Modelling the Diffusion of Innovation and Water Conservation Methods through Social Networks in Semi-Arid Rangelands

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Introduction When organizations wish to promote an innovative practice , such as improved conservation or stewardship measures , there is a tradeoff to consider in 1) how beneficial the practice will be , 2) how much effort will be invested in the promotion of the new practice , 3) how widespread the adoption of the practice will be , and 4) how likely are the adopted practices to continue beyond the end of the promotion effort . While the first two items are typically technical issues that can be explained by the attributes of the innovations being considered (Pannell et al . 2006) , the latter two are properties of the societies into which the innovations are being introduced . There have been considerable advances in our understanding of network structure in recent years (Newman 2003) and significant advances in our ability to apply techniques such as agent-based models and network models to understand the dynamics of human societies (Janssen and Ostrom 2006) . In this paper we describe a prototype model that combines agent-based and dynamic network models to simulate the diffusion of innovation in a pastoral community in central Australia , and discuss its implications in future extension efforts to pastoral communities .

Materials and methods We developed an agent-based model using the Swarm simulation libraries (Minar et al . 1996) . Swarm simulations require that models be defined in terms of *agents* (who are the actors in the simulation) and *actions* (what the actors do at each time step) . We defined actors as pastoral station owners and the tracts of land they manage . At each time step the land tracts received rainfall and produced cattle according to vegetation conditions . The pastoral owners would make decisions to stock , sell off , or agist according to their land's performance . Pastoralists could also look to neighbours or friends (social network) for improvements on how to run their own operation .

Results & discussion Preliminary results suggest that social networks play an important role in diffusion of innovative ideas , but even in the tightly controlled confines of a simulation the significance of the effect of social networks can be difficult to discern from other factors in the system . By cataloguing and describing the modelled effects of different kinds of social networks in diffusion , we will produce guidelines on how they can be identified and utilized in extension efforts for pastoral populations .

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