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Constraints of Grassland Science, Pastoral Management and Policy in Northern China: Anthropological Perspectives on Degradational Narratives

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Introduction

Conventional grassland science in China is underpinned with degradation narratives on the ecological decline of Inner Mongolian steppes; regarded as a consequence of cultural practices undertaken by ethnic-"minority" mobile pastoralists. Roe (1991) argues that "development narratives" as necessary policy blueprints are created and "operationalized" into standardised practices across the board. Grassland scientists can operate within these narratives disregarding anthropogenic/cultural implications of pastoralism, the extent of human impacts on the environment, traditional pastoral practices across variables in time and space, or even the extent to which human-animal interaction has caused degradation. The issue of "degradation" (and therefore the challenge of management) in grassland science presumes a particular view of the past often based on a misreading of contemporary landscapes – by reading history backwards (Fairhead and Leach 1996; Leach and Mearns 1996; on desertification narratives see Swift 1996).

In this paper I offer a counter-narrative focussing on "post-traditional" (Eisenstadt 1973) mobile pastoralism based on two years' field experience (2002-2004 and subsequent revisits 2006, 2010) as consultant on a China-Australia grassland management project in Inner Mongolia. In my analysis I follow debates that have become prominent in the last decade, on new interdisciplinary approaches to range- or grassland ecology and the

community-based management of pastures. In the late 1990s Humphrey and Sneath drew attention to regional scenarios of adaptation among "mobile pastoralists" of inner Asia and problems of top-down policy which undermined traditional mobility/livelihoods and led to the erosion of natural/indigenous resource-base[1]. They argued that maintaining forms of mobility and concordant district-level management will continue to be important if pastoralism (as a cultural and economic practice) is to be successful and sustainable in the steppe environment (Humphrey and Sneath 1999; see also Sneath 1998).

The move towards household enclosures over the past twenty years remains a corner-stone in conventional grassland management. As framed in mainstream development discourse in China (centred on the values of modernity, rationality, and economic growth), the administration of "household enclosures" operates with analytical tools presuming stability and uniformity, which downplays the importance of ongoing, customary pastoral practices[2]. In earlier work in a north-eastern corner of Inner Mongolia, I looked at household enclosures and their impact: negative effects on the natural resource-base, widening the inequality gap and increasing intra-household conflicts over land-use (Taylor 2006)[3]. A problem was the lack of understanding or empathy by technical specialists on traditional and changing cultural practices.

In fact the traditional basic social unit among ethnic-Mongolian pastoralists was a fluid camp herding arrangement around patrilineal kinsmen. This was normally constituted by two to six households which managed their flocks/herds as a single integrated economic unit. Under collectivization, this arrangement was disrupted by massive southern Han in-

migration 1960s-1970s including neighbouring provinces such as Jilin and Liaoning, also small-trade people from other sumu in the region. However, traditional practices and the notion of maintaining the commons remained strong core values within the basic unit of pastoral production at the *aili* (the "natural" village). In Xing'an League, these villages were mostly established early- to mid-twentieth century and have remained substantially unchanged in terms of administration. Recently, since the introduction of household enclosures new social and economic tensions emerged between resource-users, even as poorer herders (with little or no livestock) seemed to begrudgingly accept their lot as their richer neighbours continue to expand enclosures. These poorer households, with little or no livestock, were often shepherds for the larger pastoralists.

In project villages all families were related through agnatic kinship or marriage with the typical village having between thirty to fifty households. In a case study at Ganggan Village, in Middle Banner[4], there were two or three influential households who controlled most decision-making. These richer households brought in wives from less prominent families and thus creating interlocking marriage ties. All villagers considered themselves a kindred network similar to all *aili* and the foundation of local cultural life and social order. *Aili* households support each other and poorer kindred, especially those without livestock, despite the recent household contracted UR system. Community/village rituals reinforce the sense of kindred ties. For instance, when a family kills a sheep, close relatives are invited to drink and eat. During New Year celebrations, when a pig is killed the feasting is shared with the entire village, with each family sending a representative to attend. Indeed, many ceremonies involve the entire village: weddings; a child's one-

month celebration; the admission of a student to university; the 49th, 61st and 73rd birthdays; funerals; post-burial rituals; and devotional and prosperity rituals to *Aobao* and various deities normally held May to August in the lunar calendar year. Through these practices of mutual benefit and collective participation, the cohesion of the community is confirmed, maintained and strengthened.

The Xiang'an League project: using policy solutions

The Inner Mongolian Grasslands Management Project (IMGMP) was first proposed by China in 1992 with the first phase running from 1996 to 2001. The national partner was the league Animal Husbandry Bureau (AHB), since amalgamated into the Agriculture and Animal Husbandry Bureau (AAHB). In the project area the priority of the bureau was to regulate and ensure compliance in its programs. It was directed at protecting through its policies what is essentially the private value of animal capital and productivity from communal grasslands. The initiative of the government within the grasslands through AAHB amplifies an obvious priority of public investment in support of ongoing private (to the detriment of communal) benefits.

The project area consisted of 59,000 sq.km covering four *sumu* ("township", or *Xian* in Chinese) in Middle Banner (Kē'ěrqìn Yòuyì Zhōng Qí) and Front Banner (Kē'ěrqìn Yòuyì Qián Qí), in Xing'an League. The area is dominated by an extensive steppe of rolling hills and valleys (approximately 57 percent). Both banners combined have around 21,666 sq. km of grasslands. This is the northern tip of the Kerquin Grasslands, which is

found on light textured, often sandy soils. The geology of the area varies from igneous rock in the higher altitude north west of Xing'an League, adjacent to the Mongolian border, to sedimentary soils in the eastern section. The majority of people in fact are Han Chinese migrants (54 per cent), beside ethnic Mongolians and other regional ethnic groups such as Daur, Oroqen, Manchu, Ewenki, Hui, Xibe, and Koreans. Ethnic Mongolians now constitute only around 18% of the total population of Inner Mongolia (about 24.7 Million persons, as at 2010).

The goal of the project, as stated in the design document, was to "improve the ongoing analysis and implementation of policies and regulations to promote sustainable, economic, utilisation of grassland resources" (China-Australia 2002: v). According to the same document, the problematic assumption underlying the project was that the effect of communal grazing and increases in numbers of livestock will, over time, lead to more severe degradation of the grasslands. Regional grassland specialists categorise degradation according to degrees of intensity: normal (potential), light, medium, heavy and even "very heavy" (i.e. dominated by annual grasses and forbs with very few perennial species, and a high level of bare soil from wind or water erosion). However, there does not appear to be a standard method to assign these categories. Grassland scientists talk about a "degradation series", supposed to show the stages of vegetation that an ecological site goes through with increasing degradation caused by livestock overgrazing. In assessing the degradation stage, sampling of vegetation is undertaken.

The project worked with the User Rights (UR) or so-called "*Two Rights One System"* policy[5], in place since the early 1980s as the "way to introduce favourable conditions for more sustainable grasslands management" (China-Australia 2002:17). A number of regulations were developed to support UR policy and further its aims, in particular relating to the transfer of UR (Order 99, n/d) and to encourage a balance between forage and animal production through the introduction of overgrazing penalties (Order 104, effective from 1 August 2000). There were also draft regulations relating to grazing fees. UR are to be allocated for an initial period of 30 years, after which time they can in theory be reallocated to take into account changes in household structure. The UR contract requires only one signature, usually by the male head of the household. UR can be passed over to the next generation through standard inheritance.

In the first phase of the project, herders were issued with UR certificates and contracts, which included a map showing the allocation. These documents provided the right to graze up to a given number of livestock units on the designated area. These maximum numbers of livestock were based on scientific calculation of Sustainable Carrying Capacity[6] (SCC, discussed later) for the allocated area. The SCC figure was also displayed on the UR certificate. Larger herders were given loans or grants to move away from the *aili* on the assumption that this would reduce grazing pressure on commons. This was not successful, as richer households took advantage of the situation, using both their new inducements and traditional rights to the commons, including hay land.

There was an attempt to monitor UR allocations and impacts since 1996 by conducting detailed baseline studies of farm production and income through a Livestock Statistics Information System (LSIS) and what was called the User Rights Information System (URIS). This was to provide a basis for assessing the effect of changes as UR were introduced. The project also collected and analysed economic information with respect to farm enterprises in each of the project *sumu*. Combined with technical information on herd/flock composition and grassland type, this information was to provide a reference-base for assessing the effectiveness of interventions to raise farm productivity. The method used in the collection of all this data in phase one, however, made these tools substantially ineffective: firstly, there was no participatory information-gathering and -sharing with farmers; secondly, relevant statistical data were sourced from local cadres and Banner Grassland Monitoring Station officials, ever keen to show increasing livestock productivity. This data was then processed by regional grassland scientists, tasked with research documentation and making recommendations to the AHB. Underpinning the whole approach was the simplistic narrative that partial privatization of the commons through the issuance of household UR would solve the problems of degradation. Indeed, to most herders in the project area, the expansion of desert was resulting from a combination of policy-driven increase in animal numbers and climate. The AAHB encouraged increase in animal production to receive financial inducements for achieving policy outcomes and inflating real numbers. The poorer Middle Banner in 2006 had set targets for a further 50% increase over a five-year period. Indeed the AAHB is torn between the expansion of livestock and protecting the grasslands. People were also aware of the problem of goats on pastures and many said that despite the good prices for

cashmere relative to wool they had to sell many of their goats for sheep in order to keep the grassland from becoming desert.

Essentially, the 1996-2001 project design (later changed because it was considered unworkable) identified that while "some progress" at privatization had taken place in the four project *sumu,* there was a problem in the "attitudes and behavior" of the herders. As simply stated by the herders, they did not want to work with an exogenous and "selfish" policy, but no one had talked with them about what they wanted to see instead. As development "psychologism" and modernization ideology it was nothing but the old "problem" of changing the "stubborn thinking" and "resistance" of pastoralists.

The second phase of the project, 2002-2006, moved further away from the technocratic approach of the first phase. The first action of the team was to rework the original project design and start immediate revisions with local stakeholders. This was to shift the focus from enforcing policy mandates to engaging with herding communities, and from reliance on outdated and dubious statistical pastoral data and equilibrium-systems management tools to starting a community-driven learning process. Although reluctantly agreeing to revisions, the Australian company in charge of the project started to feel increasingly uneasy about altering an accepted top-down design. Rigid time-lines, milestones, and cost-benefit analyses tools embedded in the project design also prevents flexibility in implementation (Taylor 1999). In the revised design, pastoralists in selected *gacha* (formal administrative villages) participated in decision-making through local workshops. The shift to a more flexible community-driven approach was eventually

accepted though time run out before the project was able to scale-up changes on the benefits of group herding arrangements.

A considerable amount of ethnographic research in the last fifteen years has shown that land privatization under UR has not worked and has failed to ensure ecological stability or improvement in livelihoods. Indeed, it has even been seen to cause increased impoverishment and environmental decline (Ho 1996; Williams 1996, 2002; Sneath 2000; Rong Ma 2003, and Li and Huntsinger 2011; Wu and Du 2008). After the disbandment of the commune system in the early 1980s livestock was privatized to villagers as new problems emerged (Wang 2007: 7). At this time around 70 percent of grazing land was leased to individual households (Suttie and Reynolds 2003: 15).

The government of the Inner Mongolia Autonomous Region issued "Relevant Regulations on Further Fulfilling and Perfecting the Two Rights and One System" to prevent overstocking by defining livestock carrying capacity (CC) and fulfilling the grassland contract responsibility system. In essence, the policy demarcates pastures, restricts free-range grazing, encourages sedentarisation and controls stocking rates[7]. The most significant change in this policy was the emphasis on ecological protection over livestock output and income growth. It also involved local governments supporting herders to build livestock sheds, fencing and improving breeds (Wu and Du 2008: 18).

The "Problem" of Environmental Degradation

The modern quandary of "degradation" is due to the restriction of pastoral movement since the 1980s, especially hurting poorer households (Humphrey and Sneath 1999: 276). As a loss of ecosystem function over a long period (Bai et al. 2008: 223), "degradation" is seen by herders as the noticeable reduction in the growth of grasses over an annual cycle; specifically reduced diversity in grass species; increase in unpalatable biomass (which is connected to overused pastures); decrease in vegetation density and distribution; reduction in water levels in rivers and the expansion of sandy areas and dunes (Humphrey and Sneath 1999:48). Most commonly degradation is defined by vegetation indicators, though Behnke and Scoones (1993: 24) suggested an expanded definition to include a diverse mix of biological and physical measures such as changes in soil, vegetation, livestock conditions and output.

At the IMGMP, in order to make estimations of SCC across the whole project area scientists used a Stocking Rate Standard (SRS) model. The "one size fits all" SRS model assumes both temporal and spatial homogeneity. Henceforth in the project herders also became the active "instigators" of degradation. Appropriate stocking rates are related to the management system, though in non-equilibrium systems SCC and the maintenance of a steady balance between livestock numbers and available feed are the favored objectives for resource-users. Instead, it is best to incorporate more flexible and short-term responses to environmental dissimilarity based on local conditions, niche resources and allowance for (culturally preferred) swift adjustments to livestock numbers. This means

rethinking normative degradational narratives towards increased decentralization of grassland management under community-level responsibility (Ribot in Wang 2007: 2).

In late 2005 new regulations allowed local authorities to control stocking rate though according to a much debated animal-feed balance approach and the imposition of fines for overstocking. At 55 *aili* in the Middle Banner, reviewed earlier in 2000, some 89% exceeded their notional SCC, in some case by over 500% (IMGMP 2006*)*. Thus such external policing of animal numbers is problematic and certainly difficult to enforce (Banks 2001)[8], aside from herder resistance and the lack of capacity by banner Grassland Monitoring Stations. Although pastoralists wanted customary management this necessitates multi-stakeholder dialogue and feed-back into regional policy frameworks.

In 2000-2005, experts from the Inner Mongolia Agricultural University and North America (Canada-China Sustainable Agriculture Development Project) worked on establishing a "Framework for a Range Condition and Stocking Rate" (Houston et al. 2004). The framework was to quantitatively assess the impact of grazing on the grasslands for the purpose of recommending appropriate stocking levels. A stocking rate[9] guide was to be created that standardizes categorization of grassland conditions. Ecological sites were established that included information on dominant plant species, important land characteristics, soil types, soil moisture regime and potential plant communities. Vegetation was then collected to determine the percent by weight of increasers and decreasers of grasses, sedges, shrubs, and annuals. Thereafter,

approximate stocking rates were to be determined by season and level of site degradation. However, it needed to take into consideration the need to regularly assess climatic variability and changes in grassland condition. It also raised more questions than it answered. It was never adopted by managing agencies and it never engaged herders in their own vernacular/cultural understandings of ecology and livestock management.

In IMGMP there was clearly environmental decline through pressure on the natural resource-base and corresponding low productivity. However, land degradation was clearly contested by the various resource users (see also Ho 2001; Miller 1999). As expected, smaller pastoralists tended to blame state policies which did not seem to work in their interests. Permanent degradation due to overgrazing was not common, as Behnke and Scoones (1993) also noted earlier in their African research, and where it did occur it was more than likely due to state interventions such as fencing (Williams 2002; Taylor 2006).

Historically, the degradation problem in Inner Mongolia starts in the late 1950s as livestock numbers increase despite the "grain-first" campaign until 1980. However, the extent of this increase is contested (Ma and Li 1993; Ho 2003: 48-49). The reason for this was the emphasis on increasing resource exploitation and need to meet food needs of an increasing population. In the 1980s policy continued to emphasise increased production exacerbating existing "grasslands-livestock" imbalances and skewing of resource benefits to larger better-connected herders. Wu and Du (2008) noted in central Xilingol League[10] that this policy peaked in 1996 when the livestock numbers reached 10 million. The

writers, along with many critical scholars, show how state policy ignored grassland sustainability leading to widespread degradation, loss of productivity, and overall herders' income. *They suggest simply doing away with fences and the household enclosures altogether*. Similarly, in this exemplary pastoral league, Wen *et al*. (2007) showed negative returns through privatisation. Most state livestock plans now stress feedlot systems, aside from seasonal grazing restrictions, as an attempt at reducing grazing pressure and restoring pasture productivity (Waldron *et al*. 2008: 4). The increase in grain production since 1979 and irrigation needs which drew heavily on groundwater supplies also affected grassland productivity. The soils in this region are in any case always short of water with high soil evaporation and plant transpiration (Ren *et al*. 2011).

Assessing Policy from the culture of the grassroots

At the core of my argument is that existing grassland policies have not been shown to work and need to include processes that give the herding community a central role. The root of the problem in trying to ensure sustainable grassland management is a lack of interdisciplinary know-how and weak multi-stakeholder participation. The "new grassland ecology", which seems to be understood by pastoralists, emphasises "movement" and flow, anthropogenic and climate considerations. These challenge conventional static notions of carrying capacity and climax vegetation (Scoones 1999).

Notions of "overgrazing" derived from a particular model of ecology can become wrapped up in the representation of particular groups of people, who are then seen as one with the causes of environmental degradation. As mentioned above, the early project thus focussed on changing herder "attitudes" and "behaviour". However, ethnic Mongolian herders transform the landscape as a lived space based on knowledge of immediate experience, as specific dwelling practices. In planning interventions in the landscape, it is necessary to privilege the understanding that these pastoralists derive from their "lived worlds" (Ingold 1993: 152). The cultural filters through which local actors ("dwellers") perceive nature and the landscape has important consequences in the way both insiders/dwellers and outsiders *act* in this landscape (Hong 2005; Humphrey and Sneath 1996). It is also necessary to appreciate the limits of scientific prediction, management and control with regard to the complexity and uncertainty of socio-ecological systems (Scoones 1999: 490).

Many herders in fact blamed policy interventions for the perceived decline in natural resources, the loss of traditional grazing practices, and the overall erosion of culture. On the other hand, many others agreed that, given their now largely sedentary life, state-supported protection of above-ground biomass and grassland improvement is necessary. Even in this case though, herders felt that management interventions must be undertaken on *their* cultural terms and frames of reference – not that of outsiders. Although traditional grazing practices have changed due to many factors, cultures adapt while solutions to identified problems need to come from the village/grasslands. Notions of what is "best [possible] practice" management must be established in the grasslands with

pastoralists, not in the research centres. It is the herders who know "best" about their local situation from an "education of attention" (Ingold 1993: 153), but this needs to be a learning involving all relevant stakeholders for it to be institutionalised.

Some Grassland User Right (UR) Issues

As mentioned earlier, in the original project design it had proposed "changing attitudes and behaviours" of herders. At the same time, there were doubts, at project management level, as to whether the regulations could be implemented, particularly those relating to overgrazing penalties to achieve reductions in livestock numbers. Grazing fees, which seemed easier to implement, proved impossible to collect in the *gacha*.

In 2002 revisions were made to the original design and included reflection/learning workshops involving mid-level institutions (sumu, banner and regional) and local-level stakeholders (male and female pastoralists and local cadres). These early consultations on UR raised questions concerning access and equity; animal and human population dynamics; intensification and pressure on grazing and natural resource decline. UR policy/privatisation does not lead to reduced grazing pressure. The current, wide-scale re-allocation of pastures to individual households has in fact brought serious land degradation as a consequence of limiting livestock movement. Based on the premise that the grasslands are misused and wasted and that reform is needed to ensure more effective rational use of pastures (Bauer 2005: 61), practitioners have often worked with existing

policy to tackle the *symptoms* rather than the *causes* of land degradation and lower productivity (Squires et al. 2010).

Since the beginning of the project, degradational narratives were generated as institutionalized "truths" (Foucault 1991), drawn from power and based on the application of a supposedly universal science. For example, boundaries between UR household allocations in order to establish exclusion areas and determine processes for monitoring of pasture status, were defined using GIS imagery, in complete disregard of available and well tested participatory tools (see Hessel et al. 2009; Chambers 2006). Technique such as "participatory land-use planning" and indigenous mapping of pastures, with maps based on transects and participatory meetings with herders at the *aili/gacha* level were introduced during the revision, as part of the new community-centered approach. However, this more time-consuming approach to establishing UR was not favoured by the project managers and state agencies as it uncovered serious boundary problems and communal conflicts.

UR therefore requires a flexible and localised approach, combined with community-development (CD) aimed at identifying regular and accessible markets and moving towards greater group-based reliance. Without a CD process, local elites and power interests are likely to ride the policy to their own advantage as in the case of the project. At many project *gacha*, wealthier herders would either ignore policy directives where that did not suit their own interests, or interpret them in convenient ways, as in the case of overriding grazing bans, or manipulating use-right leases (issued in 1996) based on the

ratio of household-animal numbers (Taylor 2006: 376). These phenomena need serious analysis as they negate the intent of government policy to tackle the integrated and complex causes of land degradation. In terms of UR certification, the earlier phase of the project included no consideration for ensuring women's access rights (women in their agnatic natal households and as wives in their husband's household).

Indeed, in the IMGMP *gacha* many poorer female-headed households were excluded from formal UR working-group meetings and other sources of information. Incidence of TB was particularly high in poorer *aili* and families unable to buy medicines. In a number of households women carried much of the burden and were left responsible for all herding activities. In most villages, women seldom attend formal meetings or ceremonies, lack information other than what they are told from their husbands and lack control over money. Busy with household chores (cooking, feeding pigs, tending home gardens, and generally looking after the family) women said that they rarely had time to socialise among themselves: "we women are too busy... men attend family ceremonies and go there to talk. We are busy in the daytime with our work, so we don't visit each other. There is no ending of work, so we have no time".[11]

A more critical position is needed to understand the social, economic, and ecological impact of enclosures in (dryland) non-equilibrium contexts[12]. The state's problem-solving was on technicalities such as animal/feed ratios, the introduction of exotic breeds (for example the Merino sheep, for wool production, although the herders prefer the more

resilient and tasty Mongolian Fat Tail); all-year-round enclosures (leading to deteriorated animal health, as in increased contagious respiratory diseases, also relating to poor nutrition and poor management of housed animals); deferred spring grazing regime (two-three months, April-June); silage maize cultivars and leguminous Alfalfa (although it was later acknowledged that Alfalfa is a difficult plant to establish due to alkali soils). The exemplary use of model-herding practices and showcase research stations (out of the reach of poor producers) was reconsidered in the post-2002 revisions of IMGMP. Instead, farmer field schools (FFS) were established at *gacha*-level, in the attempt to get closer to the herders and make use of existing local ecological knowledge/s. Participatory Rural Appraisal (PRA) methods were used for the first time in the league in 2002 to generate shared knowledge on environment and management and needs to be pursued in further work in the region.

Solving the Problem through "Engineering" the Grasslands

The management of the grasslands is seen by the state as an "engineering" concern needing grassland "protection" (perimeter fencing) and "construction" (planting Alfalfa and Poplar trees)[13]. There was a sense of urgency in attempting to fix the problem in the eastern Inner Mongolian steppes before the Beijing Olympic Games in 2008 given the distant drift of fine sand particles across the Chinese metropolis. The attitude towards planned material transformation and domestication of nature, land reclamation and the ordering of social arrangements has its modern antecedents under Mao's revolution (see

Shapiro 2001). In scientific fervour, the "Grasslands Ecological, Environmental Protection and Development Plan of China 2001-2010" suggested fixing the problem of desertification with a "combination of new biological, engineering and agricultural methods".

The grassland scientific community in China unanimously concur on the actual causes and the possible solutions to this environmental problem: too many grazing animals and the need for reduced stocking. However, pastoralists believe that the most critical considerations are *seasonal variations in forage production*, biomass availability and temporality. Despite widespread concerns for a "degradation problem" surprisingly little attention has been given to cultural practices and human motivations of grassland inhabitants. There is now overwhelming evidence that the *commons*, far from being free-for-all, are cared for under well-understood community access and management rules[14]. In regard to pastoral systems, common resources can be managed sustainably where there are few marked social differentiations among groups; similar production regimes; recognition of shared benefits from group membership; and where rules controlling resource use are effectively enforced by the herding group/s.[15] Recent socio-ecological research in Inner Mongolia (see for instance Ho 2001, Williams 2002, Taylor 2006, and Banks 2003) has shown that, contrary to Hardin's (1968) simplistic "tragedy of the commons" argument[16], individual enclosures and the household responsibility system since 1983 have not (*ipso facto*) improved either ecological stability or quality of livelihoods.

In the project, private enclosures were not always the preferred option for herders, *except outside richer tenant herders*. In terms of rationalisation and economies of scale, many expressed interest in small rotational group herding arrangements. A similar result was also recorded by research in north-western China, showing that grassland contracts under "group tenure" are more appropriate socially (as in the reluctance to subdivide pastures for fear of household conflicts), environmentally (as in given the seasonal patchy resources), and economically (as in achieving essential economies of scale) (Banks 2001; Banks et al 2003).

Local households' understood the notion of "group" as based on extended kinship[17]. It is also important in arid and semi-arid ecosystems to ensure social safeguards through secure access to pastures for poorer herders and new herding households. Community-based management allows for greater flexibility and mobility, an important factor when operating in conditions of great variability. Nevertheless, community-based management is not entirely supported by the current legal/regulatory framework which stresses tenured household enclosures. Communities are also reliant on regional and state mechanisms in matters such as conflict resolution and the regulation of stocking rates through the AAHB. Participatory workshops with pastoralists in semi-desertified Kerquin grasslands indicated a preference for: (1) no fences or household allocations (the cause of much antagonism among households); and (2) rotational groups of four to ten agnatic households using limit-range transhumant seasonal grazing regimen. This system facilitates joint use of pasture and equitable access to resources, especially marginal and

seasonally patchy resources that would otherwise not be easily subdivided between households (in more densely populated semi-pastoral areas this is particularly important).

Thinking New Ecology in the Grasslands

It is clear that science should be partnered with local agro-ecological knowledge. The various league and banner level arms of AAHB conducted limited assessments of above-ground biomass productivity to estimate the maximum tonnage of grassland primary productivity that can be grazed sustainably (SCC of an area). The notion of a definitive SCC embodying land productivity and climate variations at a particular grazing site is fundamental to conventional grassland science.

SCC is expressed as the highest number of animals that an area could sustainably support with estimates based on assumptions about the impact of livestock on plants and plant succession[18]. Still seen as an important management tool in fighting resource degradation, SCC assumes a direct correlation between number of animals and grazing area and that the herder has full control of the grazing rights. This is hardly useful in any case for herders grazing commons (Hocking and Mattick 1993). In African work Abel and Blaikie (1990) proposed a "tracking strategy" for stocking rates as an alternative to the CC concept following variation in rainfall, thereby optimising resource use. Abel (in Hocking and Mattick 1993: 18) noted the importance of consulting resource-users who

have greater technical knowledge of their own production environment than that of the scientist.

So how practical and relevant is SCC in Inner Mongolia? An Australian farm-management specialist working with IMGMP indicated that the problem of overstocking and consequent degradation can be solved if 500 kg of dry matter (DM) per hectare is left as groundcover (factoring in assumptions about rainfall and SCC). A simple enough statement – but much harder to interpret in a meaningful way in the field, where different human actors have their own understanding of what defines degradation and sustainable resource use. SCC assumes that the conditions for plant growth remain the same and its assumptions are based on one category of livestock being kept in a definite area (excluding important niche resources), under one modality of management. Pastoralists, on the other hand, focus on the consideration of spatial and temporal variability, including maintenance of *locally*-defined stocking rates on common pastures (though well below a highly variable ecological SCC).

The notion of the superiority of science over vernacular/endogenous knowledge (Howes and Chambers 1979; Agrawal 1995) dominates the debate on pasture management (Hesse 1978). In Inner Mongolia, the technical setting of stocking rates relies on long-term stocking-rate records combined with monitoring information (this was the function of the AAHB Grassland Monitoring Stations). When long-term stocking rate records are not available, measuring the annual forage yield in the area being grazed is considered the best alternative. However, as forage yield varies from year to year, measurement is best over a number of years to give a long-term stocking rate.

Annual forage yields were measured by clipping the forage in late summer using a series of representative quadrats in the management unit. The clipped material was then air-dried and weighed, and the weights then averaged over the number of quadrats measured. The average weight was expressed as kilograms of dry forage per mu (Houston et al. 2004: 19). So for instance a stocking rate may be expressed as 6.8 (warm season), 15.9 (cold season), and throughout the year 22.8 mu/sheep unit[19].The notion of CC constitutes the foundation of conventional grassland science and sees successive changes in plant species composition and how this is affected by particular stocking rates on pastures. It has been suggested that Inner Mongolian grasslands have a theoretical stocking capacity (per million livestock units) of 23.82, though the actual stocking capacity as a percentage of the theoretical stocking capacity is a massive 330 (Lu in Waldron et al. 2008).

In New Ecology, rather than succession, more complex species, animal and human (social and cultural) interactions take place as an *interdependent system*. This necessitates a more holistic, multidisciplinary approach to grassland management. Therefore, to be useful, SCC must be related to real production objectives, which determine the particular plane of nutrition (de Vries and Djitèye in Hocking and Mattick 1993: 10). For that reason alone, and the over-emphasis on DM intake and seasonal and annual production of above-ground biomass, new ecologists argue that aside from Total Dry Matter (TDM) it should also be linked to crude protein content (=Nitrogen x 6.5), and energy and mineral levels in the TDM. Hocking and Mattick (1993) also explain that the nutritive values of

grasses change throughout the growing season, with Nitrogen levels, digestibility, declining steadily after ear emergence.

Nomadic "post-traditional" pastoral regimes need flexible pasture arrangements allowing for continuance of social norms such as reciprocity. These may at times put pressure on a group's grazing resource and local management and monitoring of common resources. Such a management system needs to be able to regulate the use of niche resources in relation to stocking rates, seasonal primary production levels (most severe on "cold season" grasslands and throughout the region spring-autumn pastures), with an *agreed basis* for the implementation of UR. This is more likely to be sustainable and culturally accepted than policing grazing restrictions and de-stocking based on externally derived SCC.

The issuance of household UR and fences in the early project had negative impact on herd mobility/productivity. Herds/flocks respond well to ecological heterogeneity. Similarly, having a variety of species in a given zone makes best use of these ecosystems. Management strategies should incorporate limited seasonal animal movement to make use of the best green matter in a given season or year. As a pragmatic stance of maximizing feeding quality, some degree of livestock movement is needed. Herders consider landscape variability (especially the presence of green matter and the nature of the soil) important for production and, while grass is in a Levi-Straussian sense (1996 [1962]) "good to think" (as in symbolic systems of collective meaning and identity), for

livestock it is certainly “good to eat”. Indeed, animals need shelter from wind, moisture, feed, shade, and exposure to a variety of seasonal forage, in different amounts at different times of the year (Williams 2002: 181). This is an effective response to the uncertainties of a harsh natural environment and improves land productivity.

The UR system should consider that common resources are not dependent on individual households alone, but group/community decisions; the grassland is a community asset. In the project area, aside from individual households with allocated enclosures, SCC was not able to consider who the effective decision makers are as decisions were often made outside the local herding community. Another concern was that while the project had to show how to make UR policy work, most of the grassland (97%) had already been allocated some years earlier in ad-hoc fashion based on hasty allocations and unclear boundaries. UR certificates were distributed to households without clear boundaries; there was little if any community consultation or use of vernacular maps; inadequately trained officials from the AAHB and *Sumu* and political pressure from the League Government. As a consequence many household and wider community conflicts emerged. As noted earlier, allocations were based on household-livestock numbers (nominally 6: 4) though often “massaged” at the local level to favour elites. This situation in Xing’an League, contrasts with the first introduction of UR in neighbouring Xilingol League, where land was distributed solely on the number of household members.

But, as the project managers found out, family composition (and animal numbers) change over time and conflicts erupted as the result of intensification on UR grasslands and

resultant land fragmentation. In virilocal residence, sons eventually want to establish their own new nuclear households requiring separate allocations within existing parental household UR allocations. UR was allocated to households on conditions at the time of issuance. It is important to determine how land tenure arrangements are contributing to increasing fragmentation and changing land use patterns and how to integrate this knowledge into better policy application.

The model CC used in the project comes from countries under high-rainfall perennial pastures and capital-intensive management (see Dijkman 1999). Indeed, CC is based on single livestock species, extensive systems of fencing and based on the maximisation of production gains per head/per unit of labour. In eastern Inner Mongolia, pastoralists often run mixed species herds, whose production outcomes are directed towards human and animal survival, milk, wool, capital accumulation and risk aversion. Pastoralists living in non-equilibrium ecosystems need CC estimates that accordingly make use of flexible and opportunistic arrangements. Reducing stocking rates is at odds with herders' objectives as this importantly means reduced productivity per/Ha. Pasture degradation has as much to do with unworkable policies, agro-pastoral practices and restricted mobility as stocking rates *per se*.

Are there evidence-based alternatives to conventional "equilibrium" grassland management? In non-equilibrium dynamics stochastic variation is a significant factor, while plant biomass is regulated by *abiotic* determinants such as temperature, rainfall and

wind (Behnke and Scoones 1993; Fernandez-Gimenez and Allen-Diaz 1999). Indeed, vegetation dynamics in the arid steppes is clearly under the control of climate rather than grazing pressure. Recent work in Northwest Tibet showed that rather than a system of rigid stocking rates, "opportunistic" strategies adapted to annual variable vegetation production were preferred (Tsechoe Dorji *et al.* 2010). In the project alternative group management with greater mobility/flexibility started to emerge between the constraints of policy in response to unpredictable climate (see also Da in Wang 2007: 1). In one Middle Banner *aili* pastoralists noted that the height of grass in the 1960s was 100cm, but now only 16-20cm and said this was due to both climate change and state fencing policies. These herders said that a solution to grazing pressures and severe loss of biomass was in a seasonal rotational system *without fences* managed by agnates in the *gacha* (2-4 *aili*) under community rules. Indeed, often small group herding may be the only viable option given patchy, poor quality biomass, and limited water sources. In these resource-scarce situations fencing exacerbated household conflicts.

As an example of one village in the project area, the contracted household UR system came into effect in 1988. The UR allocation implies rights to graze a proportion of the total community herd and also a share in hay land for spring and winter fodder. Adjustments were made for hay land 1983 to 1988 corresponding to changes in both the number of people and livestock (ratio of 7:3). The village also divided the grazing pasture among households using the same formal criteria with the stipulation this was to remain unchanged for 30 years, regardless of changes to human/ livestock numbers. However, regardless, the community continued to graze their animals freely according to informal

rules. In the view of villagers, the pasture belongs to the community under specific local rules, as in the case of cattle dividing all the animals in the village into groups to graze in different areas to avoid overgrazing, trampling and erosion. Every spring, households would send a member to attend meetings to discuss grazing allocations, rotation and direction in the coming year. Despite new UR regulations, it was usual for these inter-household kindred to graze animals in the same site or direction for convenience and monitor each other thus avoiding any need for external policing.

Conclusion

Imposing SCC has a high cost of enforcement and an increasingly questionable technical validity in temperate dryland systems. As well, household fences, which were well funded by banner governments from 2002 onwards, are now often despised by small herders as they are seen to create more problems than they set out to solve. Ultimately, the paper argues, grassland management should be as much a *community responsibility* as local government entailing a radical shift in the "household responsibility" system. The effort at introducing a new participatory CD process, involving the identification of all stakeholders, conducting reflection workshops, PRAs and the like, is only the beginning of work that needs consistent and dedicated attention from funders. Indeed, the degradation "problem" is not necessarily one for science alone to answer, or external technical fixes, but involves first and foremost anthropogenic considerations: It is about people, local herding traditions and changing cultural practices under increasing resource

constraints. Conversations must involve *gacha/aili* level social (herding) groups, such as extended agnates, local cadres, and even the increasingly marginalised, poor non-herding households. Finally, there needs to be a rational compromise between SCC estimates made by outsiders and *local definitions*. If not, there will be no longer-term and community-agreed responsibility and commitment to the management and monitoring of grassland resources.

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[1] See Franchetti (2008) on the proto-historical importance of mobility among regional pastoralists.

[2] Some scholars prefer the term "semi-private property rights", first initiated on Xilingol League which has the largest area of pastures in China. See for instance Wen Jun Li, Saleem H Ali, and Qian Zhang 2007. These authors, like so many scholars in the past decade, argue for a community-based contract system.

[3] Pseudonym for project in the article was "Anxin" because of commercial-in-confidence rule at the time of writing; but in fact it was the now "completed" China-Australia "Inner Mongolia Grassland Management Project: Phase II", based at the city of Ulanhot, Xing'an League , Inner Mongolia.

[4] I am grateful to Professor Zhu Xaoyang (Institute of Sociology and Anthropology, Peking University) for assisting in the 2004 ethnographic surveys.

[5] User Rights/UR, or so-called "Two Rights – One System" means two rights (rights of ownership held by both state and/or collective; in the case of IMAR this is only at the collective or administrative village level, and actual use-rights). The "one system" means household contracting obligations; otherwise known as "contracting-out", a means of semi-privatisation. UR was adapted from the late 1970s "household responsibility system" on arable land to pastoral systems introduced in 1983 to Inner Mongolia though refined in 1997. The "UR household contracting system" comes from the 1985 China's Grassland Law. It involves issuing 30-year user-certificates on reallocated pastures in accordance with China's emphasis on encouraging household production incentives.

[6] SCC/ha = net supply/intake per Livestock Unit – based on total herbaceous forage productivity (as total dry matter TDM). It is assumed that livestock require a daily DM intake equivalent to 2.5% to 3.0% of their bodyweight.
[7] Stocking rate is the number of animal units on a certain area for a specified time period (Society for Range Management 1998).
[8] Banks suggests that under communal group land-tenure (*res communis*) a common boundary is best whereby everyone in a social contract can contribute to "policing" regulations.
[9] The method for estimating stocking rates from forage yield is given by the "Standard of Suitable Stocking Capacity of Natural Grassland" (Measurement and Standard Bureau of Inner Mongolia 1990).
[10] The first league in Inner Mongolia to introduce the household contract/user rights system in 1984.
[11] Interview conducted in 2004 with 46 year old Mrs Bai Lianhua, wife of the Party Secretary of Manglai Gacha, Middle Banner.
[12] See for instance May (1989).
[13] For a discussion on the negative impacts of ecological "construction" policy see Hong Jiang (2006).
[14] In other words, understanding natural resources as "Common Pool Resource", as earlier argued by political economist Elinor Ostrom (2002) among others; see also Gardner et al. 1990.
[15] Agrawal (2001) suggests the need for a more systematic and integrated understanding of the various factors relevant in the sustainability of the commons.
[16] Hardin's argument in practice has not been shown to ensure sustainability or the prevention of a "tragedy"; instead self-organising and self-governing commons' systems have been shown to work well (de Young 1999). For a useful discussion in relation to pastoralists see Williams (2002:74-77), also Scoones (1996) and Bromley and Cernea (1989).
[17] Zukosky, in his work with the Altai Kazakhs, talks about "tribal" sentiment (2008: 49).
[18] As an example of this science-based analysis based on remote sensing data (normalized difference vegetation index [NDVI]) and attitudes to anthropogenic causation for degradation, see Kensuke Kawamura et al. 2003, and Liang E.Y. et al. 2005.
[19] 1 hectare = 15 mu.

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