Australian agriculture has a long history of exposure to extreme climate variability and resulting productivity loss. In 1982-83 Australian agricultural productivity was reduced by approximately 10% as a result of one of the most severe examples of climate variability on record: overall climate related damage to the Australian economy was estimated at around A$3 billion (Lindesay 2004). More recently, in 2006-07 climate driven reductions in agricultural productivity have been estimated at A$2.4 billion (about 6% of total agricultural productivity) (ABARE, 2008). Future climate change scenarios predict greater exposure to climate extremes and hence increased risk to farm productivity and profitability, particularly if current farm management systems do not adapt to the changing climate (Howden et al., 2007). To date, adaptation research has concentrated on understanding the value and feasible development of broad scale adaptation options for agricultural production (Bradshaw et al., 2004; Easterling et al., 2007; Howden et al., 2007). The success or failure of these broad-scale adaptation options will depend largely on regional climate and prevailing soil conditions, and will require regionally-specific evaluation processes to determine their efficacy. In this presentation I outline the integration of expert farmer knowledge, climate change science and crop simulation software to deliver an effective method to evaluate regional adaptation options for farmers in rural New South Wales, eastern Australia.

Experienced farmers with significant agronomic expertise have identified potential adaptation options for a range of field scale farm management practices currently employed in two key mixed cropping regions of New South Wales. These adaptation options have been evaluated using the Agricultural Production Systems Simulator (APSIM) (Keating et al., 2003). APSIM, parameterised to soils representative of the study regions, has been used to simulate the impacts of climate and to examine farmers' ability to manage and adapt to: a) current climate variability; b) future climatic conditions with unchanged management practices; and c) future conditions with farmer-defined adaptation options.

Simulations of cropping systems in 2030 and 2050 under moderate and high climate change scenarios, modelled without adapting current management regimes, suggested reductions in productivity in response to warmer and drier conditions. Applying the adaptation strategies developed using farmers' expert agricultural knowledge showed that production decreases could be mitigated. Accessing expert local knowledge through participatory engagement practices has helped develop useful adaptation options to optimise farming systems under climate variability and change.

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