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**Economics and system applications for perennial grain crops in dryland farming systems in
Australia**

Lindsay W. Bell

CSIRO Ecosystems Sciences, Toowoomba, Qld, Australia

Abstract

The development of perennial grains could provide a number of sustainability and farm management benefits for Australian dryland crop-livestock farming systems. Whole-farm bio-economic modelling has shown that perennial wheat would have the greatest economic feasibility if it had dual-purpose attributes by providing additional forage post-harvest (during summer) and early in the winter growing season. This accrued from the ability to increase livestock numbers without a proportionate reduction in returns from grain production. Grain-only perennial wheat achieving similar prices would require yields of 60-100% of annual wheat to compare with current systems, while dual-purpose perennial wheat was still economically favourable with grain price \$35/t less and grain yields 40% of annual wheat. In all cases perennial wheat would be most attractive on soils or situations where current annual cereal systems are most marginal. Cost-benefit analysis based on modelled increase in farm profit (\$20/ha farm area), suggests that a 20-year investment in perennial wheat would result in a 10-fold return if it was adopted on 600 000 ha assuming 50% chance of success. While perennial wheat would have the largest impact in Australian farming systems, the development of perennial legumes for dual-purpose grain grazing could also offer some potential. Several native Australian legumes have been assessed for their suitability and there are several short-lived perennial legumes that could have potential in such a system both in Australia and elsewhere (e.g. *Lablab purpureus*). Finally, perennial grain crop development should consider the range of farming systems where they might be used including facultative perennial systems, phase rotations (e.g. 2-4 year long rotations), companion or relay cropping (oversowing them with other crops/pastures) or polycultures involving a range of perennial species.