



Rangelands and their Governance: Implications for Traditional Pastoralists

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Abstract: Rangelands play an important role in the livelihood of local communities and wildlife. In this paper, however, the three main roles of rangelands in low rainfall areas will be discussed in the following sections: (i) as a feed source for livestock production; (ii) a base of survival for local communities, their institutions and management practices they developed to overcome environmental variability and (iii) as a means of avoiding conflicts between herders and farmers. This paper is about local communities of people who live in and get their livelihoods from drylands. On a global basis they number hundreds of millions of people with thousands of millions of livestock. The focus is on the human dimension of rangelands i.e. indigenous communities, local institutions and resource management systems.

Key words: Development, tenure, common property, privatization, traditional institutions, pastoralism.

Importance of Rangelands

Rangelands play an important role in the livelihood of local communities and as refuge for wildlife. Three main roles of rangelands in low rainfall areas are recognized: (i) as a feed source for livestock production; (ii) a base of survival for local communities, their institutions and management practices they developed to overcome environmental variability; and (iii) as a means of avoiding conflicts between herders and farmers.

Rangeland-users, especially traditional pastoralists like nomads and transhumants, continue to be perceived by many as the cause of rangeland problems. Yet, the human dimension of rangelands (i.e. indigenous communities, local institutions and resource management systems); often unfortunately continues to be disregarded in policy formulation. The human dimension is a key factor for sustainable development policies on rangelands. It is timely that policy-makers and researchers start talking about the interaction between people and resources, not only in terms of efficiency but also in terms of equity and sustainability. The role and rights of local communities on rangeland resources need to be well-defined as these are necessary for their livelihood. As primary beneficiaries of these rangeland resources, local communities ought

to be made responsible for their management and long-term conservation. Such a policy will not be a complete innovation, but a restitution of many traditional rights and management roles that pastoral communities exercised on rangelands. The strength of local communities is indicated by community members' continued adherence to customary rules and institutions. The capacity of local institutions depends on: (i) the existence of their former territory; (ii) their social legitimacy to enforce customary rules; and (iii) their recognition by the State as viable management institutions. An important role of rangelands that is generally missed, is in conflict avoidance between farmers and herders. The use of rangelands during the cropping season enhances the interaction between herders and farmers by securing the welfare of each party. Livestock graze crop residues and contribute to nutrient cycling on cropped areas.

Pressures Affecting Rangelands

Pastoralists, policy-makers and researchers have been discussing about the reduction and degradation of native pastures. The recent debate around rangeland problems has shifted the focus of rangeland development from economic efficiency, which for many years concentrated on settling and transforming the pastoral population (sedentarization) regardless of the long-term environmental impacts, to the sustainable use of rangeland

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resources. Several factors are identified as being causes of resource misuse and impediments to sustainable management of rangelands. Some of these causes will be highlighted to provide background and explore the solutions that are being promoted.

The debate around rangeland development should focus now, not only on the areas that are considered as native pastures, but also on the settled areas. It is only through such an integrated-land-use approach that rangelands could be tackled adequately for sustainable resource use. These areas are a continuum used by the same rural communities who developed different coping strategies in response to nature and to government development policies. Thus, renewed interest in rangelands should be oriented towards understanding present communities and their resource-management systems. Any approach that seeks sustainable resource use but does not integrate local communities and management systems in the design process is bound to fail. There is an ongoing debate around community participation but, in general, commitment to developing local production systems is still missing. This does not mean that local production systems should be followed blindly, but they should be studied with respect to their changes and the remaining resource management practices and rules that could be beneficial to future rangeland development (Ngaido, 2010; Seely, 1998; Squires *et al.*, 2017; Milner, 2011).

Land Tenure Confusion

The tenure situation in rangelands which operate in most of the countries under a common property resource (CPR) system is some what confusing. CPRs are broadly defined as natural resources in which a group of people have common use rights (not necessarily ownership rights). These include natural forests, village lands, grazing lands, streams, rivers, groundwater and as well as man-made resources like irrigation reservoirs (big and small), community wells and village roads (Gaur *et al.*, 2018).

Because of their areal extent and lack of any obvious signs of habitation or other markers of ownership, rangelands are particularly susceptible to competing claims. Two systems continue to claim legitimate ownership of rangelands: state and local communities.

Governments and others have persistently failed to understand the underlying rationale and dynamics of pastoralism. Many perceived pastoral lands to be unoccupied (having no owner) or under-used and poorly managed and thereby justified their appropriation by the State as government property. While the State took all the rangelands under its purview through the principle of Eminent Domain, these lands were supposed to be managed under the Public Trust Doctrine - where the State is not an absolute owner, but a trustee of all natural resources but many arid zone countries including Iran, China and most of the former Soviet Republics in Central Asia enacted legislation that made the State the owner of rangelands (see below for Case studies from Iran and western China).

India

India is a special case wherein CPRs make a valuable contribution to the sustainable livelihoods of rural populations. The impact of globalisation on the commons shows various patterns of ownership, control, use and misuse. The commons were subjected to degradation as well as conservation in the process of centralized management in India. After the reform period, the administration of natural resources was given significant attention by specialized departments such as the Forest Department and the Revenue Department. All the land, apart from private land, was regarded as State property and controlled by the State (Gaur *et al.*, 2018).

The situation in India has been analysed by several research teams. For example, Gaur *et al.*, 2018; Gaur and Squires, 2018; Rao *et al.*, 2005; Singh, 2013. Sahoo and Misra (1994) conducted studies on the status of CPRs in the various states of India, to investigate privatization of land and its socio-economic implications for the rural poor. The rural poor depend on CPRs for food, fodder and fuel, in a variety of ways (Fig. 1) and also play a major role in the provision of ecological goods and services, including water for humans, their animals and for industrial purposes including hydro-electric generation, water transport, etc.

Due to privatization, users of CPRs have collectively lost a significant part of their source of livelihood in recent decades (Sahoo and Misra, 1994). The main cause of decline

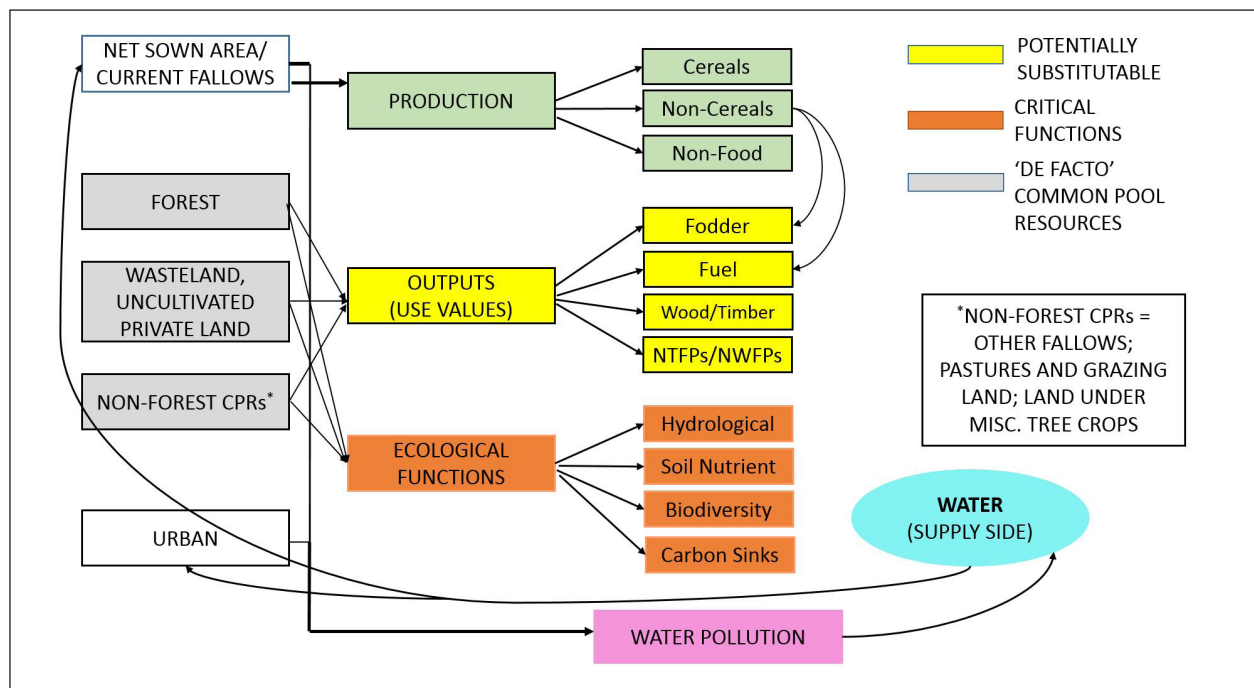


Fig.1. Land use and CPRs in India (Source: Bhaskar, 2002).

of CPRs in India is privatization. Transfer of CPR land to poor people for their private use through various social welfare programs (Gaur *et al.*, 2018) and illegal occupation of the CPR land and its subsequent legalization, were two important factors which resulted in large-scale privatization of CPR lands.

Iran

The areas of CPRs, especially rangelands in Iran, are large and traditionally were controlled by pastoralists. From 1925, a forced sedentarization policy for the nomads was implemented as part of the modernization program for Iran, in a move to bring them out of 'backwardness' and into the mainstream of a modern economy. A further blow was struck by the nationalisation of land in 1963 that took away large areas of pastoral lands from the nomadic pastoralists, including several territories that were used as alternative grazing grounds by the various tribes as part of land recovery strategies. This approach resulted in separation of grazing lands and migratory corridors alienated without consulting or even informing, local communities. Land belonging to tribal landlords was confiscated, to break the political power and autonomy of these large landlords. While some tribes succumbed, this move became a source of conflict between the tribes and the State.

Development initiatives, such as dams, oil refineries, roads, land brought under irrigation and protected areas, interrupted their migratory paths, degrading and fragmenting their summer and winter rangelands. There was systematic isolation of indigenous pastoral communities from their traditional land and resources. Pastoral lands that were under the management of a clan were divided and allocated based on herd sizes, severely disrupting mobility patterns and resource access and leading to resource conflicts. This led to overgrazing of rangelands, illegal grazing in forests and widespread conflicts. With the competing demands over the rangelands, the relevance of the common lands in ecological and economic terms are debated often against the use of such rangelands for commercial (non-agro-pastoral) purposes.

Nowadays, natural resources, that is, forests, rangelands and deserts belong to the government. 'National land' is exploited by people through a contract. For use of rangelands for grazing, the Technical Bureau of Rangelands (TBR), through its district staff, identifies lawful livestock holders and then issues a 'grazing permit' to the stock owner for a set period which need be extended each year. For better management of rangelands, a range development plan is formulated and

based on the plan, a contract is signed by the stock owners and the provincial head of the government Forest, Rangeland and Watershed Management Organization (FRWO) of the Ministry of Jihad-e-Agriculture, in order to ensure the stock owner invests in development and improvement of rangeland instead of only exploitation.

Current plans and programs of the TBR focus on range improvement projects, such as handplanting, seed production, re-conversion of rain-fed farms to pastures, shrub transplanting, fertilising, construction of water troughs, installation of wind pumps and wells, range inventory and land tenure assessment and preparation of range management plans. There is considerable pressure being exerted in Iran to privatize rangelands to ensure that capital investments are protected and in a bid to use the land title as collateral when applying for a loan (Solaymani and Gosain, 2018).

Despite these efforts, the failure of the top-down approach of the government as the owner of rangelands and the TBR as specialists in rangeland management has led to acknowledgement of the fact that pastoralists have managed rangelands much better on their own and need policy support rather than intervention to adapt to the changing economies. In view of the heterogeneous and dispersed resources of rangelands and unpredictable rainfall patterns, the traditional flexibility of pastoralists in securing access to resources across several different and complementary ecological niches, is better suited to their survival and in turn sustainability of their environment. Pastoral production systems have reciprocal and interdependent relations with both rural and urban communities, which are of critical value to herding economies. The semi-mobile rural communities are mostly herders who have partly settled to augment their livelihood during lean periods when they are compelled to sell their livestock.

In most places, the rights of local communities to the CPR were reduced to 'use rights'. This appropriation of rangelands by the state has many implications regarding rangeland management, because it reduces the capabilities of local communities to control and manage the use of resources. The main issue regarding the question of appropriation is to determine the

trade-off between efficiency and sustainability. The state, claiming that local communities are not efficient resource users, takes the responsibility to set up new rules of access and create resource control mechanisms. With rare exceptions, governments have generally not been efficient controllers of rangeland management. Any policy based solely on State ownership of traditional grazing lands, regardless of prior claims, risks failing partially or even totally. The failure of state control mechanisms is due to the high cost of patrolling a very large area of rough and remote rangelands without community participation and cooperation. The main question that emerges under State control is how to get local participation for sustainable resource use.

Local communities often continue to view rangelands as their territory and continue to control access on an informal basis. Customary management rules are often no longer being recognized; this is one of the major impediments caused by state appropriation. Neighboring groups (local institutions) will continue to use their social networks to demand reciprocal access for grazing from one another (even if the state has assigned an area for the exclusive use by one designated group). They grant each other access as a means of confirming their claims and strengthening their traditional social relations with other communities. Importantly, these arrangements enhanced their risk management strategies during drought years (Behnke *et al.*, 1993). Pastoral communities have maintained some of their customary claims by adapting their strategies to state development policies. For example, local communities were the major beneficiaries of land allocation in settlement schemes that were adopted in some countries. The only difference has been the change from common to individual resource control. As a result, community members claim two types of rights: (i) individual rights of ownership they derive from their community membership and that are confirmed by the state; and (ii) common ownership rights not recognized by the state, which they continue to claim on unsettled rangelands. On an ecosystem level, this amounts to greater exploitation of resources and less concentrated efforts on their conservation.

It is important, however, to note that regardless of government land policies, local

institutions continue to view their rights over rangelands as superior to the state claims. Such claims are even asserted on improved state rangeland reserves. These opposing claims between state and local communities have resulted in poorly-defined tenure rights on rangeland resources. The confusion between who manages and enforces rules of use and who grants access to rangelands has fostered a situation of “no-control” which is called “open-access”. Some argue that instability of life and lack of property rights are the real causes of overgrazing and misuse. In addition, such tenure confusion raises many equity issues because wealthy community members, who have the political means to defend those holdings despite their questionable legal status, encroach large grazing areas at the expense of poor community members. Such a situation is all too common in post-Soviet Central Asia (Halimova, 2012; Kirja *et al.*, 2014).

Collapse of Traditional Institutions and Management Systems

The establishment of national borders, the appropriation of rangelands by the State and the confinement of herding communities into smaller grazing areas narrowed their traditional grazing access-options (Jacobs and Schloeder, 2012). Some argue that the legal assault on property rights seems to share one common objective—overthrowing the customary rights and breaking the traditional organization of the pastoral society. The collapse of traditional migration patterns has put great pressure on community pastures and increased the use of purchased feeds and crop residues. All too often, traditional practices and management systems in rangelands, which were developed by local communities in response to their different constraints, have broken down (Squires *et al.*, 2009; Jacobs and Schloeder, 2012; Shaumarov *et al.*, 2012; Gaur *et al.*, 2018).

Tribal control of rangelands, virtually ‘states-within-states’, was revoked in many countries. The unintended result of this was to take rangelands out of traditional common property management and move them to open-access and subsequent uncontrolled use and heavy degradation. In addition, the power loss of tribal institutions fosters the individualization of many common resources

leading to privatization or *de facto* monopoly over the use rights (water, grazing and shelter).

Expansion of agricultural production has shifted the boundaries of rangelands. In a desperate pursuit of food self-sufficiency, the governments of some countries have encouraged the production of staple food crops and a switch to small ruminants even in high-risk areas, regardless of environmental damage. The development of the transport system and cheap fuel allow greater mobility of herds, feed and water. This has resulted in large stay of livestock herders on the ranges. Modern transport of animals and water has disturbed the traditional flock movements and caused overgrazing. When the grazing period in the mountains is extended e.g. by availability of motorized transport or by climate change that postpones the onset of snow in late autumn especially in high altitude summer pastures that are refuges for ungulate wildlife. Additionally, where departure in autumn has been deferred by 2-3 weeks in response to the longer growing season and absence of heavy snowfalls, the fodder and browse on which wildlife depend is often over-utilized by livestock

Privatization of Rangelands

The persistence of rangeland degradation in many arid zone countries prompted several approaches for better resource use. Generally, poor or destructive resource use is perceived as a consequence of a lack of well-defined rights. In order to promote sustainable resource management, it therefore becomes necessary to grant secure access rights to resource users. Provision of tenure security to resource users should promote better resource use and encourage investment in maintaining the resource base. This is because holders of such rights can reasonably hope to enjoy the benefits of their investments in good stewardship. Ellis and Swift (1988) noted that, “the assumption is that some form of privatization will alleviate the imbalances supposedly induced by communal grazing”. As such, privatization of common property resources is thought to be one of the most practical solutions to environmental degradation. In this discussion it is very important to depart from the narrow view of private property-confined solely to an individual (Du and Hannam, 2011).

The main feature of private property is that it is legally respected by the state and is easily marketable. As such, three types of private property rights are distinguished by: (i) community private rights under collective management (i.e., cooperative), (ii) community private rights under individual management (i.e. tribal system); and (iii) private rights under sole individual management. The first two types are forms of corporate ownership of private property.

Community private rights under collective management occur when the state recognizes the traditional claims of the communities in a particular area and organizes or allows a spontaneous organization of community members in a cooperative or users group. Members of the community have co-owner rights and agree among themselves how to access control and use of the resources, often through a designated management committee (Milner, 2011). The main question is whether community members have the same incentive for resource use and conservation, because in the short-term the gains in the utilization of the resources are more than the costs of resource rehabilitation and conservation. Such a management system is sustainable in the long-term, only if the members are allowed to transfer their rights to other community members. This could be an important solution to land fragmentation and consolidation in low rainfall areas (Gaur, 2013; Squires and Hua, 2017).

Private property rights granted to a community under individual management could apply to a tribe, to a clan or an extended family. Contrary to the previous community private property, management continues to be carried out by the individual who traditionally was in charge of resource management. Under this tenure situation, it is not necessary to create new institutions, though provisions should be made to secure the rights of weak community members as well as to enhance awareness of sustainable practices in range use.

Individual private property occurs when the individuals have total control and decision-making power over their property. This type of property is often thought by the developed world to be the most desirable because it encourages investment and resource

conservation. It also offers more security because the owner has total freedom to decide on how to use resources. Studies on the impacts of such tenure regimes on investment, however, are not very conclusive.

As a strategy against rangeland degradation, privatization could be part of the answer in any of the three forms wherever they are viable. There are still some communities, for example, with strong local leaders who continue to use efficient traditional resource management systems. For such communities, the best strategy may not be individual private property but, through recognizing and strengthening traditional rights, to allow them access to credit. Having secure land tenure allows people to use the title certificate as collateral to borrow money for investment in water facilities, shelter sheds and fencing.

Revitalization of Traditional Management Systems

During the past decades beginning in the late 2000s, the failure of rangeland development projects prompted a new interest in traditional resource management systems. FAO and GEF (Global Environment Facility) commissioned working papers on pastoral and agro-pastoral societies. This was a step towards understanding customary rules and resource management practices. It resulted in a new view of rangeland communities and their livestock production systems. It was argued that, traditional pastoralism, including nomadism, is a sound form of grazing management that ensures the revegetation processes. The efficiency of the traditional production system was due to groups' common understanding that they were, "utilizing a productive resource which had to be maintained." The key element of traditional management systems is the homogeneity of their production system, because all the groups are using the same strategies to feed their animals. Two major impediments to the revitalization of traditional management systems are the reduction of the grazing areas (national and international) and the opportunistic behavior of community members. Traditional pastoralism depends on social networks that were spread at the national and regional level. The reduction of grazing areas has squeezed herding communities and pushed them to settle and reorient some of their activities. As a result,

local institutions have broken down and the strategies for livestock production are being individualized. Communal tribal pastures are no longer always perceived as a common resource that is important to preserve for the benefit of the whole community, but rather as a resource available for appropriation. Many members are asking for their private shares of tribal collective lands. The “top-down”, remote, centrally-planned approaches to pastoral people and resources have had several unexpected negative consequences, largely due to a lack of consideration for the short- and long-term incentives and interests of the rangeland users. It is necessary to have an integrated land-use management approach, which takes full account of the larger economic and social contexts of pastoral people, particularly their needs for the security of tenure and authority to form reciprocal resource-use agreements with neighboring groups who are similarly secure. This permits economic, social and ecological stability beyond what is possible under the western ranching model of set-stocking and carrying capacities. The past exclusion and denial of pastoral social institutions, justified on the grounds of modernity and the establishment of national unity, have had terrible consequences in terms of rangeland degradation. Economically viable range rehabilitation on a large scale requires direct participation, protection and investments by pastoral people. This requires care and sensitive handling to meet the needs both of the State and of the pastoral people.

A clearer understanding of the socio-economics of traditional pastoralism is needed if the application of recent technological advances in rangeland monitoring is to yield maximum potential benefits. To understand and consider viable pastoralism in the context of a healthy support environment, several distinct features need to be understood, which require going beyond the more traditional control of livestock numbers in terms of a hypothetical concept of rangeland carrying capacity. Stock numbers can continue to be governed by the pastoralists’ traditional strategy of enhanced mobility and accessible communications that optimize advantages and opportunities offered by changing climatic and episodic conditions (opportunistic grazing to ‘chase forage and water’). Grazing systems could remain

essentially event-driven. Attention should however be paid to understanding the special needs of pastoral nomads, particularly in terms of cultural values and the need to involve them in the processes of change and development that have a potential to affect them.

One conclusion which has emerged generally from development activities that impact economic policies for the sustainable use of rangelands or for desertification control could enhance social stability. This, in turn, will yield environmental benefits. Instability, combined with land-use pressures, undermines the sustainable use of natural resources. While the mechanics of information-gathering and enhancing mobility have changed with time, the basic strategies for livestock management and production have remained the same. In recent years, however, a number of complex concerns have emerged that render effective livestock production more difficult and burdensome for the pastoral nomads. These concerns include: a rapid increase in human population in pastoral communities; a more sedentary way of life; an increasing need for technology to deal with pressing problems of management; and rapidly-changing political, economic and social conditions. As a result, policy and program interventions are required that are multidisciplinary, process-driven and focused on a minimum threshold of critical objectives. Humans and nature are always in search of a liveable balance, but mishaps are more likely to happen because of the “discontinuous” nature of the relationship between the pressures generated by human activities and the tolerance limits of ecosystems (Squires and Feng, 2018). It is unlikely that damages inflicted on dry rangelands by overgrazing will be irreversible, because even a minor change in rainfall or other climatic conditions will often bring about a rapid response in terms of vegetation and alter expectations. It is, nevertheless, worthwhile when faced with risk and uncertainty with such critical consequences, to follow the precautionary principle and take action on a broad front to ensure that unexpected surprises do not occur (Feng and Squires, 2018).

Conclusions

Thus, whole dealing with the complex and rapidly changing socio-economic problems faced by the traditional pastoralists, policy

and program interventions should be multidisciplinary in character and they should be process-driven. They should also attempt to cover a minimum threshold of critical objectives focused on improving the productivity and resilience of the rangelands. Within a broad program of this nature, the interventions should support the design of planning and implementation procedures in order:

- i. to slow and, if possible, reverse the worsening of the quality of soil, water and other natural resources;
- ii. to protect, conserve and restore the genetic density of the targeted regions;
- iii. to develop institutions of research, reforestation and technology generation;
- iv. to strengthen environmental legislation and institutions involved in the task;
- v. to mobilize adequate resources to correct damages, such as erosion and soil degradation caused by the indiscriminate conversion of land for agricultural use;
- vi. to ensure environmentally-sound investments in the rehabilitation and development of irrigation and drainage schemes;
- vii. to help in the establishment of soil and water management demonstration centers in agro-ecological zones, where potential problems have been found; and
- viii. to identify innovative ways of providing pastoral nomads with access to credit to improve the management of their natural resource base, particularly through micro-credit schemes on pastures and rangelands.

In establishing the priority of the interventions to be undertaken and their effectiveness, it would have been helpful for us to have a generalized understanding of the carrying capacity of the dry rangelands. Unfortunately, as already noted, there is no consensus on the use and reliability of the models for estimating carrying capacity, especially in regions of high climatic variability. The policy issue that arises is whether the damage that has already been inflicted on the rangelands is irreversible (i.e. beyond some projected level of carrying capacity) and there is therefore no justification for further investments, or whether they are seen as a temporary setback from which they could recover to produce adequate returns on investment. Documented evidence suggests

that a change in rainfall or other climatic conditions often bring about a rapid response in the dry rangelands. Vegetation cover is often found to improve over considerable areas with even a modicum of precipitation. It appears unlikely, therefore, that an irreversible damage to dry rangelands is a probability within time frames of relevance to us.

As the Desertification Convention (UNCCD) makes it clear, action to deal with land degradation in desertified, arid and semi-arid lands is required in two parts. It is necessary to follow climatic conditions closely and to have pastoral nomads involved in the use of the recently-developed technologies for rangeland monitoring. Secondly, and in addition, policy and program interventions are needed to cope with emerging problems of economic and social adjustment. From the long-term and ecological point of view, however, the bottom line must be that when faced with risk and uncertainty of such critical consequences, it is worthwhile to follow the precautionary principle and take immediate action on a broad front to ensure that unexpected and unpleasant surprises do not occur. Such mishaps are the more likely to happen because of the "discontinuous" nature of the relationship between the pressures generated by human activities and the threshold levels of tolerance of ecosystems. The actual collapse of ecosystems could be extremely burdensome in both human and financial terms; anticipatory and preventive policies are far more reliable and far less costly than curative ones.

References

- Behnke, R.H. Jr., Scoones, I. and Kerven, C. 1993. *Range Ecology at Disequilibrium: New Models of Natural Resource Variability and Pastoral Adaptation in African Savannas*. Overseas Development Institute, London.
- Bhaskar, V. 2002. *Conceptualising the Commons: Power and Politics in A Globalising Economy*. Report of the DFID.
- Du, Q. and Hannam, I. 2011. *Law Policy and Dryland Ecosystems in the Peoples Republic of China*. IUCN Environment Policy and Law Paper No. 80, IUCN Gland.
- Ellis, J.E. and Swift, D.M. 1988. Stability of the African pastoral ecosystems: Alternate paradigms and implications for development. *Journal of Range Management* 41(6): 450-459.

- Feng, H.Y. and Squires, V.R. 2018. Climate variability and impact on livelihoods in the cold arid Qinghai-Tibet Plateau. In *Climate Variability Impacts on Land Use and Livelihoods in Drylands* (Eds. M.K. Gaur and V.R. Squires), pp. 91-112. Springer, NY.
- Gaur, Mahesh K., Goyal, R.K., Kalappurakkal, S. and Pandey, C.B. 2018. Common property resources in drylands of India. *International Journal of Sustainable Development and World Ecology* pp. 491-499.
- Gaur, Mahesh K. and Squires, V.R. 2018. *Climate Variability Impacts on Land Use and Livelihoods in Drylands*. Springer NY.
- Gaur, Mahesh K. 2013. Orans - The sacred groves of Thar Desert of India. In *Environment, People and Development (Experiences from Desert Ecosystems)* (Eds. Mahesh K. Gaur and P.C. Mohrana). NIPA, New Delhi.
- Halimova, N. 2012. Land tenure reforms in Tajikistan: Implications for land stewardship and social sustainability: A case study. In *Rangeland Stewardship in Central Asia: Balancing Improved Livelihoods, Biodiversity and Land Protection* (Ed. Victor Squires), pp. 305-330. Springer, Dordrecht.
- Jacobs, M.J. and Schloeder, C.A. 2012. Extensive livestock production: Afghanistan's Kuchi herders, Risks to and Strategies for their survival. In *Rangeland Stewardship in Central Asia: Balancing Improved Livelihoods, Biodiversity and Land Protection* (Ed. Victor Squires), pp. 109-128. Springer, Dordrecht.
- Kirja, E.M., Ayonga, J.N. and Ipara, H. 2014. Promoting effective community participation and management of wildlife conservation areas. *Journal of Natural Sciences Research* 4(28): ISSN 2225-0921 (online).
- Milner, H. 2011. Science and the community: Role of the ecological approach in sustainable rangeland management. In *Range and Animal Sciences and Resources Management* (Ed. Victor R. Squires), Vol II, pp. 84-101. Encyclopaedia of Life Support Systems UNESCO/EOLSS, EOLSS publishers, UK.
- Ngaido, T. 2010. Integrated rangeland management systems. In *Range and Animal Sciences and Resources Management* (Ed. Victor R. Squires), Vol II, pp. 327-342. Encyclopaedia of Life Support Systems UNESCO/EOLSS, EOLSS publishers, UK.
- Rao, K.R.M, Sabesh Manikandan, M. and Leal Filho, Walter 2005. An overview of the impacts of changes in common property resources management in the context of globalisation: A case study of India. *International Journal of Sustainable Development & World Ecology* 12(4): 471-477.
- Sahoo, H.P. and Misra, M.K. 1994. Village Ecocomplex Functioning with common property resources: A case-study on coastal Orissa, India. *Environmental Conservation* 21(1):57-61. <https://doi.org/10.1017/S0376892900024085>
- Seely, M.K. 1998. Can science and community action connect to combat desertification? *Journal of Arid Environments* 39(2): 267-277.
- Shaumarov, M., Toderich, K., Shuyskaya, E.V., Ismail, S., Radjabov, T.F. and Kozan, O. 2012. Participatory management of desert rangelands to improve food security and sustain the natural resource base in Uzbekistan. In *Rangeland Stewardship in Central Asia: Balancing Improved Livelihoods, Biodiversity and Land Protection* (Ed. Victor Squires), pp. 381-405. Springer, Dordrecht.
- Singh, Subrata 2013. *Common Lands Made 'Wastelands': Making of the 'Wastelands' into Common Lands*. Presented at the 14th Global Conference of the International Association for the Study of the Commons, June 03-07, 2013.
- Solaymani, Hamid R. and Gosain, A.K. 2018. Integrated adaptation approaches to climate change in semiarid basin of Iran. *Annals of Arid Zone* (in press).
- Squires, V.R. and Feng, H.Y. 2018. Humans as agents of change in /arid lands: With special reference to Qinghai-Tibet Plateau. In *Climate Variability Impacts on Land Use and Livelihoods in Drylands* (Eds. M.K. Gaur and V.R. Squires). pp. 75-90. Springer, NY.
- Squires, V.R. and Hua, L.M. 2017. Land fragmentation: A scourge in China's pastoral areas. *Livestock Research for Rural Development* 29(8): 1-16.
- Squires, Victor Roy, Zhan-Huan, Shang and Ariapour, Ali 2017. *Rangelands along the Silk Road: Transformative Adaptation under Climate and Global Change*. Nova Science Pub Inc.
- Squires, V., Lu, X, Lu, Q., Wang T. and Yang, Y. 2009. *Degradation and Recovery in China's Pastoral Lands*. CABI, Wallingford (Rangeland Degradation and Recovery in China's Pastoral Lands).

