Characterising agroecosystem resilience using an indicators-based approach.

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Abstract

As demonstrated by the recent (2012/13) "once-in-a-lifetime" drought conditions that affected nearly the entire country, New Zealand’s diverse agricultural and horticultural sectors remain acutely vulnerable to climate extremes. Furthermore, the shift towards more intensive production and higher-input systems, have the potential to create new risks and increase uncertainty for producers. In order to support more effective farm-level responses to risk and uncertainty, the results of a recent study exploring the development and practical application of indicators for agroecosystem resilience, are presented.

Resilient systems have been characterised as those that have a higher capacity to absorb shocks and stresses; have the ability to self-organize into flexible and responsive networks for learning, distribution and change, and; have a high capacity for learning and adaptability through feedback mechanisms within the system. While these concepts have been well developed in the literature as theoretical and conceptual frameworks, there are few examples of operationalizing and empirically applying these concepts, particularly for agroecosystems which are among the most complex of social-ecological systems.

Using a ‘bottom-up’ and participatory-based approach, we reviewed and then empirically applied a set of behavioural indicators across three different types of dairy farm systems in eastern New Zealand: organic, low-input or grass-based, and high-input, intensive systems in which supplemental feed is the main input. The 19 characteristics of social, economic and ecological resilience the study developed were instrumental in evaluating the differences in the resilience of different farm types. The ‘lock in trap’ of highly intensive systems, while profitable in the near term, may be less resilient to climate shocks as these are likely to occur in conjunction with changing market and financial risks. Low-input systems are less dependent, in particular, on fossil fuels and were associated with higher levels of farmer satisfaction and well-being. The framework provides a useful template for cross-sector comparison, and demonstrates that in-depth, robust qualitative assessments of resilience can provide a complement to quantitative metrics. The characterisation of resilient farm-systems also has the potential to contribute to broader sustainability frameworks for agriculture.

Keywords: agriculture, frameworks, stakeholder engagement, resilience assessment, sustainability

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