GrassGro indicates that erosion risk drives adaptation of southern tablelands grazing farms to projected climate change.

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The extent of future climate change cannot be directly measured using conventional observational research methods. Rather the current understanding of climate systems must be embodied in mathematical models in order to project forward on the basis of known trends in climate forcings. Similarly it is impossible to test in the field the impact of climate change on the productivity of grazing systems at a farm scale without also using appropriate pasture growth and grazing systems models. To date impact assessments of climate change on grazing farms have been limited to either specific statements about components of the system or generic interpretations of production trends and associated risks without seeking to quantify the full impact at a farm scale.

This paper describes the use of a grazing system simulation model (GrassGro) to quantify the impact of climate change on two specific grazing systems located at Bookham and Goulburn on the southern tablelands of NSW. GrassGro uses daily time step weather data as input to a soil water budget and pasture growth model in concert with a grazing animal model. Modelled pasture growth is responsive to atmospheric CO_2 concentration. In order to determine the impact of climate change the grazing systems were simulated for the historical weather data from 1970 to 2000 and compared with a simulation of the same system using projected daily weather for thirty years centred on 2030. The projected daily weather data were generated using a novel technique that used comparisons of average projected and historical outputs for a range of Global Circulation Models (GCMs) to estimate the basic parameters of a stochastic weather generator.

Results for the localities studied show that although there was considerable variation between the GCMs, growing season lengths were consistently shorter with the greatest truncation occurring in autumn. Winter pasture growth was enhanced by higher temperatures. Overall these changes in feed supply led to considerable reductions in carrying capacity and profit per hectare. This impact was largely driven by the inability of the system to maintain target ground cover at present-day stocking rates.

Three SRES emissions scenarios were tested (A1B, A2 and B1). For 2030, there was little difference between scenarios in the impact on the grazing system. The seven years from 2001 to 2007 were also simulated, and it was found that several of these years are analogous to the worst years in the projected 2030 climate. Climate projections suggest, however, that severe drought years such as 2004 may become more frequent with less likelihood of a sequence of higher rainfall years to aid in recovery between them.