive industry, the production and utilisation of pasture as their main feed source is key to their future success.

Much of the dairy best practice management can be directly applied to beef and sheep farms.

Soils used for dairying ranges from deep sands around Meningie to sand/ loam soils over clay in the Dunes and Flats, and Ranges and Cross Border Creeks sub regions, to rendzina soils in the Volcanic Plains and Southern Dunes, volcanic soils around Mount Gambier and Glencoe and shallow soils over limestone close to the coast.

The use of dry sheep equivalents (DSE), or stocking rate, to determine carrying capacity has no relevance in the dairy industry. In almost every dairy in the Limestone Coast at least 50% of the feed intake comes from bought in supplementary feed, and farm profitability is calculated by measuring kg/ha/year pasture utilisation.

Figure 1: Map showing Limestone Coast region and sub-regions

Pasture utilisation (kg/ha) can be related to sheep and beef productivity. Carrying capacity (DSE/ha/year) multiplied by 400 provides an approximate figure for pasture utilisation (kg/ha/year). An average figure for pasture utilisation in a Limestone Coast dairy business is approximately 5,000kg/ha/year, which equates to 12.5 DSE/ha/year.

Sustainable land management is the focus of a profitable and successful dairy operation, as it is for sheep and beef properties.

Best practice land management involves best practice in:

- Fertiliser management
- Effluent management
- Grazing management
- Maintenance of soil cover
- Irrigation and irrigated pasture management
- Fodder conservation

Dairy best practice land management techniques have been derived from extensive research in New South Wales, Victoria and Tasmania, coupled with validation and verification using focus dairy farms at regional dairy demonstration sites in South Australia, Victoria, Tasmania, New South Wales and Western Australia.

Results of this research, and its application on farm, is available on the Dairy Australia website along with the Dairy SA website www.dairyaustralia.com.au/dairysa.

Finding a balance in the management of the grazing enterprise between optimum production per animal and production per hectare of land is equally relevant to the dairy enterprise as it is to the beef or sheep enterprise.

Overstocking, particularly on soils prone to waterlogging in winter, can result in severe land degradation resulting in the loss of productive pasture species, which in turn will significantly reduce milk production and farm profitability.

Loss of productive pasture species also increases infestations of weeds, which can reduce overall productivity, and in some instances impact on livestock health.

Heavy grazing can cause pugging on waterlogged soils resulting in soil damage, loss of pasture and make paddocks less trafficable.

Many dairy producers use irrigated pastures to graze cows and to grow crops for silage, and efficient irrigation management is essential for profitable and sustainable milk production.

The focus of a successful and profitable dairy enterprise is to maximise pasture utilisation from both irrigated and dryland pastures without damaging the soil.

Figure 2: SA Jersey cows at pasture (photo credit Dairy SA)

Dairy farmers in the Limestone Coast are using the following strategies to maximise farm profit, to maintain pasture and the soil.

- Removing cows from paddocks to a "stand-off" area or a covered barn to avoid pugging of paddocks especially during winter.
- Using irrigation for pastures and crops especially for silage and hay production with a focus on efficient water management and irrigation scheduling.
- Sowing improved pasture species – both annuals and perennials.
- Soil and pasture nutrition, especially maintaining adequate soil phosphorus, sulphur and potassium levels, along with regular soil testing to optimise fertiliser application without excess nutrient run off or nutrient leaching into underground water aquifers.
- Applying lime to achieve and maintain a near neutral soil pH on acidic soils.
- Grazing management, especially rotational grazing and grazing at the correct grass leaf stage.
- Providing all year around access to grazing paddocks using well-constructed laneways.
- Supplementary feeding hay, silage and grain, along with pasture feed budgeting.
- Applying nitrogen fertiliser and/or gibberellic acid to pastures for additional pasture supply.
- Calving later in winter or all year around.

Figure 3: Friesian cows at pasture (photo credit Dairy SA)

Strategies to improve sustainable dairying

Deferred grazing is used to allow dryland pastures to reach sufficient leaf area to maximise pasture growth rate (and fully establish a root system) by early winter. Dairy farmers will ensure pastures reach canopy closure before winter by spelling pastures for long periods in autumn, and not grazing before the correct leaf stage, which is three leaves for perennial ryegrass and tall fescue and four leaves for phalaris and cocksfoot.

To achieve grazing at the correct leaf stage, dryland perennial grass pastures are spelled for up to 60 days in summer, between 20 to 40 days in autumn and winter and 10 days in spring.

Perennial grasses (either irrigated or dryland) are only grazed at any time of the year when they reach the correct leaf stage.

Lucerne paddocks are grazed only to remove tall growth, and to leave 2 to 5 centimetres of new growth at the base of the plant, which enables the lucerne plant to replenish crown and root carbohydrate reserves.

Milking cows usually graze a paddock for around 6 to 8 hours at a time (between milkings), so dairy farmers regularly assess pasture availability before grazing. Once pasture availability is assessed, a daily pasture ration is allocated, based on the herd's daily metabolisable energy requirements. Pasture allocation is designed to complement the herd's daily grain/silage or hay ration, and to ensure adequate kg/ha pasture residual dry matter for quick pasture recovery without putting pressure on milking cows by making them eat pasture too close to the ground.

Daily feed budgeting, along with monitoring pasture availability in front of the milking herd, and the kg/ha pasture residuals following grazing, are key factors involved in maximising kg/ha pasture utilisation. This is important to reduce costly damage to soil and pastures and to avoid paying more than necessary for supplementary feed.

Deferred grazing in autumn, grazing to the correct leaf stage and daily feed budgeting results in increased pasture utilisation, with the dairy farm monitor project showing there is a clear positive relationship between $ gross margin per hectare from milk production and kg/ha pasture utilisation.

For more information go to www.dairyaustralia.com.au/industry-statistics/dairy-farm-monitor-project.

Profitable dairies in the mid and lower Limestone Coast are utilising up to 10,000 kg/ha dry matter per year.

Sowing improved pasture combined with best practice pasture nutrition and fertiliser management are key to ensuring profitable and sustainable dairy production in the Limestone Coast. This involves regular soil testing and the annual application of phosphorus (plus sulphur and potassium if required), along with lime applications to correct soil acidity. This results in increased home-grown forage utilisation and therefore increased farm profitability.

Correctly taken soil samples are regularly collected from representative areas of a dairy farm and the results used with a farm nutrient management plan to guide annual fertiliser applications. Soil constraints are also considered when determining nutrient requirements and accurately calibrated fertiliser spreaders used to apply fertiliser.

Dryland brassica fodder crops sown in early spring are an effective way of cleaning a run-down pasture and providing useful high-quality feed for livestock during summer/autumn, dependent on the amount of summer rainfall and water storage capacity (depth) of soil.

The autumn/winter feed gap can be a challenge, particularly in seasons with a late break, when there is a narrow window of time before ground temperatures drop significantly, or soils become waterlogged, reducing pasture growth. Dairy farmers use various strategies to combat this issue including deferred grazing, coupled with containment feeding and supplementary feeding, dry sowing cereals (or annual Italian ryegrass) to maximise early feed production, soil testing and applying adequate phosphorus, sulphur and potassium and applying nitrogen fertiliser and/or gibberellic acid in early winter.

Perennial grass-based pastures such as perennial ryegrass, tall fescue, cocksfoot and phalaris along with cereals and annual ryegrass are highly responsive to nitrogen fertiliser (N).

Nitrogen is applied to annual pastures/crops at seeding with additional applications before the three-leaf stage and again following each grazing. Dairy farmers are applying several applications of up to 30 to 35 kg/ha N per application during autumn and winter, and during summer on irrigated pastures. Regular small applications (less than 35 kg/ha N) are recommended rather than single large doses.

Nitrogen is only applied when pastures are actively growing and can use the nitrogen, and the application is timed to avoid wet conditions and maximise plant uptake. Nitrogen is not applied to water-logged soils before irrigation/heavy rains and for at least 2 to 5 days after irrigation/heavy rains. This minimises nitrogen losses to the atmosphere where it contributes to greenhouse gas as emissions.

Gibberellic acid, a naturally occurring plant hormone, stimulates plant cell expansion resulting in pasture (and weed) leaf and stems becoming longer. It is applied with a boom spray and is easily and quickly applied. Often a small amount (25 L/ha) of liquid nitrogen fertiliser is added to further improve plant response. Gibberellic acid is applied during winter when soil temperatures are lowest and plant production of naturally occurring gibberellic acid is lowest.

Early sowing cereals and annual ryegrasses for grazing have become common to help fill the winter feed gap and also to provide additional silage and hay on dairies in the Limestone Coast. Often cereals and annual ryegrasses are sown with a companion species such as vetch, sub clover or persian clover to maximise the nutritional value of the pasture.

Removing cows from paddocks to a "stand-off" area or a covered barn to avoid pugging of paddocks especially during winter. The impact of pugging is minimised by deferred grazing (and application of N fertiliser) in early winter so that wet paddocks have 1800 to 2200 kg/ha pasture availability (feed on offer) before they are grazed.

Using 'on-off grazing' can significantly reduce pugging damage and increase pasture utilisation. With this technique, dairy cows are only allowed to graze a very wet paddock for a short period (2 to 4 hours) after which they are held in a stand-off area, such as a compacted rubble or cement feed pad, a laneway, an old quarry or the dairy shed yard with appropriate supplementary feed supplied.

Care must be taken when selecting suitable sites for a stand-off area to limit the impact on native vegetation and to minimise nutrient runoff or nutrient infiltration to any underground water aquifers.

Significant increases in pasture utilisation of 40% to 60% have been measured after installing subsurface **drainage**, compared to undrained paddocks on dairies with paddocks subject to waterlogging in winter.

Permanent underground pipe drains can be installed in paddocks with free-draining topsoils and an impermeable clay layer at a depth of more than 70 cm, or underground unlined channels constructed by pulling a "mole" through the soil (mole drains) dug in clay and clay loam soils with poor natural drainage and with clay less than 40 cm from the surface.

Before planning any drainage (either above ground or underground), contact the Limestone Coast Landscape Board to obtain advice on whether the drainage may be considered a 'Water Affecting Activity' requiring approval from the relevant authority.

Efficient irrigation on dairy properties is managed using irrigation scheduling to minimise overwatering and waterlogging. Irrigation scheduling is based on plant water use and soil moisture levels. Plant water use is based on mm daily evaporation from a class A evaporation pan.

Figure 4: Irrigated dairy pasture (photo credit Dairy SA)

Efficient irrigation provides the right balance of air and water, with the soil not watered to above field capacity (the point at which the soil has been saturated and starts to drain), and not allowed to dry out below wilting point (the point at which pasture plants become stressed). The difference between field capacity and wilting point is called readily available water (RAW). Efficient irrigation aims to replace RAW in the plant root zone as soon as this is exhausted, and not to apply more water than is removed by the pasture.

For more information go to www.dairyaustralia.com.au/land-water-and-climate/water/irrigation/irrigation-scheduling

Dairy effluent is a valuable resource and is retained on farm and reused for productive gains.

Manure stockpiles/effluent should be tested for nitrogen, phosphorus and potassium content, then suitably distributed to grazing paddocks to match application rate with soil, pasture and crop requirements, ensuring appropriate withholding periods are observed before grazing.

It is essential effluent ponds are correctly sized and managed, manure stockpiles are sited away from sensitive areas and are bunded, and that stand-off areas/feed pads are designed for appropriate effluent manure and waste feed management.

Effluent ponds should be emptied regularly and de-sludged when required. Sump traps should have sufficient capacity and spare pumps should be available if required.

Appropriate width buffers should be used to protect waterways and drains from effluent.

Soil testing is essential to identify the need for beneficial amendments, such as lime (for acidity) or gypsum (for soil amelioration). Thorough investigation is warranted to determine the chemical and physical condition in the top 30 centimetres before conducting any soil amelioration activity (such as deep ripping or mixing) to avoid causing further degradation. Soil testing is also essential to prevent overuse of fertiliser and potential pollution of underground and surface water supplies with nutrients essential for pasture growth.

Many dairy producers choose to time calving in late winter/early spring so that these later dropped calves (and their mothers) are then grazing an abundance of spring pasture, putting less pressure on cows and pastures in early winter.

Insect control on pastures (and crops) is equally important on dairies as it is in beef and sheep properties. Lucerne flea, redlegged earth mite and both black and red cockchafers should be monitored, particularly in sandy paddocks. Pastures are most susceptible to insect damage at the time of emergence. Diamond back moths can also damage brassica forage crops, and if present, should be controlled early before they become established in a brassica crop.

Ripping and rolling shallow limestone soils has resulted in a considerable improvement in dryland pasture productivity, albeit at a considerable per hectare cost. Ripping and rolling has resulted in an even larger increase in the productivity of irrigated pastures.

Dung beetles should be encouraged by taking care with your cattle drenching program, and ensuring you have the complete suite of winter, spring, summer and autumn active beetle species. For more information go to www.dungbeetle.com.au or www.creationcare.com.au/dung-beetles.

Waterways/creek lines, stock should be provided with alternative (non-riparian) watering points. Riparian and wetland areas should be fenced for stock control, with bare riparian areas revegetated.

Unsuccessful Strategies Implemented by Farmers

Some improved pasture species have been sown and not persisted well such as chicory in paddocks prone to waterlogging or in paddocks with a heavy capeweed infestation, and lucerne where soil pH $_{(water)}$ is less than 6.0 especially at 30 to 40 centimetres depth.

Constraints Impacting on Potential Carrying Capacity

Soil constraints in surface and subsoil layers are common in the Limestone Coast, which can be a barrier to increasing pasture utilisation. Constraints include:

- Shallow sheet limestone layer, which restricts root growth and reduces the persistence of perennial grasses.
- Highly alkaline soils on some flats (pH $_{(water)}$ higher than 8.0) restricting pasture legume growth and persistence and leading to nutrient and trace element imbalances in pastures and livestock.
- Water logging or water inundation in paddocks.
- Soil acidity (low pH) in dunes in both the surface and subsurface layers, and in the surface in sand over clay soils. Soil acidity can also be present in the surface of sandy soils where there is limestone at depth.
- Readily available water (RAW) capacity can be low on shallow soils.

Inadequate **fertiliser application**, particularly phosphorus, sulphur, potassium and nitrogen are major constraints to maximising pasture productivity. If soil nutrients are lacking, pastures will be unable to reach their potential regardless of how much water and sunlight is available and how effective grazing management is. Conversely, overuse of fertiliser can be detrimental to water quality, as well as costing money.

Soil testing is essential to identify optimum phosphorus, sulphur, and potassium application levels.

Weed infested pastures impact on pasture production. Weeds are often a lower feed value (especially in spring) and can affect animal health. Weeds may arise from livestock grazing paddocks to below 50% ground cover in autumn, pugging in winter or by livestock preferentially grazing desirable pasture species rather than weeds. Good weed control is critical when establishing new pastures.

Trace element deficiencies in livestock are common, particularly copper, selenium and cobalt. The coastal country, running south of Mount Gambier north along the coast to Robe, is particularly prone to cobalt deficiency. Copper is usually applied in autumn with fertiliser, following a positive diagnosis after sub clover leaves are collected in winter. Cobalt and selenium can be administered directly to animals following an analysis of livestock blood collected by a veterinarian.

Providing stand-off paddocks or a feed pad will help prevent pugging in winter. This allows "On-Off grazing" by limiting pasture grazing to no more than four hours per day, with supplements fed in the stand off paddock or on the feed pad to ensure milking cows are fully fed. Alternatively, a four hourly pasture allocation using strip grazing with a single electric wire can be used. Either method will increase pasture utilisation, improve the quality of feed, increase pasture productivity and protect the soil from erosion. This in turn can increase the profitability and productivity of the livestock enterprise.

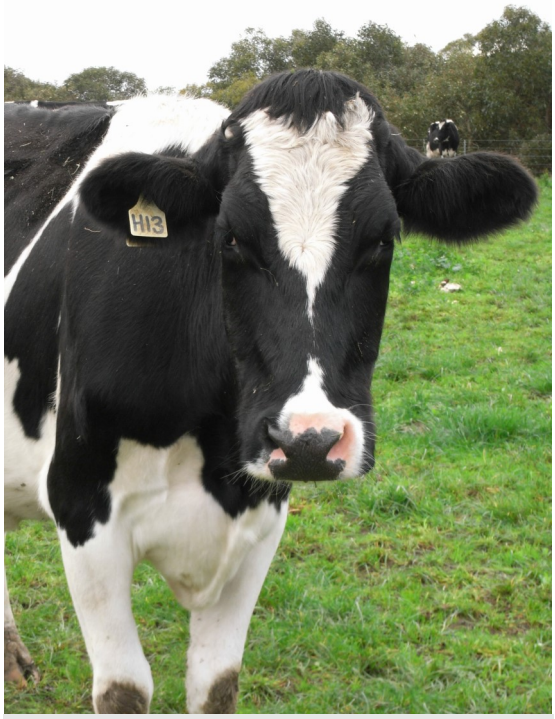

Figure 5: Friesian cow

For further information, please contact your local dairy consultant, soils consultant, or agronomist.

This fact sheet has been compiled by Tim Prance, Pastures and Grazing Systems Consultant, T Prance Rural Consulting with information sourced from local consultants and farmers across the Limestone Coast.

The aim of this fact sheet is to capture and formalise local intelligence on sustainable land use for dairying in the Limestone Coast.

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