Appendix 5: Pasture growth to lift under climate change

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Dairy systems in south eastern Australia may be facing a warmer and drier future, but a recent modelling research has shown that dairy producers in some areas could maintain or even increase pasture production under a changing climate.

It is well established that pasture consumption is a key index of dairy farm business success. Climate change is a feature of the 21st century and pasture production is heavily reliant on the climate. Projected climatic changes will alter the pattern of pasture growth requiring dairy farmer to adapt their grazing systems. Using biophysical models, researchers from the Tasmanian Institute of Agricultural Research and the University of Melbourne have been studying what dairy systems might look like at a regional level under a future climate.

The research has focused on the production of perennial ryegrass and white clover under future climate scenarios and examined adaptation options at both a biophysical and farm system level. Annual and seasonal pasture growth was predicted by inputting projections of future rainfall and temperature – based on three future climate change scenarios – into the grazing systems models DairyMod and SGS Pasture Model. The future climate scenarios were developed for each site by adjusting baseline climate data (from the period 1971–2000) with climate change projections based on a high greenhouse gas emission scenario in 2030, and mid- and high-emission scenarios in 2070.

Researchers found that although higher temperatures and reduced rainfall are likely to result in a contraction of the spring growing season by a few weeks, warmer temperatures in winter and early spring, and higher levels of atmospheric carbon dioxide concentrations will elevate pasture growth rates enough to offset most, and in some cases all, of the decline later in the season (Fig 1).

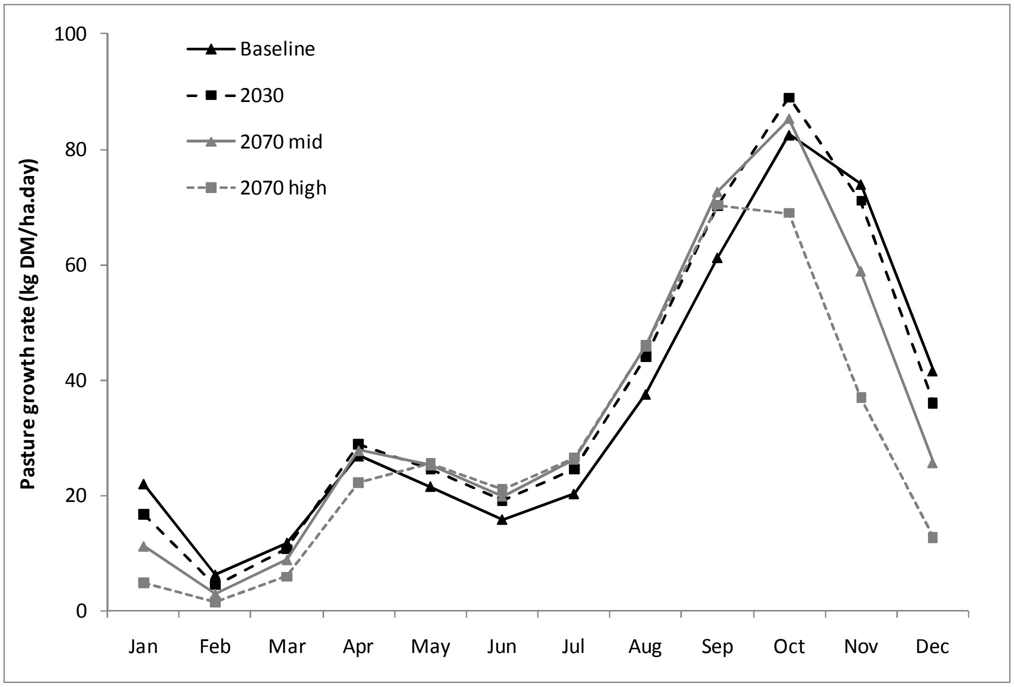

Figure 1. Mean monthly pasture growth rates under a baseline (1971-2000) and three future climate scenarios at Ellinbank.

The research also highlighted that the use of deeper rooted perennials and higher temperature tolerant plants were able to alleviate the impact of a warmer and drier on pasture production. Incorporating deep rooted and heat tolerance traits into pasture species may involve breeding new cultivars of perennial ryegrass or changing to species such as tall fescue that already have these traits.

At a farm system level, the capacity to adapt stocking rate and calving time to future climates was explored. The impact of climate change on pasture production and farm gross margin at three sites; Terang (south-west Victoria, Mediterranean climate); Ellinbank (Gippsland, Victoria, temperate climate); and Elliott (north-west Tasmania, cool-temperate climate) were modelled under a range of climate by stocking rate by calving date scenarios. In the cool temperate region where pasture production was expected to increase in most climate scenarios adapting calving pattern and stocking rate resulted in significant increases in gross margins. No benefit or a decrease in gross margin were simulated in the Mediterranean and temperate regions suggesting that further changes to the farm system are required to maintain profitability in these regions.

While maintaining or improving pasture consumption is considered critical to the underlying competitive advantage of the dairy industry it is also important that these climate change adaptation strategies do not conflict with climate change mitigation. For example, the logical response of producers to warmer winter conditions will be to increase nitrogen fertiliser application, resulting in greater nitrous oxide emissions. The greenhouse gas emissions intensity of milk production of predominately pastured based dairy farms have been shown to be generally higher than those of dairy farm systems with higher levels of concentrate feeding and higher per cow production. For these predominantly pasture based systems the research teams are exploring climate change adaptation strategies that are not only resilient to a changing climate but also reduce emission intensity of milk production and improve farm profitability.