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Agricultural Transformations – NZ pastoral farming systems past, present and future

Warren KING

AgResearch, Ruakara, Hamilton, New Zealand

There are increasing calls for agriculture in NZ to be *transformed*. The signals from Wellington, especially, suggest that government investors in the primary sector (MPI, MBIE) do not consider that 'business as usual' will deliver the improvements in environmental performance demanded by the voting public. The Crown Research Institute whose primary focus is pastoral agriculture – AgResearch – has adopted a strapline: 'Driving prosperity by transforming agriculture'. But what does this *transformation* actually mean?

Many long-term observers of farming in NZ consider that we have transformed before. In particular, the deregulation of the 1980s – especially the withdrawal of subsidies on fertiliser and Supplementary Minimum Prices – created massive, rapid changes. Necessity really was the mother of invention, but the result was leaner, more cost-effective primary production systems that have seen sustainable productivity gains for decades. Much of this was supported by science. The foundations of modern grass-fed dairying were developed during that time based on a substantial body of research. Advances in sheep genetics and farm systems has seen a remarkable drop in ewe numbers nationally since that time without any decrease in lamb production. Perhaps transformation is best seen in hindsight.

A more recent example of transformation followed the *re-regulation* of the Taupo catchment. When the Waikato Regional Council implemented Variation 5 in 2011 to limit N leaching into Lake Taupo, it effectively removed the community subsidisation of farming activity. In other words, the environmental externalities of farming (in this case, leaching) were going to be estimated, costed and capped. The impact of these regulations has seen a transformation of farming in the Lake Taupo catchment, with much more forestry but also some farms intensifying (Barry *et al.* 2010). This regulatory model shares similarities with proposed regulations around water quality and GHG emissions elsewhere in NZ too.

The drivers of transformation are intensifying and not only from central government. Many New Zealanders are concerned about water quality in our lakes, rivers, streams and estuaries. There is good evidence that water quality is declining in some places and that some of this decline is attributable to agricultural activities. Non-linearities in the relationship between on-farm activities and reductions in environmental quality mean the

problem is non-trivial and will not be quickly solved. For example, estimates of time-lags from agricultural activity to leaching of N into Lake Taupo range from years to decades.

These issues are being observed from overseas as well. A recent OECD report (OECD, 2017) has suggested that our economic growth model is approaching its environmental limits. Branding of the products from our primary sector – our 'clean, green' image – is becoming increasingly questioned. The primary sector is being squeezed between the expectations of our global consumers (food safety, environmental footprint per mouthful, especially greenhouse gases) and the expectations of New Zealanders (price, quality, environmental footprint per hectare, especially water). This creates a dilemma for farmers, since there are significant risks to change – especially change considered transformational – but there are bigger risks from not changing.

If New Zealand is to transform its pastoral agricultural sector, then de-risking decisions around land-use change will be critical. Recognition of the context within which farmers make decisions can identify the best candidates for future land uses and prioritise appropriate support for the transition. A broad set of drivers may have significant bearing on these decisions, including financial, environmental, regulatory, knowledge, market and social information. These form the 'domains' within a multi-criteria decision-making framework as developed by Renwick *et al.* (2018; Figure 1).

The relative importance that each farmer places on the domains can illustrate the similarities and differences between each farmer's context (Figure 2). Key information needs and other support can then be identified to de-risk and accelerate decision-making.

This model assumes that transformational change at an industry scale can be brought about by each farmer making the best decision for their enterprise. However, the decision made by a farmer may be quite different from other farms on outwardly similar land due to individual preferences (*e.g.*, values) or local considerations. While the implementation of such decisions will likely involve support from an array of rural professionals, ultimately it will be decisions made by a farmer for their farm (*i.e.*, 'bottom-up'). There is no explicit inclusion of the broader set of stakeholders

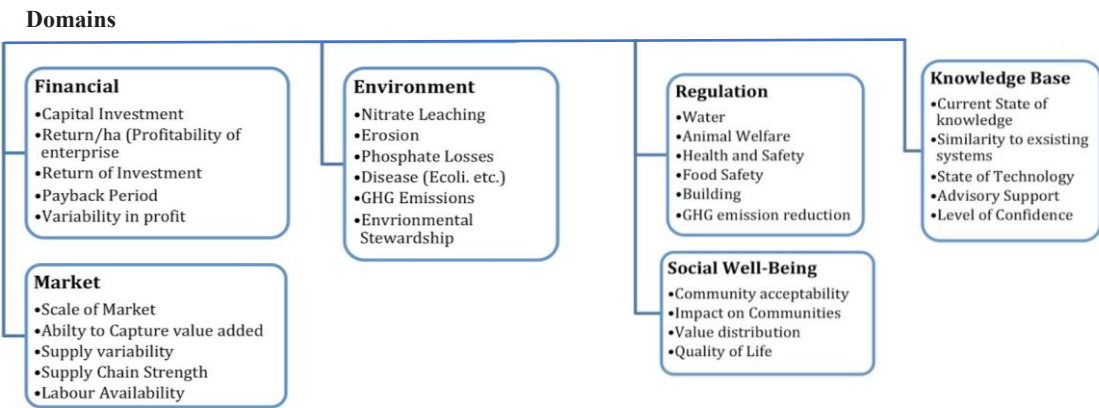


Figure 1 Multi-Criteria Decision-Making Framework: Domains (from Renwick *et al.*, 2018)

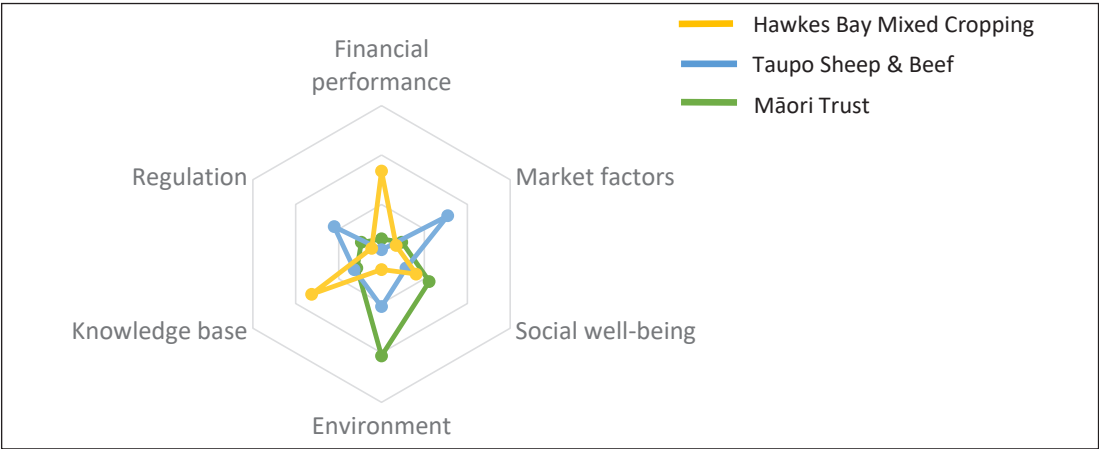


Figure 2 Multi-Criteria Decision-Making Framework: relative importance of each domain for considering land-use change on three farms.

that also have an interest in the best use of that land *e.g.*, tangata whenua, neighbours, other farmers or land users in the sub-catchment, landowners down-stream (including urban-dwellers), consumers of products, etc. Despite that, the farmer’s decisions about land-use change will be expected to contribute to a national-scale transformation. The size of that contribution is unclear but there are other decision-making models too. Mission-lead Agricultural Innovation Systems (MAIS; Klerkx and Begeman, 2020) is a model that deliberately includes a very broad set of stakeholders in land-use decision-making, including industry and policy makers. The idea is that decisions can be *designed* to consider landscape, regional and national scale policies, to identify barriers to change and use policy settings to address them, and to be directed and coordinated in land-use change decision-making. In contrast with the examples drawn above, this model is more ‘top-down’ in its approach. The list of stakeholders who might be

involved in the MAIS model is very broad and could/should include actors from throughout the global food (and fibre) system (Figure 3.). In conclusion, whatever the mix of decision-making eventually looks like, it seems clear that NZ pastoral agriculture is facing a period of great change. New Zealand’s model of agricultural growth is coming up against environmental and social (license) limits - sustainable intensification with best management practice will not get us far enough. Nevertheless, if the focus remains on land-use change being driven by individual farmers, it is difficult to see that these collective changes will deliver the transformation that is needed. Transformation is in the eye of the beholder, and is subjective, context-dependent and perhaps only definable in hindsight. We may already know what farm systems will be needed to deliver a profitable, responsible, resilient agricultural industry. Or we may not. It seems clear that different approaches will be

The Global Food System

Food System Map
Version 1.2, March, 2009

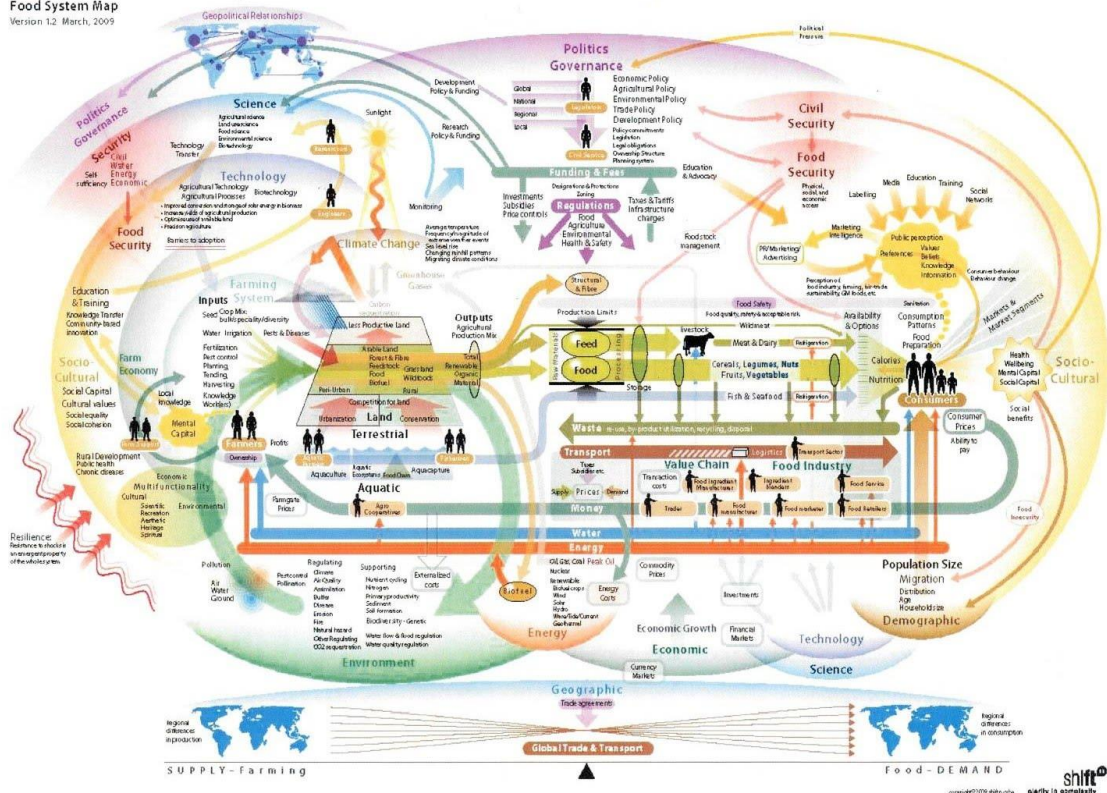


Figure 3 Global Food System Map.

needed to land-use change. Whatever this looks like, science will remain critical to inform the development of opportunities, to reduce the risks, and to accelerate the process of transformation. The science that will inform this great transformation comes from a range of institutions, including multiple Crown Research Institutes, universities, and industry bodies. As an industry, we must ensure that science is better prioritised and integrated across an array of disciplines and enterprises to address the defining issues of our generation: how do we sustainably utilise the resources we have to deliver better futures for our land and our people? And what does this look like?

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