

Author(s): Lisa Brennan, Stuart Brown, Neal Dalgliesh, Chris Smith, Brian Keating, Michael Robertson, Brett Cocks and Gordon McLachlan

Title: Economic and environmental benefits/risks of precision agriculture and mosaic farming

Abstract

Some of the solutions to market and environmental challenges facing Australian agriculture may lie in more diverse land use, in which enterprises and practices are better matched to soil and climate circumstances. Precision farming innovations such as precision agriculture and mosaic farming hold promise. We use the term precision agriculture to cover within-paddock variation in management, associated with information on spatial variability (e.g. variable rate fertiliser application). Mosaic farming is used here to describe a land-use system made up of a "patches" of annual cropping interspersed perennial vegetation, such as lucerne and/or trees. It has some similarities to precision agriculture, although is more likely to be considered on a larger farm or sub-catchment scale, as distinct from the field or paddock focus of most precision agriculture applications. Despite the breadth of possible applications of precision farming technologies, most attention has focused on the technical aspects of these technologies in the absence of a strategic framework in which to assess the economic and environmental benefits. This paper reports on the development of a 'bio-economic' analysis framework to encompass implications of spatial management options at both whole farm or multiple farm (e.g. in relation to mosaic farming) and within paddock (e.g. in relation to precision agriculture) scales. The framework has been applied to case studies involving key stakeholders (e.g. landholders, agribusiness) to identify useful ways in which management systems that seek to capitalise on spatial variability e.g. through crop management and enterprise mix in relation to soil variability and lateral hydrological processes, can be designed and evaluated. In particular they will address the issues of space x time x management interactions. A key component of our approach has been the use of the Agricultural Productions Systems Simulator (APSIM) – a simulation model that has been extensively for the management of cropping systems. With our collaborators, we have explored how APSIM can be combined with economic analysis to provide a framework to explore the nature and consequences of spatial variability in farm paddocks. We assert that a tool, such as APSIM, that can allow for the assessment of temporal variability has a potential role in both interpretation and assessment of possible actions taken in precision agriculture.