LAND TENURE AND SUSTAINABLE AGRICULTURE IN MARGINAL ENVIRONMENTS:

THE CASE OF WESTERN CHINA

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ABSTRACT

Within new institutional economics and resource economics, clearly defined [individual] private property rights are widely regarded as the most efficient type of land tenure institution. China has moved half-way towards the establishment of such institutions in its extensive pastoral sector since the post-1978 economic reforms. However, resource degradation has emerged as a significant problem in this sector. Based on county-level fieldwork, this paper specifies the types of land tenure institutions in existence and relates these to observed economic and environmental outcomes. It is concluded that whilst resource degradation can in part be attributed to ill-defined property rights in land, it is not self-evident, given the nature of the resource configuration and existing cultural endowments, that a further shift towards [individual] private property rights will result in superior outcomes.

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1. INTRODUCTION

This paper is about the relationship between land tenure and resource management in marginal environments of developing countries. Marginal environments are characterised by rain-fed agriculture on mainly undulating lands, and are found in the hinterlands, mountains, hills and wetlands of developing countries, including in the semi-arid, sub-humid and humid tropical zone. Unlike the monocrop Green Revolution agriculture found on well-watered fertile plains, agriculture in marginal environments tends to be complex, diverse and risk-prone (CDR). CDR agriculture supports the livelihoods of as many as 1.4 billion people globally.

This paper focuses on the extensive pastoral sector of Xinjiang Uygur Autonomous Region of China. Xinjiang is semi-arid and subject to extremely hot temperatures in summer and extremely cold temperatures in winter. Three large mountain ranges (two with peaks over 7,000 metres) and two large desert basins are the main geographical features of the autonomous region. There is irrigated cropland agriculture on the edges of the basins and mountains, but the herding of animals on natural pasture lands constitutes the predominant land use. Pastoral farming is characterised by transhumance, with many herders travelling more than 150 kilometres each year between winter bases and high summer pastures. Fieldwork for this paper was undertaken in Urumqi, Xinjiang's capital, and Altay Prefecture, in the extreme north of Xinjiang, in late 1996.

Land tenure in Xinjiang's extensive pastoral sector has been undergoing gradual transformation since 1985. There is widespread perception among officials and academics that land degradation due to overgrazing has worsened during this period. This paper examines the land tenure dimension of land degradation problems in Xinjiang. After briefly reviewing theories relating resource tenure to sustainable resource management (Section 2), it outlines the grassland resources of Xinjiang and their utilisation (Section 3), and explores the land tenure dimension of degradation problems (Section 4). Summary and conclusions are drawn in Section 5.

2. LAND TENURE AND SUSTAINABLE AGRICULTURE:

2.1 Definitions, concepts and relationships

Land tenure refers to property rights pertaining to land. Land tenure does not relate to the relationship between people and land but, rather, '*to the sanctioned behavioural relations among people that arise from the existence of land and pertains to its use*' (adapted from Furubotn and Pejovich, 1972:1139, emphasis original). Three aspects of property rights in land are commonly distinguished: the right to use land; the right to obtain income from land and to contract the terms of its use with other parties; and the right to alienate land (Barzel, 1989:2; Eggertsson 1990:34).

There are four broad types of property rights regimes: private, state, common and open-access or 'non-property'. Since traditionally common property and open access were regarded as being the same, it is important to clarify the distinction between them. Common property regimes (CPRs) refers to situations in which a well-defined

group of people manage and use a well-defined resource and have rules governing members use of the resource, and rules for changing the use rules. Open access or 'non property' refers to the case where there are neither: ie. there is not an exclusive group of users and there are no rules governing individuals use of the resource (Bromley, 1989b:870-871; Stevenson, 1991:3). Common and state property regimes may entail individual use rights. What distinguishes one type of property rights regime from another is the *scope* of the primary decision making unit, whether this be the individual, community or state (Ciriacy-Wantrup and Bishop, 1975; Wade, 1987). It is also important to define *commune* and *common property regime*, as used in this paper. Commune refers to the large, highly centralised and state-run type of collective institution that constituted the organisational basis for Chinese agriculture from 1958 until the early 1980's. Common property regime, on the other hand, refers to largely endogenously evolved types of collective institutions.

Property rights over land are not synonomous with legal property rights, because law is not unified, rationale, consistent and all-encompassing of social and economic behaviour. In reality there are:

> inconsistencies and uncertainties embodied by the law itself; a plurality of 'legitimate' claims to, and interests in, property; and a plurality of ordering mechanisms which are capable of generating rules and inducing compliance, thus establishing 'property' (Razzaz, 1993:341-342).

Thus policy implementors may have considerable scope in interpreting and implementing (or otherwise) laws and regulations pertaining to land, and thus establishing 'property'. Rights that are not implemented or enforced constitute no rights at all (Randall, 1980:157-158).

Furthermore, property rights encompass not just those ordained and enforced by formal laws and regulations, but also the social conventions and 'explicit' and 'implicit' contracts between individuals and groups. A *social convention* can be defined as a behavioural 'norm' to which everyone expects everyone else to conform, and to which everyone prefers to conform on the condition that others will also conform. The breaking of social conventions can result in social ostracism. An *explicit contract* is an overt agreement between agents, and an *implicit contract* is a tacit, unwritten agreement between agents. Because land tenure is embedded in social and cultural practices and norms, it can be referred to as a social institution.

Property can be construed as a 'bundle' of rights, and its correlate, duties (Bromley, 1991). In the case of private property, for example, one party may possess surface rights but not mineral rights, or rights of transit over land owned by another party. Customary land tenure institutions frequently involve complex bundles of overlapping and differentiated property rights. Behnke (1994:12-13) concludes, with respect to customary institutions in pastoral Africa, that:

> any defined area is likely to be used by a myriad of different ownership groups of variable size and composition, with overlapping claims to territory derived from particular claims to different categories of resources within it.

Thus the case of a neat territorial package, owned and used exclusively by one distinct party, is the exception rather than the norm in pastoral Africa.

There are two major strands in the literature that link land tenure to land degradation (Wachter, 1992:4). The first is the *agrarian structure approach*, which is concerned with how farm size and land distribution influence the way that land is used. For example, the concentration of land ownership in fertile lands is often associated with the displacement of poorer farmers to more ecologically marginal lands. The second, which is the focus of this paper, is the *land tenure insecurity approach*. This approach postulates that land tenure insecurity will:

1. create incentives for farmers to over-utilise resources;
2. deter farmer investment in land conservation and/or improvements, and;
3. deprive them of the means to invest in land, as secure land rights may be used as collateral to raise credit

There are three major theories concerning the relationship between different types of property rights regimes, tenure security and land degradation: the 'Tragedy of the Commons', the 'Property Rights School' and the 'Assurance Problem'. These theoretical approaches, as well as their policy implications and consequences, are briefly outlined below

2.2 The Tragedy of the Commons

This theory is associated with Hardin's 1968 paper, 'The Tragedy of the Commons'. Hardin described a situation where the resource base (grassland) was owned communally but livestock were owned by individual herders. Because the marginal benefit to a herder of stocking the grassland with an extra animal unit would accrue to him or her, but the marginal cost (in terms of loss in resource productivity) was borne by everyone, there would be a tendency for herders to continually increase their herds out of rational self-interest, with the consequence of grassland degradation and rent dissipation. Thus in Hardin's analysis, communally owned resources are invariably over-exploited and major policy implication is the need to privatise such resources.

The real tragedy in Hardin's analysis was the way that he equated communally owned resources with open access. The situation he described, one of individual users independently competing for a non-exclusive resource, was open access (or non-property). However, in the case of African pastures and, indeed, many communally held resources, resource use has traditionally been regulated by common property regimes and resource degradation isn't an invariable outcome (Ostrom, 1990; Stevenson, 1991). Despite its fundamental flaws, 'The Tragedy of the Commons' has been influential and has provided the theoretical underpinnings for grassland privatisation in Africa, the consequences of which will be discussed shortly.

2.3 The Property Rights School

The conceptual foundations of the Property Rights School (PRS) were laid by, among others, Coase (1960), Demsetz (1967), Furubotn and Pejovich (1972), Demsetz and Alchian (1973) and Posner (1977). According to the PRS, what precipitates institutional change is changing land and economic values caused by increasing population pressure on limited land resources, or the development of new technologies or markets. Existing property rights will be poorly attuned to deal with the new situation, and land tenure uncertainty and externalities in the form of resource

degradation can arise. Over time, a new system of property rights that can internalise these externalities will develop. If and when it does depends on the marginal costs and benefits of moving from one set of property rights to another. The PRS approach has been used to explain the evolution of private property in the North American West (Anderson and Hill, 1975). Population pressure and commercialisation increased the benefits of exclusion, whilst the introduction of barbed wire reduced the cost of exclusion, inducing the shift from an open access to private property rights regime.

The PRS predicts an invariable shift in property rights towards individualised land tenure and interprets this as a furtherance of economic efficiency (including its sustainability dimension). The institution of individual private property rights is at the end of the linear path of institutional change set out by the PRS and is often treated as being synonomous with the set of non-attentuated property rights that are required to ensure Pareto-efficiency. A set of non-attentuated property rights is (Posner, 1977:10-13, Randall, 1980:157-158):

1. completely specified (ie. embodies perfect information about that rights that accompany ownership).
2. exclusive (to ensure that users have the incentive to maximise the value of the land)
3. transferable (to ensure that resources gravitate towards their highest-value use), and;
4. enforceable and enforced (to ensure that they are actually established).

If one examines the empirical evidence, there has been, as the PRS predicts, a widespread tendency for rights in land to advance towards more individualised forms of tenure in response to increasing population pressures and changing economic circumstances. This can be seen within the context of still-existing common property regimes, as well as in the demise of common property regimes and the advance of private property.

Yet, especially in the case of marginal environments, the relationship between private property, land tenure security and land degradation is not so clear. The formal privatization of resources has frequently been associated with averse distributional and environmental consequences. The distributional consequences arise in part because of weaknessess of government administration and legal systems in LDCs, including the lack of a public service tradition, strong influence of patron-client networks, and sparse public funding (Wachter, 1992:78-82; Atwood, 1990). Coupled with differences between rural households in terms of wealth, education and accessibility to government administration, this has meant that formal government land registration and titling programmes have often had the effect of increasing the land tenure security of some, but increasing the land tenure insecurity for the many less influential right holders (Lane and Moorehead, 1994:126-127; Wachter, 1992:80-81; Platteau, 1995:10-16).

Recent research from Inner Mongolia highlights the tendency for influential households to enclose pastoral lands first (and more so than they are legally entitled to). Futhermore, the households treat their enclosed pasture as a contingency reserve and continue to graze their livestock on the common property grasslands, thus exacerbating degradation problems outside of the enclosed areas (Williams, 1996). Exactly the same patterns and problems have emerged in parts of pastoral Africa (Lane

and Moorehead, 1994:127) and, in light of this, the greater observed demand by poor rather than rich households for the maintenance of common property is understandable (Platteau, 1995:31-32).

The cases cited above do not represent a failure of private property rights per se, but illustrate the difficulty of establishing completely specified private property rights coupled with the propensity of some social groups to exercise extra-legal power over others. More generally, formal land laws and individual registration and titling have contributed to land degradation through undermining existing common property arrangements without replacing them with more effective property rights systems.

2.4 The Assurance Problem

Some recent contributors to the new institutional economics have challenged the notion that common property regimes necessarily entail inferior economic and environmental outcomes to private property. There may be 'hidden' benefits of common property that we need to search for (Eggertsson 1990:453). Simultaneously, there is a growing empirical understanding of common property regimes, both past and present, and there relationship to local ecology and community objectives.

One potential benefit of common property is that it may represent a lower cost institution than formal private property (Runge, 1986:624-625). The establishment of the latter entails considerable costs related to the definition, assignment, monitoring, enforcement and adjudication of property rights, including the 'social overhead' costs related to the maintenance of related public administrative and legal systems and the private cost of exclusion technologies. This is especially likely to be the case in marginal environments, which are typically remote from centres of government authority and outreach and where resources can be spatially dispersed over large areas.

Another potential benefit of common property relates to economies of scale. Dalhman (1980) asserts that the English open field system, a type of common property regime, persisted because it allowed the minimisation of transaction costs with respect to the realisation of economies of scale from herding. He postulated that under a system of private property, the associated transaction costs would have been much higher.

A third potential benefit of common property is that of lowering risk. Marginal environments are characterised by poor communities that are dependent on natural resources for their livelihoods. Because the distribution of natural resources often varies across space and time (in the case of extensive pastoral agriculture because of variation in rainfall), there can be a high degree of uncertainty with respect to income streams. Given people's lack of accumulated wealth to act as a hedge against natural disaster and in the absence of well functioning markets for social or stock insurance, they may prefer land tenure institutions that emphasise flexibility and the right to be equally included, rather than fixed boundaries and the right to exclude (Runge, 1986:625-626). This is certainly consistent with the observed tendency for nomadic and semi-nomadic pastoralists to place more emphasis on preserving non-exclusive rights of access to pastures, water and salt for their animals, rather than land ownership per se (van den Brink, et al, 1995:384). To relate this back to the prior discussion on transaction costs, common property regimes may simply be a lower-cost way of

preserving land tenure flexibility and inclusiveness than individual private property, especially in the absence of well functioning markets for land use rights.

Given that common property regimes may offer superior outcomes under certain economic and resource situations, there will be gains to the group from maintaining or adopting such institutions. However, an individual will only gain from a cooperative strategy if a critical mass of other individuals are also following the same strategy. Each individual therefore will adopt a strategy that is contingent on their expectations of the strategies that are adopted by other individuals. If free-riding behaviour, or the expectation of free-riding behaviour, is dominant, then individuals will no longer have an incentive to adopt a cooperative strategy. Therefore the challenge for CPRs is to provide ongoing assurance to individual users that other users will also adopt a cooperative strategy and not misuse common property resources. This has been called the 'Assurance Problem' (Runge, 1986:629-630).

The existence of long-enduring CPRs demonstrates the capability of communities to overcome the assurance problem. The literature suggests that cooperative, common property arrangements are easier for resource users to devise and sustain the more homogenous they are (Kanbur, 1992). Through an extensive case study approach, Ostrom (1990:90) has identified seven institutional design aspects to long-enduring common property regimes:

1. Clearly defined boundaries
2. Congruence between appropriation/provision rules and local conditions
3. Collective-choice arrangements
4. Monitoring
5. Graduated sanctions
6. Conflict-resolution mechanisms
7. Minimal recognition of the rights to organise

Yet the reality is one of a global decline in common property resource management, including with respect to extensive pastoral resources. There are many contributing factors, including population growth, commercialisation, increased differentiation within communities, the loosening of kinship and other linkages that underpinned traditional CPRs, and the appropriation of CPR resources by other interests (Lane and Moorehead, 1994:130). The major policy implication is that it may be very difficult to reanimate community-based land tenure systems.

3. GRASSLAND RESOURCES, UTILISATION AND DEGRADATION IN XINJIANG

Xinjiang is one of the major pastoral regions of China, having grasslands comparable in size to those of Inner Mongolia and Tibet. The total grassland area of Xinjiang amounts to some 56 million hectares, of which 47 million hectares are useable. Pastoralism is by far the largest type of land use: the arable land area is fifteen times smaller, and the forested area is twenty times smaller. Some 47% of the total pastures are classified as desert or semi-desert pastures, 24% are relatively fertile lowland pastures and 23% are 'middle-pastures', which include high altitude summer pastures (Longworth, 1993:142). Most of the pastures are natural and unfenced. The area of

artificial pasture is only 218,000 hectares, or about 0.5% of the total useable grassland, and the area of improved (additional fenced) pasture is only 300,000 hectares, or 1% of the total[2]. (Grassland Division, Animal Husbandry Bureau (AHB), Xinjiang). In the case of Altay Prefecture, artificial pasture and other fenced pasture constitute only 0.5% and 0.7% respectively of the 7.2 million hectares of total useable pasture (AHB, Altay Prefecture).

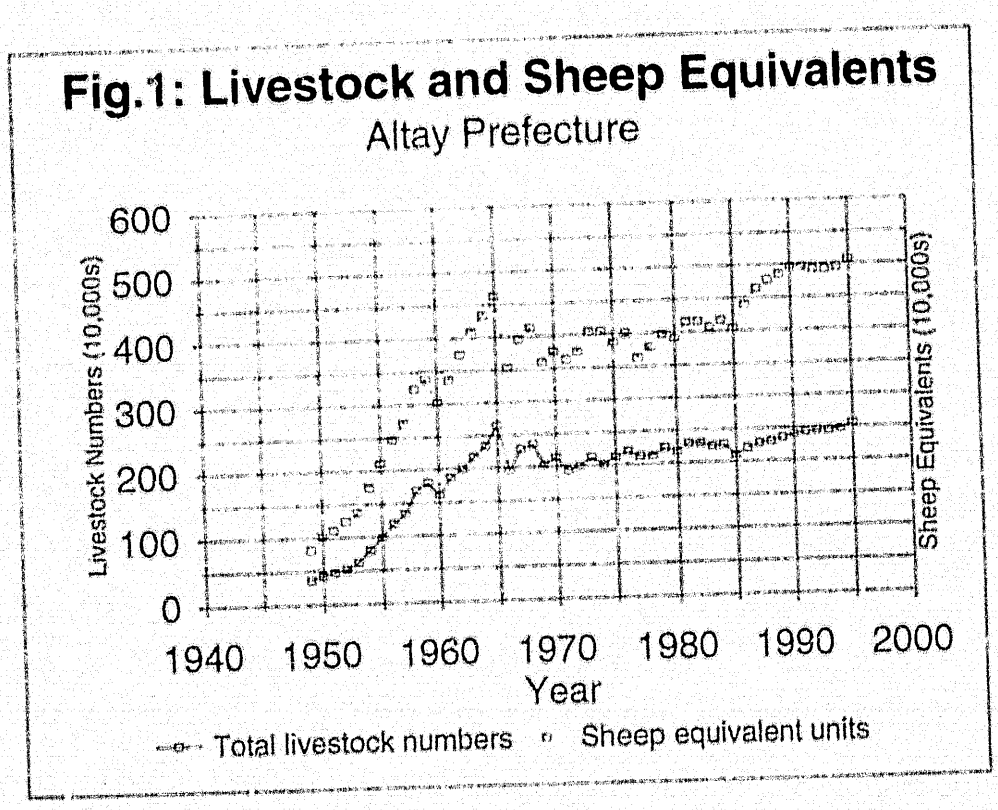
Most pastoralist farmers are semi-nomadic or transhumanant and practice extensive grazing strategies. Different pastures, as far as 150 kilometres or more apart, are used on a seasonal basis. Typically pastures are classified, in terms of their seasonal use, as either winter, spring-autumn or summer. Winter pastures are located in low altitudes areas near pastoral villages or arable land areas. Spring-autumn pastures are located on the plains between arable land areas and the hills, and in the hills. Summer pastures are typically located in high altitude mountain areas. Since the 1950's, the government has been encouraging the 'settlement' of pastoral households. This has entailed, among other things, the construction of a permanent house and barn for livestock, and the development of artificial pasture to provide supplementary winter feed. Currently nearly 50% of Xinjiang's 157,000 pastoral households are classified as 'settled', and under the government's 9th 5-year plan a total of 80% are targeted to be settled by the year 2000 (Grassland Research Institute, Urumqi). Likewise, 50% of Altay's 20,000 pastoral households have been settled and 80% are targeted to be settled by the end of the century (AHB, Altay Prefecture). It should be noted that 'settled' pastoral farmers, if not their whole households, still undertake traditional seasonal migrations.

There has been substantial degradation and/or shrinkage of pastoral lands in Xinjiang over the last 50 years. The productivity of natural pastures has declined on average by 30% since the early 1960's and currently one seventh of the grasslands are 'severally degraded' (Grassland Management Station, Urumqi). In Altay Prefecture, nearly 10% of useable pasture lands are moderately to seriously degraded, and this proportion is increasing by about 1% per annum (AHB, Altay Prefecture). Authorities and researchers have identified long-term overstocking as the major direct cause of pastoral land degradation. Total livestock numbers in Xinjiang have increased considerably since the 1950's. Figure 1 (see over the page) shows the increase in total livestock and sheep equivalent units for Altay Prefecture, but these represent the trends for Xinjiang as a whole (see Longworth, 1993). Livestock numbers and sheep equivalents rose more or less steadily from 1949-1965, then entered a trough following the start of the Cultural Revolution (1966), and did not really pick up again until after the privatisation of livestock in 1985. However, total livestock numbers and sheep equivalents have increased seven-fold and six-fold respectively since 1949.

The current theoretical carrying capacity of Xinjiang pastures has been estimated at 32.25 million sheep equivalent units. However, current stocking rates are at around 45.95 million sheep equivalent units (Tuoman, 1993). In terms of seasonal pastures a recent paper (Cui et al, 1996:1) estimates that actual sheep equivalent stock units exceed theoretical carrying capacity by 34% in the case of winter pastures, 47% in the case of spring pastures, and 56% in the case of autumn pastures. Summer stocking

[2] 'Artificial pasture' refers to land that has been ploughed and sown with new grass species or crops that are grown specifically to be used as fodder.

rates are estimated at 66% of the theoretical carrying capacity. Winter-spring-autumn and whole-year pasture have stocking rates over twice their theoretical carrying capacities (Tuoman, 1993).



Conventional rangeland science assumes a relatively simple relationship between 'overstocking' and grassland degradation. Climate is relatively stable and the primary factor influencing grassland productivity is grazing intensity, which is amendable to human control. Under such conditions, long term ecological carrying capacities and sustainable stocking rates can be meaningfully estimated. However, the applicability of conventional rangeland science to arid and semi-arid environments is increasingly coming under question (Scoones, 1994; Behnke and Scoones, 1992; Behnke, 1994). Conventional rangeland science is not so applicable in the case of 'non-equilibrium' grazing systems, which are characterised by a high variability in the amount, timing, and spatial distribution of rainfall, and usually found in arid and semi-arid areas. In such systems, rainfall, an exogenous factor, can be a more significant determinant of grassland productivity than past or present livestock numbers. Pastoralists pursue an 'opportunistic stocking strategy', accumulating high livestock numbers during years of favourable rainfall, and losing livestock during years of unfavourable rainfall.

Many grazing systems in Xinjiang province somewhat conform to the non-equilibrium type. They are located in arid to semi-arid zones and are characterised by a high degree of variability with respect to rainfall and thus grassland productivity. Yet the estimates given above of the long term decline in natural grassland productivity, coupled with a long-term increase in sheep equivalent units, suggests that more than natural, rainfall-induced, perturbations may be at work. Some degree of long-term overstocking appears to be taking place.

A second major direct cause of pastoral land degradation has been the use of pastoral lands for other purposes. The reclamation of land for arable agriculture has led to the loss of some of the best winter and winter/spring and 'cutting lands'. The lost of key resources to agriculturalists is a common predicament of nomadic pastoralists (see, for example, Lane and Moorehead, 1994:129). Between 1949 and 1960, the total arable land area in Xinjiang increased from 1.28 to 4.67 million hectares. Many of the areas reclaimed provided infeasible for arable agriculture and were later abandoned (by 1993 the arable land area had fallen to 2.133 million hectares), but not before doing damage, sometimes irreparable, to the natural pasture (Tuoman, 1993). In Altay Prefecture, the cultivated area increased from 8,000 to 96,000 hectares between 1949 and 1995, a twelve-fold increase. A secondary effect of agricultural settlement is to intensify grazing pressure on pastoral lands. Some 13 of the 35 million livestock in Xinjiang are raised by agricultural households and they frequently use pastoralists' Spring-Autumn grazing lands during summer time, often without the sanction of the state or pastoralists. Pastoral lands have also been loss because of creeping desertification and the commercial exploitation of herb plants found in the natural grassland. Most recently the extraction of construction materials and mineral and energy exploration and development have degraded or destroyed significant tracts of natural pastures. The regional director of the Grassland Supervision Station estimated that there was now a 5% per annum reduction in pastoral land area, but this may be exaggerated.

4. PASTORAL LAND TENURE AND DEGRADATION IN XINJIANG

4.1 State Ownership

State or collective ownership of grassland in China has existed since the collectivisation of the pastoral sector from 1949. This has been recently reaffirmed by the National Rangeland Law of 1985 and the Xinjiang's regional interpretation of this, its 1989 'Sub-Law'. In Xinjiang, there are some 184 state farms and these own a total of some 1.7 million hectares of pasture land, or 8% of the region's total (AHB, Urumqi). Most of the remaining pastures are collective-owned. In practice, however, there is currently not much distinction between state and collective ownership. Most of the livestock on state farms have been transferred in ownership to farm workers and, as in the case of collective-owned land, the grassland is contacted out to management units or individual households. Local branches of the Grassland Division, a part of the Animal Husbandry Bureau, preside over the assignment, monitoring and enforcement of grassland use rights in the case of both state and collective-owned pastures.

The economic justification for state intervention in property rights is usually given in terms of market failure. In the case of resource tenure, major market failure may occur because of the presence of externalities and/or common pool resources. This argument has provided the theoretical basis for the significant state ownership of fisheries, forests and grazing lands in developing countries (Wachter, 1992:46). Economic and development theories suggest that there is no simple relationship between state property and resource management. In many instances, state property has been identified with the acceleration of resource degradation. Traditional land tenure arrangements have been undermined and, because of the limited resources and institutional weaknesses of governments, state ownership has meant defacto open access. Notable cases include the nationalisation of communally owned forests in Nepal in 1957 (Bromley and Chapagain, 1984) and the nationalisation of grassland and watering points in many parts of pastoral Africa (Lane and Moorehead, 1994:122-123).

In the case of China, the effective nationalisation of pastoral lands coincided with the increasing collectivisation of agriculture, culminating in the creation of communes over 1958-59. Under the commune system, most livestock were state-owned and the use of grassland was centrally administered by commune authorities. Generally, the commune system has been partly blamed for the acceleration of resource degradation, but the evidence is not conclusive about how, and to what extent, it contributed.

Direct state management of lands via the commune system ended with the dismantling of the latter in 1985. Use rights to state or collectively-owed pastoral lands have since been formally assigned to management units or households. In the case of such arrangements, the literature suggests that resource management practices will depend in part upon the specific contractual specifications concerning land use and related incentives or disincentives. It will also depend on the term of the contract and the enforceability and enforcement of the contract (Wachter, 1992:46-47). A property rights arrangement where state-owned lands are assigned to individuals or groups for their long term use and the state does not arbitrarily interfere approximates, in many aspects, the case of a formal private property or common property regime respectively. Such a combination of state-ownership and (state-attentuated) individual use rights represents the situation with respect to the leasing of public lands to pastoral farmers in New Zealand, Australia and the United States. Thus state ownership per se doesn't imply much for resource management in pastoral China: what is needed is an examination of the grassland contract system.

4.2 Decollectivisation, Fuzzy Boundaries and the Formation of Common Property

Decollectivisation of the Chinese agricultural sector was authorised by the Third Plenary Session of the Central Committee of the Chinese Communist Party in 1978. The decollectivisation of agriculture was initiated with the privatisation of livestock in 1985. The distribution of livestock to individual households was done on a household population basis, with all households getting a proportionate share of different types of livestock. Households were to 'pay' for the livestock through an annual livestock tax, but otherwise were given the right to income arising from the sale of pastoral products.

Following the privatization of livestock in 1985 there has been property rights ambiquity with respect to the grasslands. Generally, the grasslands remained under state ownership but the demise of the commune created a vacuum in terms of the management of the pastoral lands, a vacuum that the new village and township governments were only able to partially fill. Pastoral lands were very roughly and informally allocated by county and township-level Animal Husbandry Bureau (AHB) officials to small groups of households, or (less rarely) to individual pastoral households. Thus land tenure from 1985 up until recently has been characterised by 'fuzzy' territorial boundaries and the formation of common property arrangements. Both of these characteristics have been frequently blamed for resource degradation by officials and researchers.

There are some transaction cost explanations for the emergence of 'fuzzy' boundaries: the state lacked the capacity to clearly delineate boundaries between different groups, and the cost of exclusion technologies were too high. However, another perspective is that the pastoralists' preferred fuzzy boundaries given uncertainty with respect to the timing and location of rainfall and thus pastoral resources. As noted by Behnke (1994:15) with respect to communal pastoral tenure in Africa, 'certain ambiguities as to who own what and can go where provide a degree of ambiguity that suits everyone'. Thus land tenure flexibility can facilitate opportunistic stocking strategies that bare no necessary relationship to grassland degradation in an non-equilibrium grazing systems.

As was discussed in Section 2.4, common property arrangements can emerge because of mutual benefits gained from coordination. In 1985 small groups of pastoral households formed voluntarily and pooled their livestock into specialised herds and shared herding responsibilities. Often but not always they were related by kinship ties. The potential benefits of such arrangements in Xinjiang's pastoral sector, as perceived by pastoralists and researchers, include the:

1. realisation of economies of scale with respect to herding labour;
2. better matching of livestock feed requirements with pastoral resources;
3. 'social insurance' arising from flexible access to land within the boundaries of the common property, the spatial disperal of a household's livestock at any one point in time, and the practice of 'mutual aid' or pooling of consumption goods in times of aversity, and:
4. enabling the better policing of pastures through the freeing up of herding labour. The Spring/Autumn pastures in particular are frequently subject to encroachment by livestock belonging to agricultural households during the summer period.

Despite these potential benefits of common property arrangements, there effectiveness in terms of resource management must be questioned given the increase in overstocking since 1985. The groups obviously lack the ability to exclude other users from some of their pastures, and they may also lack effective internal rules to govern their members' use. Both deficiencies generate a situation more akin to 'open access' than common property arrangements. In this respect, the government's emphasis on introducing more well-defined, 'private' property rights is not surprising.

4.3 The Introduction of the Grassland Contract System and the Individualisation of Land Tenure

A major legislative step towards the introduction of more formal and defined rights over grasslands was the Xinjiang's government June 1989 Rangeland 'Sub-Law', which represented a regional interpretation of the 1985 National Rangeland Law. Ownership rights would continue to reside in the state or collectives, but grasslands would be contracted out to management units and individuals on the basis of existing use rights. Grassland Use Certificates (GUCs) would be issued to users. No term for the GUCs was specified, save that use rights 'would remain stable for a long time' (Art.9 and 35). The sale of use rights was forbidden, and the transfer of use rights or conversion of pastoral lands to other uses required administrative permission (Art.12).

The Sub-Law devoted considerable attention to grassland protection and construction. County governments had to ascertain 'rationale' stocking rates for each type of grassland (Art.22), and the overgrazing or improper use of the grasslands could be penalised with fines or the confiscation of use rights (Art.41 and 42). Holders of GUCs were required to pay a 'grassland management fee', which was then to be used for the purpose of grassland improvement (Art.7 and 36). The sub-law also provided for the establishment of Grassland Supervision Stations within the Bureau of Animal Husbandry administrative structure. These were to be set up at the county level and tasked with the implementation of the sub-law, including the ascertainment and monitoring of stocking rates, and the collection and management of Grassland Management Fees (Art.39 and 40).

With the enactment of the Sub-Law the issuance of GUCs took place on a large scale. Grazing lands were assigned to users, whether collectives, units or households, on the basis of livestock numbers. Each user received a proportionate share of different seasonal and quality pastures. Priority was given to allocating lands to their traditional users, and the issuing of certificates to groups of households reflected the fact that these households had been practicing grazing in common since 1985. The lack of comprehensive cadastral or grassland resource surveys meant that officials had to use village sketch maps, showing grassland resources and their traditional users. This made it difficult for them to precisely delineate boundaries, ascertain the areas of parcels contracted, and determine appropriate stocking rates.

Where there were disputes over use rights, the government took the approach of not issuing GUCs for those areas. The GUCs themselves were simple documents, recording the boundaries of different seasonal grazing lands by way of crude maps or literal description and reference to neighbouring households/groups. The GUCs also provided places for land areas and allowable stocking rates to be recorded. Boundaries between different GUC holders were demarcated by reference to ridgelines and other natural formations, and by stone piles.

According to one government report, by November 1990 a total of 141,892 GUCs had been issued, including 3,512 to groups/collectives and 138,142 to pastoral households (Doc.1, 1990). These accounted for 97.5% of total pastoral households. However, this conflicts with a later government report in 1994 that acknowledged that some

prefectures had yet to introduce GUCs and that Xinjiang was seriously lagging behind other pastoral provinces with respect to their issuance (Doc.2, 1994). Furthermore, many GUCs may not yet be fully complete - GUCs that I examined in Altay Prefecture as late as October 1996 sometimes did not specify land areas (especially for Autumn-Spring pastures) and did not contain stocking rates either. Officials explained that stocking rates were inconsistent with the government's priority of encouraging increased livestock numbers and output.

The next major step in pastoral land tenure reform has been the introduction of Grassland Use *Contracts* (GUCns). The major government regulations relating to this were issued over the period 1992-96. Grassland Use Contracts differ from Grassland Use Certificates in several aspects:

1. emphasis is given to the pastoral household as the basic unit of contract (Reg.1, 1996, Art.5), though variation is allowed according to local conditions, including herding traditions and lifestyles (Reg.1, 1996, Art.5 and 15; Doc.2, 1994).
2. a term is specified (with the government guideline having increased from 30 to 50 years between 1993 and 1996 - Reg.1 1996, Art.4).
3. Grassland Management Fees (GMFs) are specified, with these grassland use fees being determined according to the area, quality and seasonal type of pasture land.
4. it is explicitly specified that use rights are inheritable (but otherwise not transferable).
5. the 'rights and obligations' of both the contractor and contractee are specified. These include the right of the contractor to monitor grassland use and impose penalties for overgrazing or improper use, and the right of the contractee to make their own decisions regarding farm management, subject to the condition that grassland productivity is maintained or improved.

As in the case of GUCs, use rights conferred by the Grassland Use Contract are only transferable upon administrative approval and can not be traded (Reg.1, 1996, Art.5).

In the transition from GUCs to GUCns, government policy is trying to ensure essential continuity in grassland allocation. Generally, the same grassland in terms of area and location should be allocated to the same users (Doc.3, 1994). New households formed since the issuance of GUCs do not enjoy the same rights to pastoral lands as those enjoyed by existing certificate holders. They can only be contracted newly developed settlement pasture land or, more generally, 'residual' village lands that have not yet been assigned (Reg.1, 1996, Art.10). Furthermore, once contracts have been issued, no further adjustment can be made to the total area of grassland assigned within the contract period, even if household population or stock numbers change (Reg.1, 1996, Art.18). The contrasts with the case of arable areas of China, where there have been frequent and major re-allocations of land use rights in order to accommodate new households formed through population growth.

Government regulations have consistently provided for collective ownership of livestock facilities, such as stock routes, watering holes, stock dips and stud stations, as well as collective ownership of adjacent pastures (Reg.1, 1996, Art.16; Doc.3, 1994). The contracting of land to unified as opposed to individual households is encouraged in the case where pasture lands are serviced by only one watering point (Doc.3, 1994). Pastoral farmers can be encouraged to contract remote, dry, water-lacking and severally degraded pasture through, for example, a reduction or waivering

of GMFs (Reg.1, 1996, Art.14; Reg.2, 1992, Art.6). With respect to disputes between different land users, private negotiation and settlement is encouraged. Failing this, they can take their case to the Grassland Supervision Station or People's Court (Reg.1, 1996, Art.23).

GUCns weren't introduced on a major scale until late 1994 and they have sometimes been introduced in conjunction with GUCs. According to official estimates, 30% of grassland areas had been contracted out to individual households by June 1996 and 50% by October 1996. The target date for completion was the end of 1997 (Director, Grassland Supervision Station). It has been difficult to contract grassland resources to individual households on an equitable basis, especially given the large variations in pastoral productivity and seasonal useability.

In Altay Prefecture, the preparation of GUCns is complete. A total of 16,800 contracts have been prepared for the 20,000 pastoral households and they cover some 97% of the total useable grassland area of the province. However, they had yet to be issued to, and signed by, the actual pastoral farmers in the prefecture. Whilst officials reported farmer enthusiasm for the new contract system, farmers were not enthusiastic about their obligation to pay GMFs under the new contracts. Significantly, many farmers that were currently practicing common property management intended to continue with such arrangements even though the new contracts allocate lands to individual households.

4.4 The Monitoring and Enforcement of the Grassland Contract System

Evaluating the actual implications of the new grassland contract system for land tenure security and degradation may be somewhat premature, given that it was only introduced two years ago and that its implementation is still incomplete. However, some of the likely problems with the implementation, monitoring and enforcement of the new system can be hypothesised.

In the case of the Xinjiang pastoral sector, the extensiveness and seasonality of land use makes the definition, monitoring and enforcement of individual households boundaries difficult and costly. Not only to households face the threat of other pastoralists using their lands, but also the threat of agricultural households grazing their stock on their pastures, particularly their Spring-Autumn pastures during summer time. Fencing is costly for the households (relative to benefits) and only artificial pastures tend to be fenced. With respect to the enforcement of property rights, this may be a costly process for farmers. They are a considerable distance from enforcement authorities (Grassland Supervision Stations and People's Courts) and could not be guaranteed that the administrative or court decision would be in their favour, let alone lead to compensation for their loss of resource productivity and transaction costs. Finally, because of many farmers' preference for common property arrangements, they may elect *not* to try and establish individual, exclusive rights to their pasture lands.

In the GUCs and GUCns, maximum stocking rates are given for different seasonal pastures and farmers are threatened with punitive measures in the event that they exceed these. However, such provisions are unlikely to deter overstocking for a

number of reasons. Firstly, the capacity of the state to monitor and enforce such provisions is extremely limited. Given the extensive and transhumant nature of pastoralism in Xinjiang, even random 'spot checks' of stocking intensities are a costly task. The Grassland Supervision Section of the Animal Husbandry Bureau, charged with the monitoring and enforcement of stocking rates, simply doesn't have sufficient resources to conduct extensive 'spot-checks' on top of its other designated tasks. The Grassland Supervision Section in Xinjiang has a total of 2050 employees based in 470 offices/locations at the regional, prefecture, county and township levels. The thinness of spread that this represents 'on the ground' is illustrated by the case of Buerqin County. This has over 50,000 livestock and 3,100 pastoral households, utilising a total of about 670,000 hectares of grassland. The number of staff assigned to the *combined* Grassland Supervision and Management Stations at the county level is 16, and at the township levels is 20. Most of these are more involved with grassland management activities, relating to grassland research and technological extension, rather than grassland supervision activities. Furthermore, the agencies lack the funding resources and transportation to regularly monitor stocking rates: the entire county Animal Husbandry Bureau has only three jeeps at its disposal.

Even if county officials did have the ability to monitor and enforce stocking rates, then there would be the question of whether they had sufficient will. Local officials in the Animal Husbandry Bureau, who commonly belonged to the same ethnic groups as the pastoralists, often had pastoral farming backgrounds and did not perceive overstocking to be a significant problem. Given this, they could hardly be expected to be zealous in their monitoring and enforcement of stocking rates. Not surprisingly, county officials could not cite even one case of punitive measures being taken against a farmer for overstocking. At the regional level, grassland supervision station employees could only cite one case in all of Xinjiang, and this was apparently taken up by authorities as a warning, apparently ineffective, to other farmers. These economic and political constraints to the effective monitoring and enforcement of stocking rates exist not only in China or the developing country context: they are present, to a lesser degree, in the case of crown pastoral leases in New Zealand and Australia.

Finally, and perhaps most fundamentally, an implication of the new thinking in grassland ecology is that the derivation and application of long term sustainable stocking rates may be inappropriate in the context of non-equilibrium grazing systems, given the wide variations in rainfall and thus grassland productivity between different years. Furthermore, the calculation of sustainable stocking rates, even if possible, could be a prohibitively expensive task given the complex relationships between rainfall fluctuations and the varied plant species and mixed herds typical of non-equilibrium grazing systems (Behnke, 1994:6-8).

Given the limited capacity of the state to monitor and enforce the new grassland contracts, and the preference of some farmers for common property arrangements, attention has to be given to the resource implications of informal property rights, notably social conventions and contracts. One of the reasons for the emergence of common property arrangements between pastoral households, according to farmers and researchers, is that it allows a better monitoring of pastoral resources as more family members can stay all-year round in their permanent houses, which are usually located near winter and/or spring-autumn pastures. Another informal institutional

arrangement that has evolved and has property rights implications is the practice of pastoralists taking the livestock of agricultural households up to the abundant summer pastures. This reduces grazing pressure on their Spring-Autumn lands and contributes to an overall better utilisation of seasonal grassland resources.

4.4 Pastoral Land Improvement and the Grassland Contract System

A premise of the new contract system is that farmers were deterred from investment in land improvements because of uncertainty as to whether they could appropriate the benefits. Historically there has been very little private investment in grassland improvement. The state has been the major investor, investing particularly in the construction of artificial pasture and related irrigation works, pest eradication programmes, and aerial sowing. Under the new contract system, land use rights are inheritable and a 50-year term is suggested. Assuming that boundaries are actually enforceable at low cost, a priori reasoning founded on property rights theory suggests that this is good for land tenure security and will thus encourage private investment in pasture improvement.

However, there are many other possible constraints to private investment in pasture improvement, including.

1. high risk and uncertainty, because of climatic variability
2. low or negative economic returns
3. poverty coupled with the lack of access to rural credit (this indirectly relates to land tenure institutions, particularly the non-transferability of land use rights)
4. farmers' lack of knowledge with respect to improved technologies coupled with the general financial and institutional weaknesses of grassland extension services.

Given these factors, it is likely that the state will remain the major investor in the grasslands. The primary purpose of the GMFs payable under the grassland contract system is to supplement limited government funding for grassland supervision and management stations, especially at the township and county levels. The collection of these fees to date, however, has been low. Farmers are reluctant to pay fees, in part because the legacy of the grasslands being a 'free' resource and in part because they have little confidence in deriving any benefit from such fees (through the misappropriation of the funds). Thus the likelihood of GMFs significantly increasing state investment in the grasslands is not likely, at least in the short to medium term.

5. SUMMARY AND CONCLUSIONS

The introduction, from 1989, of the grassland contract system in Xinjiang province was based on the assumption that, through the better definition of property rights and the introduction of individual land tenure, land tenure security would be improved. This in turn would give farmers the incentive to manage their lands sustainably and invest in pasture improvement.

However, this paper has attempted to illustrate the difficulties involved in the effective establishment of individualised land tenure in the context of Xinjiang's extensive pastoral sector. These difficulties can in part be analysed from a transaction cost

perspective. The transaction costs associated with the individualisation of tenure include the high private costs associated with the monitoring and enforcement of boundaries relative to the benefits (given the low productivity of the resource base). They also include the high public costs associated with the delineation of well-defined boundaries, the adjudication of disputes and the monitoring and enforcement of contractual provisions relating to resource management. Finally, the individualisation of tenure leads to pastoralists' loss of land tenure flexibility and, consequentially, a means to manage environmental risk. Given the high transaction costs associated with the grassland contract system, it is not surprising that its implementation has been relatively slow and partial. Although common property arrangements among some pastoral households still exist, their success at excluding others or regulating members' resource use is questionable. In sum the situation is one of considerable property rights ambiguity, if not 'open access' leading to overstocking and land degradation.

There are no quick-fix institutional solutions to pastoral land degradation in Xinjiang, nor a definitive long term solution. Other regions within China, as well as the transitional economies of Mongolia and Central Asia, have also recently decentralised pastoral land tenure and face somewhat similar challenges to Xinjiang. One principle that is repeated in the recent international literature on pastoral development is the need for pastoralists own land tenure arrangements and objectives to be considered in the design and implementation of land tenure reform. Thus the devolution of some authority over the assignment, monitoring and enforcement of grassland use rights to village-based institutions or pastoralist groups could play a potential role in making the grassland contract system more effective.

Finally, a reminder that although this paper has focussed on the institutional dimension of land degradation problems, it isn't meant to belittle other causes of degradation. The poverty of pastoralists and their related high private discount rates is probably a major factor accounting for overstocking practices. Thus any measures, technological or otherwise, that improve their income (and security of income) without intensifying grazing pressures on the land should bode well for resource management in the medium to long term.

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