Working in tandem with natural variability: New paradigms for livestock grazing in Australia

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In a nutshell

An adaptive management paradigm already exists that addresses the concerns of this inquiry with respect to livestock grazing systems. Holistic management (HM) empowers graziers with decision frameworks to help them adapt to climate variability, and is based on observations of natural herd behaviour of large herbivores in southern Africa. HM grazing is rapidly gaining popularity on farm enterprises in Australia's temperate grazing zone. It (1) provides flexible management options in the face of climatic uncertainty, and (2) enhances the resilience of the natural environment, thus leaving it better prepared for climatic variability.

Unlike many other adaptive strategies to climate change, HM grazing is a proactive, low-tech solution that has at its core a different way of thinking about grazing systems, combined with the smarter application of known management techniques. Adoption of HM grazing signals a change in farming mentality from trying to gain control over the land to working with natural variability and embracing an ethic of land stewardship. Farmers using HM grazing have reported a wide range of benefits, including reduced soil erosion, increased water efficiency, improved pasture species cover and composition, improved quality of life, and more stable financial returns. Public good benefits include increased carbon sequestration, more biodiversity, and reduced nutrient loads off-farm.

We summarise key aspects of HM grazing. To give a flavour of first-hand accounts of the benefits outlined above, we provide anonymous quotes by HM farmers involved in our current, federally-funded research in the temperate agricultural zone. We conclude by suggesting ways in which government can support the significant shift in grazing practices that is already underway.

Aims

This submission has three aims:

1. To draw attention to an existing adaptive strategy to climate change that is already used by a moderate but rapidly growing number of farmers. We refer to this strategy as 'livestock grazing according to the principles of holistic management', or in short HM grazing;
2. To comment on the possible role of government in promoting HM grazing as an adaptive strategy to climate change, and in helping to adapt the HM model so that it can be applied landscape-wide while ensuring a secure food and fibre supply; and,
3. To highlight a small number of concrete measures (e.g. incentives, information and resources) with which farmers need assistance in order to make the transition to HM grazing.

About the authors

The authors are researchers at The Australian National University, and have reputable track records in the fields of ecology and social science. We have no financial or material interest in how farmers choose to adapt to climate change, or how government chooses to support farmers who seek to adapt to climate change. Our motivation for this submission is simply that we believe we hold knowledge that will be of use to you, given the terms of reference for this inquiry.

In 2007, we began a collaborative investigation of grazing management in the Upper Lachlan catchment northwest of Canberra. The primary goal of the research was to find ways of producing food and fibre in these regions while addressing the incremental loss of native vegetation caused by traditional farming practices. Independently of one another, the ecological and social science research methods we applied began to tell a very similar story. This story is that a new paradigm for grazing management exists that works *with* the highly variable Australian climate to create profitable and resilient working landscapes. The new paradigm is called holistic management (HM).

Our current research is funded by the Australian government, through the Australian Research Council (ARC) and the Commonwealth Environment Research Facilities Program (CERF). Much of the information synthesised here has been obtained or confirmed through our federally-funded, public-good research, which is still in train (see http://fennerschool-research.anu.edu.au/sustfarms/).

Aim 1: How can HM grazing enhance adaptive capacity?

HM grazing is a particular way of running a livestock grazing enterprise that is used by a moderate but rapidly growing number of farmers. It increases the resilience of individual farm enterprises to changes or uncertainties in climate. HM grazing can be distinguished from other ways of managing a grazing enterprise at levels: a fundamental level, and a technical level:

- Fundamentally, HM grazing is based on an explicit decision framework; explicit goal-setting; monitoring practices and adaptive management; and the principle that the health of the land is a fundamentally important basis for profitable farming.
- Technically, HM grazing is based on high-intensity short-duration grazing (an extreme version of rotational grazing) rather than continuous grazing; and the keeping of 'grazing charts' that provide a means of anticipating feed availability and periods of drought.

Fundamental differences between HM grazing and conventional grazing

HM grazing builds on the notion of 'holistic decision making'. In this short submission, it is not possible to outline the depth of this framework, which has evolved over many decades. However, we try to give a flavour of what holistic resource management is about, and how it differs from conventional management.

The holistic management framework can be traced back to the 1980s, when the South African ecologist Allan Savory formally defined the notion of 'holistic resource management' [1,2]. The core of holistic resource management is a framework for decision making that explicitly considers a set of goals, and a set of tools to achieve these goals (see next section). Goals might relate to farm profits, but also to other aspects that enhance the quality of human life, such as a healthy environment or having enough time for family [3]. 'Holistic' decision making involves the careful and systematic assessment of the various goals deemed important by a given farmer, and is the kind of activity that might happen together with the whole family, over the kitchen table. Basically, it is a semi-structured way of carefully thinking through all the various things that matter to a farmer and his family.

One fundamentally important aspect of holistic resource management is the emphasis it places on the natural resource base as the ultimate source of income and quality of life. In other words, holistic resource managers tend to focus on the importance of the health of their land because they operate under the belief that unless their land is healthy, maintaining a profitable farm enterprise ultimately will not be possible. For example, a farmer practising HM grazing is likely to stock more conservatively during drought than a conventional farmer – and as a result often comes out better on the other side because his farm is 'ready to go again' as soon as it eventually does rain. The HM system provides land managers with the tools to evaluate the capacity of the land against the goal of sustaining productivity over the long-term. . In the words of one landholder:

> So we match the stocking rate to carrying capacity. That's all the drought is in Australia, is stocking rate exceeding carrying capacity. ... So we adjust our stocking rate ... to preserve the environment and to preserve [our] perennial grasses because this is [our] main asset. So when the drought breaks you don't continue on it because you've ruined all your grasses. (18)

The holistic management framework also has a series of other aspects to it that make it particularly useful in the context of climatic variability, including regular monitoring of environmental health, and adaptive management where monitoring shows a certain activity to be counterproductive.

Technical level differences

HM grazing employs a range of well-recognised tools to achieve a given set of goals. The most important of these tools has to do with how livestock grazing happens. Typically, holistic managers employ the practice of high-intensity short-duration grazing, as opposed to the conventional practice of continuous grazing. As a stylised example, these two approaches differ in the following way. In conventional, continuous grazing, a farmer distributes his livestock across all the paddocks on the farm. Apart from short rest periods, all paddocks are continuously grazed all year long, with relatively few livestock per hectare. One HM farmer noted how his neighbour's conventional practices were "really prone to collapse under pressure" (11), particularly if paddocks were ploughed to produce pasture, and left periodically bare. On such paddocks, "dirt [pours] off it with the wind and then after rain great sheets of water [come] off it" (20).

In high-intensity short-duration grazing, livestock are rotated between paddocks. All the animals from the whole farm are gathered in one mob, in the same paddock. The paddock thus receives a very high number of animals per hectare, but then after a few days, livestock are moved to the next paddock; and so on. A given paddock thus is 'hit hard' for a few days whenever it is grazed, but then it gets a long period of rest – often weeks or even months. This different grazing approach has many implications for the ecology of grazing lands, leading to reduced soil erosion, reduced soil compaction, increased water infiltration, and a more desirable mix of pasture species [1, 4, 5].

Farmers employing HM grazing use a number of practical tools to help them manage their livestock rotation schedule. The most important of these tools is a 'grazing chart', which maps out how much feed is available in any given paddock at any point in time. These are easily created with graph paper and a pencil, and are updated after each rain. Using these charts, an HM manager will know at any given point in time how many 'days of feed' he has ahead of himself, if it does not rain. If the number of 'days of feed ahead' becomes too small, the farmers can make strategic decisions such as de-stocking before a drought actually hits, before expensive supplementary feeding becomes necessary, and before the health of the land is compromised.

We note that precautionary or strategic de-stocking, while beneficial at the scale of an individual farm, could cause gluts and crashes of meat and fibre availability if many farmers de-stocked at precisely the same times. In addition, in the instance of large-scale drought there

may be nowhere with good ground cover that the livestock can be sold to or sent for agistment. Such market challenges and food security issues are not isolated to HM grazing practices, nor would they be likely to arise in all drought events; conditions on HM farms may be less vulnerable to short-term or localised dryness as a result of pasture persistence. Regardless, adapting the holistic management model so that it can be adopted at a large scale may require attention to this issue.

The focus on maintaining healthy land also has important benefits for when it does rain. Most importantly, HM grazing preferences perennial pasture grasses which grow all year round, and persist better through droughts than annual grasses (which die and regenerate once a year). Many HM landholders are happy with transitional states that feature both perennial and annual grasses, feeling that the diversity has benefits for overall resilience, with annual grasses clearly preferred to bare soil.

> You need a variety [of grasses] through the year hopefully and the natives have also responded to the dry years much better than this [exotic] stuff has. This [exotic] stuff is fine when everything's lining up and there's plenty of water. If it gets a bit challenged it's not near as good. ... Particularly with the way the rainfall's been going it's been just erratic so you need to have something that doesn't rely on getting rain. (14)

> What we want is diversity in the paddocks, whether that be green or dead, young or old, and then different types of plants. The aim is just to have something green so if we get rain tomorrow or next year or whatever, if there's something [that] can grow. If we've got lots of different things and lots of different ages then something will grow. Complexity builds stability. (5)

The HM farmers in our study have reported denser ground cover and lower levels of soil erosion from the increased diversity they have established in their paddocks. Denser ground cover and deep-rooted grasses also greatly enhance water infiltration when it does rain. Hence, after prolonged drought, when erosion is common on conventionally managed grazing properties because grass cover has been lost, HM properties tend to experience a much better situation: Water immediately infiltrates the soil instead of running off, and grasses can immediately use this water to grow.

> We have got cover here ... we don't have any dust, and all the water stays in the paddock. (20)

> We're allowing much more ground cover [with HM]. With the set stocking you end up with a little short tight sward which sheds a lot more water. A bit like a bowling green. (14)

> This is one of those paddocks ... that has been cropped and cropped and cropped, and because the water cycle has been completely destroyed on that country [and] because the perennial grass has gone, it's got water holding abilities zilch. So you tend to get a lot of runoff. ... And certainly our water cycle has improved [elsewhere with HM]. ... our water holding ability of the soil is a lot greater. We get heavy rain and it stays there. That's what we're trying to do, is keep it where it falls rather than have it run off. (13)

Finally, there are clear benefits to efficiency and reduced financial risks to working with nature in this way.

> [Unlike Property 1] which has got quite a lot of improved pasture, [Property 2] saved us during that drought because of the native pasture ... we haven't fed stock since '02 really. And see that's no inputs, less carbon emissions; it's a huge thing really when you start to apply it. (22)

> Growth is what we have noticed with our rotational grazing. You used to sort of have the idea that well nothing much grows in the winter, but it doesn't if you have animals eating it all the time. If you take animals off it things are growing all the time. We have got the beginnings of spring before spring even begins. And that's really important, as day length actually increases you have got a lot of solar panels there ... you get a huge benefit at no cost from the farming point of view. (20)

> Last year [traditional farmers] lost a lot more money than I did but this year they'll make more money than I will. You grow a monoculture - in the good years you'll make a million dollars and in the bad years you might lose $500,000, $600,000. ... We couldn't handle one of those bad years. ... I think we're setting ourselves up here for a much better farm in 50 years time. (5)

Synergies with other societal priorities

HM grazing has important synergies with other societal priorities:

1. HM grazing encourages perennial pastures, which store more carbon in their roots than annual pastures. HM farms therefore are better carbon sinks than farms with annual pastures. Australian of the Year 2008 and Chair of the Copenhagen Climate Council, Tim Flannery, advocates the holistic management of the world's rangelands because of its capacity to return and maintain more carbon in the soil. *
2. HM grazing tends to use less fertiliser. This further adds to the financial resilience of the farming enterprise because fertiliser prices have increased dramatically over the last few years. In addition, reduced fertiliser use has massive, proven benefits for biodiversity, including native grasses and forbs, invertebrates, and key ecological processes like tree regeneration [6-8].
3. Farmers practicing HM grazing in the USA have reported an enhanced quality of life, due to more time for their family [3]. The emphasis on holistic goal setting thus could also have important benefits for the mental health of members of the rural community, which is an important aspect of adaptive capacity at a social level.

Social recognition of the benefits of HM grazing

Recognition of the benefits of HM grazing is growing, and its proponents are becoming increasingly mainstreamed. For example, we are aware of an HM farmer who is a board member of a Catchment Management Authority. Another HM farmer has been awarded a Carbon Cocky of the Year award for the way that his management of ground cover has contributed to carbon sequestration. We know of many landholders who are either trying to change towards HM grazing or who are contemplating how they might go about such a change in the future. Many have been inspired by the drought to consider dramatically different practices in order to ensure the future of their working landscapes.

> It is funny how things happen at a certain time in your life .... When I left school, I went to Ag college and everything there was high input systems and fertiliser and chemicals. I came home and I did a lot of that but I didn't make any money. ... I was scratching my head and then this [course] came along. I thought to myself, well this is probably the answer that I've been looking for, for the last two years when ... I'm spending $20,000 a year, $100 an acre sowing all this pasture. I was working but I wasn't getting any money back. I thought, this is ridiculous, and thank God I did because you know things only got worse since. (17)

> The last few droughts have really brought it home to me. ... We went through the 2002/2003 droughts where we were beginning to realise, well, something's got to change. We did the Grazing for Profit course. That certainly influenced my thinking a lot. ... It hasn't always been the way it is at the moment. (12)

This same grazier revised her feelings about climate change "from concern to downright alarm" after the extreme heat, wind, and storm events of the past summer. Surprised by the differences experienced on her property across short time frames and distances, she feared the combined failures of productivity, infrastructure and human health that might follow.

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* On September 30, 2008, Tim Flannery participated in ABC Radio National's *Australia Talks* with Holistic Management educator Bruce Ward. The relevant portion of audio can be heard online at http://holisticmanagement.org.au/MP3/Tim Flannery on ABC Radio National discusses Holistic Management.mp3.

> It was a sneak preview of a possible future that made me very aware that I don't want to go there and that we should all be doing all that we can to make sure we don't – I can see it is not a place to try and live. (12)

How is this different from other strategies to enhance adaptive capacity?

There are major differences between HM grazing as an adaptive strategy to climate change and other possible strategies. The single, most important difference, is that HM grazing works with natural variability rather than trying to control it.

Many of the production principles in a HM system are supported by various public good research and extension programs[†] and are practiced by landholders who would not necessarily identify as 'Holistic Managers'. The adoption of individual or multiple production practices can clearly provide benefits, however it is important to understand that HM extends beyond the search for improved production techniques. A critical element of success experienced by farmers practicing HM relates to the holistic framework used to track management performance and support profitable and sustainable means to adapt to natural variability.

The HM system also extends beyond production-based solutions by supporting social and structural aspects of agricultural systems. Social and structural aspects of HM agricultural systems focus on stewardship and extended duty-of-care, social networks for sharing of experiences and information. Change at this level will be essential for the agricultural sector to have the capability to implement complex adaptive management strategies required to adapt to climate-change conditions.

Technological solutions like computer modelling and climate forecasting dominate many discussions of climate adaptation, as in the September 2005 publication by the 'Managing Climate Variability Program' (Land & Water Australia) titled *Masters of the Climate: Innovative Farmers Coming Through Drought.* Mechanical solutions are also common: many non-HM farmers in our study were looking to prepare for the next drought by increasing their silage and grain storage capacity, assuming that they would have to hand-feed again, usually in 'sacrifice paddocks'. Our recent analysis of agricultural industry statistics also showed a dramatic increase in on-farm silage in our study region.

> Well, we never had droughts before until the last five years. We've had dry spells but we've had nothing like this. So I had to put something in place for that. So I've built myself a hay shed a couple of years ago, and got – I can probably store about 100 tonne of grain down there now, so I can feed 1200 ewes for six months. I can get a little paddock, a little feed lot paddock, and I can just feed them in the little paddock. That allows the rest of the pasture to grass up without walking on it and eroding it. (26)

> ...Because of drought, we had to buy a silo... That's where we found it really hard in the drought, having to buy feed for the sheep because you just get behind so much then. (28)

In HM grazing system emphasises a matching of grazing demand with the carrying capacity of the land. This is implemented through the range of strategies outlined in this submission, including monitoring of environmental health and flexible livestock trading. The outcome is a reduced reliance on capital intensive technologies and external sources of energy and inputs to control increasingly difficult conditions. The emphasis in the HM system is to work more smartly with what we have: the most variable climate of all inhabited continents on Earth. In fact, HM grazing appears well aligned with the biophysical essence of Australia, which is less fertile, more variable and drier than the European systems where currently dominant farming practices originated.

[†] For example: The *ProGraze* program provides training in pasture budgeting and adaption of grazing strategies to manipulate pasture growth; in the Grain and Graze program practices such as pasture budgeting, deferred grazing, and biodiversity management are promoted; and the Future Farms Cooperative Research Centre is investigating options for increasing perenniality within farming systems at the landscape-scale.

Aim 2: How can government assist?

Like many good ideas that already have a growing support base, HM grazing could be substantially helped along by government taking leadership. Prioritising inexpensive, flexible, low-tech solutions that are proven to work, and have important synergies with other societal goals, will be a vital first step to truly bring Australian farming systems in line with their natural environment. It is not our place, at least not in this document, to comment on the precise mechanisms that government might choose to help, but some preliminary steps are easy to take for an inquiry of this kind:

- The first vital step is to critically engage with the arguments put forward in this paper, and to recognise the fundamental difference between two different kinds of adaptive responses: those that further increase our dependence on technology to maintain control in increasingly variable times *versus* those that enhance flexibility in management options and work in tandem with the variability of the natural environment.

- If at all possible, we strongly recommend you arrange for a study tour to visit some farms grazed according to HM principles. Some of the early adopters have now practiced HM grazing for 15 years, and hearing from them first-hand what they have done, and why, will forever change your understanding of why this could be an exciting way forward for Australian farmers. Some of the best examples of HM farms are within 2-3 hours driving distance from Canberra.

More concrete measures are clearly further off, but easy to foresee.

Aim 3: Concrete measures to assist adoption

Changing from conventional management to holistic management on the ground has some start-up costs associated with it, and a number of relatively minor knowledge gaps remain to be filled.

1. Outreach activities (i.e. courses) are required to teach the principles of HM grazing. Courses on HM grazing are currently offered commercially, although it is worth noting that some Catchment Management Authorities have subsidised them in the past.

2. Infrastructure costs can be considerable, and fall into two categories. *Fencing* costs arise because rotational grazing requires the sub-division of existing paddocks into a larger number of smaller paddocks. The cost associated with additional fences is a major hurdle for farmers, even if they are eager to switch to HM grazing. *Water infrastructure* also can provide significant challenges. Livestock require access to water in every paddock, but it is neither feasible nor desirable to have dams in all paddocks. For this reason, HM farmers tend to use mobile water troughs or pipeline systems. Funding assistance has been made available in some cases to overcome constraints associated with the cost of adapting water infrastructure.

3. Research funding may be required to fill a few key knowledge gaps involved in the large-scale adoption of HM grazing.

    a. An accurate cost-benefit estimation is required for a shift from conventional to holistic grazing to occur. Present insights suggest that the short-term costs of supporting a more widespread shift towards HM grazing would greatly outweigh the long-term economic and ecological costs of not doing so (e.g. fewer farmers will require drought assistance, and the natural environment will be healthier).

    b. Modified versions of HM practices should be developed to allow breeding operations to utilise them. Those who are highly invested in genetic stock are

naturally hesitant to de-stock, and the fast rotation and/or stock movement associated with HM is also perceived to cause unacceptable levels of mis-mothering at lambing time.

Further information

Key references substantiating the views put forward here are listed below. We would be happy to share our knowledge in person, or put you in touch with other experts on the issues raised here.

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