Appendix 3: Modelling approaches to adapting pasture based dairy systems to a changing climate in a carbon constrained world

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Abstract

The temperate regions of Australia support over 80% of the nation’s milk production, (Dairy Australia, 2009). Perennial ryegrass (Lolium perenne L.) is commonly sown in a mixed sward with white clover (Trifolium repens L.) and is the dominant pasture specie in many of these regions (Mason, 1993; Fulkerson and Doyle, 2001). In such pasture-based systems, consumption of home-grown herbage is a key determinant to business success (Beca, 2005; Chapman et al., 2008). Increasing pasture productivity, through improved production and consumption, has been highlighted as an important objective for the dairy industry into the future (Dairy Australia, 2010). Modelling the pasture production under future climate scenarios for the cool temperate dairy regions of Tasmanian has shown that pasture production is likely to increase between 15 and 30% (Cullen et al. 2009, Holz et al. 2010). The average per cow production of Tasmanian dairy farms is 5,000 L/cow (Dairy Australia, 2009), with on average less than 20% of the cows diet coming from purchased grain concentrates or by products (Barlow, 2008) and average annual nitrogen fertiliser applications exceeding 200kg N/ha (TIAR, 2010). These dairy farm systems are classified as farm system 1 (FS1) and are characterised by being predominantly pasture based with less than 30% purchased supplementary feeding. Climate change projections for Tasmania’s dairy regions has highlighted that the current forage base is quite resilient to future climate scenarios and that adaptations are likely to be within system adaptations with the industry continuing to focus on milk production per ha and pasture consumption per ha as key determinants of business success. Cullen et al. (2010) showed that increasing stocking rate and changes in calving date are profitable adaptive response to a warming climate in these regions, however, there is an emerging conflict between the most profitable approaches to adapting to changing climate and that of mitigation of greenhouse gases (GHG) in a carbon-constrained world. The GHG emissions intensity of milk production of FS1 farms have been shown to be higher than those of dairy farm systems with higher levels of concentrate feeding and higher per cow production (Christie et al. 2009). For these predominantly pasture based systems there is an urgent need to develop agreed approaches to examining adaptation strategies and their influences on total farm GHG emissions, the emission intensity of milk production and farm profitability.

References


TIAR, 2010. Impact Dairy Business of the Year Award field day. Tasmanian Institute of Agricultural Research, Burnie, Australia.