Ross A. Hynes PhD
22A Tucker Street
Chapel Hill Qld. 4069
ross.hynes@bigpond.com

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Crucial concepts that may be considered when developing Rangeland Policy in 2019

1. The foci need to be both strategic and tactical. Strategic for a rangelands-wide policy. Tactical where graziers and other land and resource managers are incrementally contributing to the wider strategy at a larger map scale e.g. property, paddock et cetera (Hynes 2015).

2. With the exception of 'real' grassland systems e.g. the Mitchell Grasslands, all other rangeland agro-ecosystems are expressions of keeping most of the land cover in a state of early succession. This demands ongoing intervention by grazing animals and land managers, otherwise these systems would move through successional stages towards the original: tree-dominated or shrub-dominated landscapes. Or if over-exploited move into deeper levels of degradation. (Note the State-Transition Model for sub-humid and semi-arid grasslands (Ash, McIvor and Brown 1993; MacLeod, Brown and Noble 1993) partly addresses these ongoing management challenges. The Trigger-Transfer-Reserve-Pulse and Feedback Model (Ludwig, Tongway, Freudenberger, Noble and Hodgkinson 1997) is also useful for sparsely covered semi-arid and arid rangeland systems, and partly addresses these challenges).

3. Agro-ecosystems that require ongoing intervention to maintain grass or pasture cover are always vulnerable to weed infestation as the available solar energy, soil nutrients and water resources are never utilised to their full potential. These additional unutilised or under-utilised resources are available for woody weed invasion (Hynes and Scanlan1993).

4. With climate change impacts accelerating, the policy strategy needs to anticipate, as far as possible, effective responses to enable long-term fluctuating agro-ecosystems to achieve stepwise, but non-permanent equilibriums as the effects of climate change put these ecosystems under continuous survival pressure.

5. In the Rangelands of the near future **some** enterprises will need to be retired and property managers paid to manage the remaining bio-physical values, especially water resources, not necessarily as national parks - there is probably enough already and these endure very limited management of the spectrum of ecosystem values.

6. In some Rangelands of the near future **some** enterprises will need to become mobilised to take advantage of intermittent rainfall events to move stock in and out of semi-arid and some sub-humid ecosystems that are suitable for such land-use. Kidman & Co – Outback Beef has been doing this for more than a century and continues this practice over the largest landholdings in Australia totalling 7.92 million hectares, (Wagstaff and Carberry 2019).

7. In **all other** Rangeland areas pasture management strategies will need to rapidly adjust to enable optimum use to be made of shorter windows of production in a more unpredictable and fluctuating environment (Lauder 2019).

8. At a strategic level: To enable land holders to prepare for these jolting changes both State-wide and national strategies need to have visions based on understandings of whole-systems science, which in turn, have been translated into accessible, intelligent management approaches that have reasonable probabilities of success in ecological, social and economic terms. Again, the problems are both

reductionist (as in traditional science) and whole-system. And whereas scientists have long addressed the former level, they have only recently started to develop wide-window understandings of whole systems by recognising and utilising big data and powerful IT-based systems (McCallan, Knott, Nunez-Mir, Taylor, Jo and Fei 2019). There is great urgency here to invigorate and resource whole-systems science, if we are to contribute effectively to solutions to these pressing challenges (Hynes and Scanlan 1993, Hynes 2002, Hynes 2004, Hynes 2010).

9. At a tactical level: <u>Management approaches that address minor production trade-offs for specific conservation gains.</u>

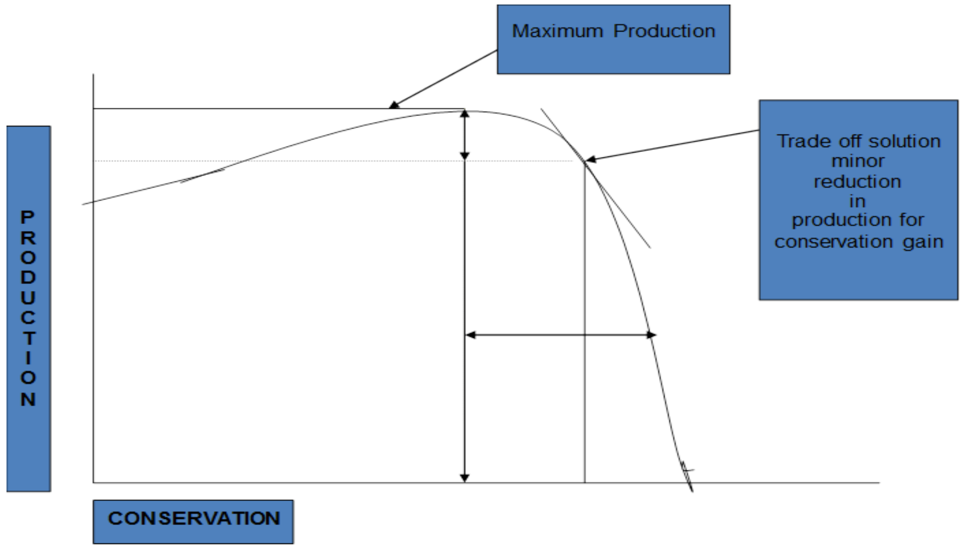

Figure- 1 presents a schematic representation of possible trade–offs between sustainable production and ecological conservation (Hynes 2010).

The concept schematically introduced in Figure 1 was developed with Dr Graeme Kirby (then Chief Economist DAS&F, NT) for graziers and national parks rangers in grazing lands of the Tropical Savannas of Northern Australia in 1996 (Hynes and Kirby 1996, Hynes 2010).

Producers and conservationists in theory should be able to agree on thresholds of resource use, which enable trade-offs for whole systems sustainability.

The objective was to convey an approach for land managers, which would allow them to contribute to the survival of certain rare and threatened species by adjusting their management in scientifically knowledgeable ways. The approach would maintain an acceptable level of cattle production, while strengthening the survival niches of species, such as the Northern Quoll, and a range of other small marsupials, as well as certain bird species e.g. the Golden-shouldered Parrot and the Gouldian Finch. Therefore in special cases, for a relatively small drop in production, an increase in certain conservation values could be achieved. And these should be applied where practicable. But these tend to be simplistic trade-offs and often rare.

Conclusions

Acknowledging the foregoing, it is almost impossible to effectively implement Concept 9 in complex, real-world cases. And the trade-offs that result are usually expedient and often politicised. For example: the Black-throated Finch and the 'Adani' fiasco, regarding mining in rangelands. Most systems exploited by humankind tend to move into deeper and deeper levels of entropy. However, they can be managed to sustain certain values for specific purposes.

The Carbon Flow approach to pasture management (described and practised by Alan Lauder) can positively contribute to productive pasture conditions. However, it works best when kangaroos are excluded. Somewhat ironically, the history of land resource-use, with its elevated practices of providing continuous bore-water or dam-water supplies, has artificially increased the carrying capacity of extensive areas of pastoral land in

Queensland. This has influenced both livestock and native species. This has led at times to plague levels in kangaroo populations, to the chagrin of graziers.

Whereas, some conservation values can be maintained in agricultural production systems, this varies with the land use strategies, the nature and resilience of the land resources and associated water resources, the types of farming and the intensity of resource exploitation.

Capitalist trading markets and the demands created by high urban population pressure (both national and international) tend to force farmers to seek the maximum profit from their land use, usually to the detriment of ecological services and non-priced values (Hynes 1997). Generally farmers will claim otherwise. But 'when the chips are down' there is a natural tendency to pursue economic survival tactics. This type of pressure historically, has accelerated the demise of whole civilisations.

Technological innovations- both intensive e.g. artificial photosynthesis, vertical factory farming and extensive e.g. the various rangeland strategies submitted above in conjunction with modern advances in rangeland management, may assist in holding levels of presently deepening entropy in our terrestrial and aquatic ecosystems. However, what is needed are revolutions in the way human kind produce food and fibre to satisfy our nutritional needs, and perceived tastes in food, fashions and habitation.

The current equations addressing resource use expectations do not add up. The economics of farming production is largely disarticulated from ecological services. In a global sense we are back to:

Impact on the biosphere = population x resource use + pollution.

And this is the crudest summary of the big, complex, 'wicked', audacious challenge facing humanity.

As a generalist species that has in the past responded to a wide range of crises, we need to recognise that we are in an ecological and societal crisis now! The solutions will need to be revolutionary, highly intelligent, strategic, adaptive and immediate! The likelihood of achieving this vision seems frighteningly over–optimistic! Still we need to get on with the job or go to extinction!

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Bio: Past President Royal Society of Queensland; formerly Director Research, Planning & Technical Services QNPWS; Director Research, Land Protection QDOL; Deputy Director CRC Tropical Savannas.

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