Chapter 16
Participatory Management of Desert Rangelands to Improve Food Security and Sustain the Natural Resource Base in Uzbekistan

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Abstract This chapter presents an analysis of contemporary status of rangelands, vegetation, and land use in Uzbekistan. Constraints to development include the climate and other physical conditions, but the socioeconomic and the policy environment are also barriers to adoption of better land management. The large rural population in remote areas is in subsistence mode, and there is little opportunity to improve household income in the face of the lack of access to grazing lands, lack of secure land tenure, and limited rural financial services. Measures to introduce and implement sustainable land management concepts and practices are outlined.

Keywords Aral Sea • Kyzyl Kum Desert • Land tenure reform • Policy • Subsistence • Poverty • Climate change • CACILM • Socioeconomics • Post-Soviet era • Rural credit • Gender

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Key Points

- The rangelands are a national asset of high economic, environmental, and cultural value, for which the whole Uzbek community needs to take responsibility. Therefore, a national rangelands strategy (NRS) is needed to be developed because the rangelands under current climate change face a wide range of problems, which cannot be easily resolved with current legislation and institutions, present knowledge, and existing dispute resolution procedures.
- Land degradation in Uzbekistan has two ultimate effects – ecosystem instability and poverty. In fact, these two effects are inextricably linked and each can cause the other. They are also part of a closed loop whereby degraded land leads to ecosystem instability and poverty forcing desert communities to further stress the fragile desert environment, thus degrading the land even further and exacerbating the ecosystem instability and poverty.
- Agricultural policy of Uzbekistan in the early transition period was primarily concentrated in support of staple crop production in arable land areas and in strengthening of the other sectors of economy in order to avoid deepening of the crisis and food insecurity (UNDP 2010b). However, national policies toward smooth institutional transition and development of livestock sector in dryland areas have lagged behind of the country priorities (UNDP 2010c). Since independence in 1991, the government took nationwide agricultural reform: state-induced farm restructuring, state ownership of land, reforms to transfer land from collective farms to private farming use (IAMO 2008), and continuation of area-based state quota for cotton and wheat production at fixed output prices.
- Implementation of better sustainable land management (SLM) practices in Uzbekistan requires the development of new capacities of people involved in the management of pastureland. New skills and knowledge are required for officers working in related institutions – particularly at the regional and local levels – but also for communities that are using pastureland for their livelihoods. Related with the need for new skills and knowledge, there is also the need to strengthen procedures – particularly for assessing pastureland – in order to provide pastureland managers with better information for assessment and to develop an integrated land use planning systems.
- The arable land per capita in Uzbekistan is much below the global average (0.183 ha/capita vs. 0.26 ha/capita), and high population growth, desertification, and salinity will further decrease this relation. Income-generating strategies need to be developed for rainfed desert and semidesert steppes. Better utilization of low quality water/mineralized water and reclamation of marginal resources would also help.

1 Introduction: The Geographic and Socioeconomic Setting

1.1 The Physical Setting

The Republic of Uzbekistan is a double land-locked country, centrally situated in the heart of Central Asia (CA) within the Aral Sea basin (Fig. 16.1). Almost 80% of land areas of the country are comprised of deserts and semideserts, including the

Fig. 16.1 Administrative map of Uzbekistan Showing boundaries with neighboring Central Asian countries

Kyzyl Kum, the largest desert of CA. As a whole, the territory of the country, located in the arid zone of Asia, is highly susceptible to land degradation, desertification, and climate change.

It is estimated that more than 52% of the arable lands and 73% of rangelands are presently undergoing accelerated land degradation (CACILM 2006). There is a broad agreement [IFPRI (ADB 2009)] that Uzbekistan is among those countries most vulnerable to climate change due to a high sensitivity of its arid arable lands (Fig. 16.2), high density of population, and growing food insecurity (UNFCCC 2008). Average rates of warming since 1950 along the territory of the republic have been increased by 0.29°C per decade, which is more than twice the world average.

1.2 Climate

Uzbekistan being situated in the middle of the Asian continent is a subject to the cold influence of the Arctic and Siberian fronts that may reach the southern border near Afghanistan. Uzbek climate features a strong continental influence. In some years, winters are characterized by an unusually thick layer of ice on top of snowfall (locally known as "*jut*") that may occur and which are strongly detrimental to wildlife, especially ungulates population, preventing them from accessing snow-covered feed (Bekenov et al. 1998). Summers can be hot and dry (Gintzburger et al. 2003).

Fig. 16.2 Topographic sketch map of Uzbekistan with the large Kyzyl Kum Desert and the Aral Sea

The appearance, or not, of optimal distribution of spring precipitation makes the difference between the good vegetation (rangeland grazing year) and a poor season as a whole. Cycles of drought, which occurred in 2007–2008 and 2010–2011 seasons, negatively affected the vegetation of the rangelands, especially in Central Kyzyl Kum (Shuyskaya et al. 2012 in press).

1.3 Socioeconomic Situation

The GDP per capita in 2011 was $3,300 (CIA 2012). The level of low-income population in the country has decreased from 27.5% (2001) to 25.8% by 2005, but in rural areas it remains still high. Uzbekistan's HDI is 0.641, which gives the country a rank of 115 out of 187 countries with comparable data. The HDI of Europe and CA as a region increased from 0.644 in 1980 to 0.751 today, placing Uzbekistan below the regional average. About 64% from a total population of 27 million live in rural areas, and they directly or indirectly depend on irrigated agriculture. The arable land per capita in Uzbekistan is much below the global average (0.183 ha/capita vs. 0.26 ha/capita), and high population growth, desertification, and salinity will further decrease this relation. Source: (IMF 2008; IMF 2008a)

Population in CA is going to increase from 60.6 million (2008) to 79.9 million by 2050 mainly by the forecasted growth in Uzbekistan from 27.8 to 38.4 million. Already, now there is food insecurity in the poorer strata and increasing numbers of rural poor. Climate change has significant impact on rural poor, as poor people have little resistance to drought and have no savings to recover afterwards.

The crisis in public finance following the breakup of the Soviet Union prompted a dual process of demonetization and re-agrarianization in rural Uzbekistan, increasing reliance on household and subsidiary plots for self-subsistence and on off-farm and nonfarm informal income-generation activities significantly. The shift from collective farms to joint-stock shareholding companies *(shirkat*s) has resulted in a process of labor retrenchment that has affected women significantly. The liquidation of collective farms in favor of independent farms has consolidated farm management as a male occupation. While the actual labor input of women into farming activities on household plots and private subsidiary plots and in cotton production has remained extremely high, they are increasingly incorporated into the workforce either as unpaid family laborers or as casual laborers earning piece-wage rates.

In the 1990s, rural households were allocated land plots on the basis of what had been personal plots on state and collective farms during the Soviet period. Some 82% of Uzbekistan's households benefited from these plots, which allowed for a minimal standard of living. These plots (average size of which is 0.12 ha) have since become the basis for small family or *dehkan* farms. During the same period, the vast majority of state and collective farms were converted into *shirkats* (cooperative farms based on household contracting). Since the late 1990s, private commercial farms have also been introduced. In contrast to the *dehkan* farmers, the private farmers are allowed to use hired labor and to have larger plots. Since 2003, the *shirkats* in irrigated croplands have been gradually transformed into private commercial farms, and in the near future, the share of commercial private farms is forecasted to increase to up to 85% of total sown land and dehkan farms to 12%. However, the major parts of desert rangelands are still formally belonging to the state owned by Karakul production *shirkats*, which remain functional until today. Land is likely to continue to be owned by the state (Robinson, Chap. 11), but nonetheless, private farmers can rent it from the state for 49 years and peasant dehkans for livelong period with inheritance rights.

Still, without strong private sector development in the countryside, much of the rural population still relies on employment in *dehkan* farms, which in most cases amounts to little more than subsistence agriculture. While these workers are classified as employed, their actual income-generating opportunities are very limited, due to poor access to markets, credit, equipment, etc. The transformation of *shirkats* into private farms is also further reducing employment since the more efficient private farms have higher labor productivity rates and therefore employ fewer workers.

Rural areas in Uzbekistan were always disadvantaged compared to cities even in the Soviet period. However, the post-1995 economic policies have probably reinforced these disadvantages, producing rising poverty levels in remote countryside and more disparities between rural and urban areas. Demographic trends have

meant rapid growth in the supply of (mainly low-skilled) labor and poor employment opportunities in rural areas and small towns. These trends are pushing growing numbers of rural residents into small subsistence farming, onto *mardikhors* (informal labor markets), or into seasonal migration. In human terms, this translates into more vulnerability for rural residents with growing numbers of children being brought up in incomplete families.

2 Poverty, Inequality, and the Character of Economic Growth

Independence and the onset of the transition in Uzbekistan coincided with a number of severe shocks. To respond to these shocks and to transform its economic system, Uzbekistan followed a policy model different from that adopted in most other transition economies. This approach has been "unorthodox" both during the macroeconomic stabilization phase of 1991–1995 and during the recovery phase of 1996–2003. However, on the basis of this "home-grown" approach, the country managed to outperform the rest of the region during the stabilization phase and in the recovery phase sustained moderate but acceptable annual GDP growth rates of 3.5–4.0%, while in the last 5 years, the Uzbek economy has been developing at higher growth rates – 7.3% on average (IMF 2008). By 2001 it was the only country of the former Soviet Union to have surpassed its estimated 1989 level of GDP.

These relatively encouraging outcomes have, however, been marred by a number of persistent problems, which have prompted analysts and more recently the government to recognize that some policy changes might be in order. While poverty increased gradually – and, to some extent, unavoidably – during the contraction-stabilization years of 1991–1995, it then stagnated during the subsequent recovery and was accompanied by growing inequality. Indeed, income inequality has escalated markedly since 1995–1996, due largely to the policy bias that favored urban-based, capital-intensive, medium- and large-size enterprises. The capital-intensive nature of the import-substitution model followed since 1995 has meant that both urban and rural labor markets were unable to absorb the rapidly growing working-age population as well as the labor being shed in agriculture and the state-owned enterprises. As a result, while open unemployment has remained low, the number of underemployed engaged in low-productivity, low-wage, or part-time jobs is high. This can largely explain the continued high poverty levels despite relatively good growth rates.

2.1 The Profile of Poverty in Uzbekistan

It is estimated that 27.5% of the population or 6.8 million people were living below the poverty line in 2001 and that 9% were living in extreme poverty Source: (IMF 2008a). Within the framework of the Poverty Reduction Strategy Papers (PRSP), the

government has updated the poverty estimates for 2008 using the same methodology and estimates that the overall level of poverty fell slightly to 26.2%. The household budget survey (HBS) results suggest that around 70% of the poor population lives in rural areas. However, other surveys have also suggested that the poverty risk is high for residents of small towns, where employment opportunities have decreased (due to, e.g., the nonfunctioning of large employers) and where the access to land is more limited. In 2001, households with an unemployed head of household were more likely to be poor, but over 50% of the poor live in households where the head is actually employed. This suggests that poverty risk is linked not just to unemployment but also to underemployment and low wages. Low salaries in the public sector (where wages are 60% of the national average) and agriculture (50% of the national average) contribute to poverty among the employed. Poorer households were larger than average and had both more children (four or more) and adults Source: (IMF 2008; IMF 2008a).

The Gini coefficient[1] for Uzbekistan is estimated at 0.35 and has decreased since the mid-1990s. This indicates that, as in other countries in the region, there are average-to-high levels of income inequality. However, there are doubts about the household budget survey's ability to capture the upper-income population. This would lead to the underreporting of the largest incomes and the underestimation of inequality. Differentials in average wages between sectors also suggest high and growing disparities, particularly between agriculture and other sectors.

Income-generating strategies need to be developed for rainfed desert and semidesert steppes. Better utilization of low quality water/mineralized water and reclamation of marginal resources would also help. The situation is aggravated by the fact that local farmers have limited experience and knowledge of advanced soil and water conservation technologies for promoting the best practices of SLM.

3 Rangelands of Uzbekistan

Pastureland represents 22 Mha in Uzbekistan or about 50% of the total area of the country (Gintzburger et al. 2005). It is mostly desert land that is being degraded over time due to overgrazing, wood overharvesting, and unsustainable agricultural practices; the result is an increasing instability of desert ecosystems and poverty for populations living in these areas. Owing to its geographical and climatic characteristics, Uzbekistan is highly susceptible to environmental degradation, in particular its arid ecosystems (Fig. 16.3). The most serious ecological problems threatening the country's natural resources are incremental soil and water salinization, wind and water erosion, overgrazing and deforestation, loss of biodiversity, and the reduction in productive potential of arable land and pastures.

A major distinguishing feature of land degradation in Uzbekistan is loose sand, and according to the Forestry Department, some 2.3 million ha in Bukhara Oblast

[1] Gini coefficient – a measure of income inequality.

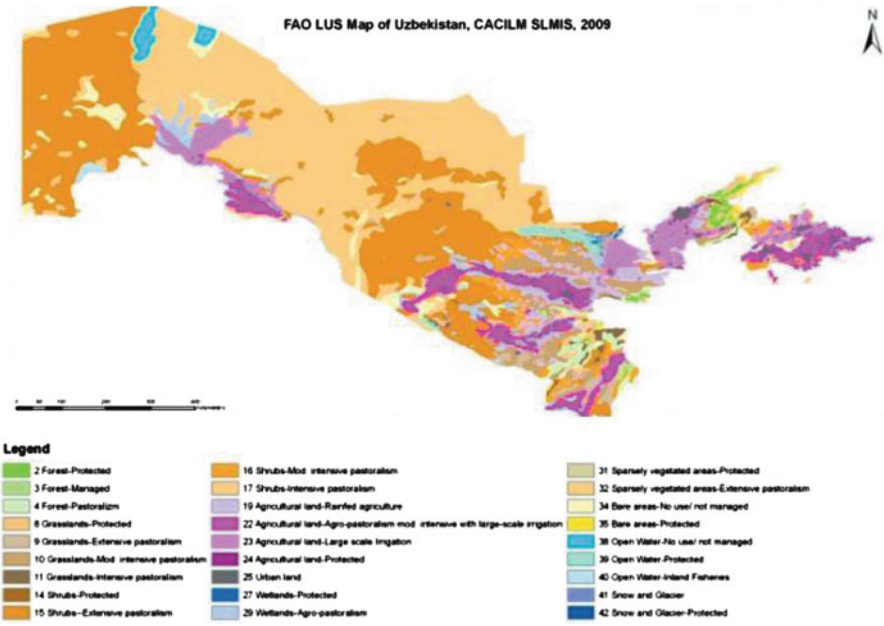

Fig. 16.3 Land use categories in Uzbekistan (*Source*: FAO, CACILM SLMIS 2009)

and 4.5 million ha in Karakalpakstan are affected by wind erosion. Sand is blown around by the wind with negative effects ranging from impact on people's health and well-being, reduced agricultural productivity, impact on roads and other infrastructure, contamination of water resources and environmental pollution, and morphological changes to land. In the case of the exposed Aral seabed, the sandy substrate has not had the chance to develop a surface fertile substrate, which would prevent most of the wind erosion that is responsible for the raising of 70 million tonnes of sand and dust per year into the atmosphere. It has been estimated by local experts that up to five million people in Uzbekistan are affected directly, and a lot more indirectly, by wind-blown sand and dust. Some have given up and have migrated away from the desert to cities in Uzbekistan or even other CA countries – communities are breaking up because of the impact of wind-blown sand.

Land degradation in Uzbekistan has two ultimate effects – ecosystem instability and poverty. In fact, these two effects are inextricably linked and each can cause the other (Holland 2010). They are also part of a closed loop whereby degraded land leads to ecosystem instability and poverty forcing desert communities to further stress the fragile desert environment, thus degrading the land even further and exacerbating the ecosystem instability and poverty.

Soil salinity is a serious problem in some of the locations of agricultural irrigated lands throughout the country due to groundwater, resulting from excess irrigation during cultivation of cotton and other crops, high evaporation during hot summer, and/or poor drainage function and maintenance. Due to the gradual increase in

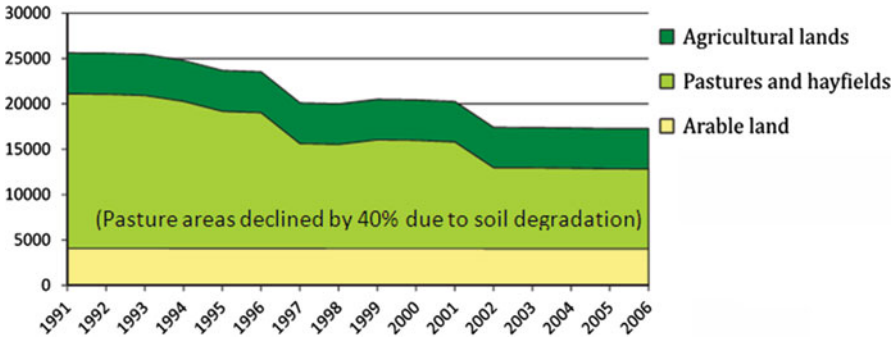

Fig. 16.4 Dynamics of land degradation in Uzbekistan (1,000 ha) (*Source*: Modified from UNDP 2010c)

salinization of soils and rising of water table, the majority of lands in the cropping farms have been gradually removed from cultivation of traditional agricultural crops. Data on salinity of soils and surface water from various sources (open canal, drinking water, and collector-drainage water) indicates a significant increase in the salinity levels. A direct correlation exists between the water table levels and the spread of salinization over different irrigated lands. In most of the farms, the farmers are forced to use the drainage water (4,000–5,000 ppm, 6–7 dS/m) when irrigation water is not available. The development of the new strategy of the sustainable use or rehabilitation of desert pasturelands (which currently declined by 40% due to soil degradation as is shown in Fig. 16.4) and adjoining agricultural lands in present conditions requires nontraditional and more complex approach to the assessment of the naturally ecological state of these anthropogenically transformed ecosystems. Nowadays, it is crucially difficult to rehabilitate and sustainably develop the salt-affected and waterlogged lands that are roughly estimated to make up about 60–70% of territories in the dry bottom of the Aral Sea, patchily throughout the Kyzyl Kum Desert, Aydarkul-Arnasay Lakes systems (AALS), and saline prone areas frequently found in the old irrigated agricultural lands of Uzbekistan.

The principal threats to land degradation affecting desert and semidesert ecosystems of Uzbekistan are as follows:

Overgrazing. Land vulnerability is exacerbated by local residents who overgraze available pastures by domestic stock, in an effort to survive. As the situation worsens, farmers tend to move further into marginal areas and to replace sheep with goats, which unfortunately complete the total denudation of land leaving it susceptible to wind action. Overgrazing of marginal land is particularly concentrated in the vicinity of settlements and around wells. In these areas, the land is not only denuded of all vegetation, but it is also prevented from forming the surface "skin" that is necessary to prevent wind erosion and begin the process of soil development.

Wood overharvesting. Local population cuts down trees and shrubs for wood fuel (Holland 2010). Unlike former times, when population in deserts was mostly nomad and the population number was not large, contemporary settlements require an extensive amount of wood fuel for cooking and dwelling heating. Obviously the settlers tend to cut any wood available instantly around the settlements in the first place. Besides, availability of motor vehicles provides an opportunity to harvest wood from more distant areas when wood resources around a settlement are exhausted. Country's desert and semidesert forest ecosystems are composed of a complex of trees, shrubs, and grass communities. Ecosystem diversity of desert and semideserts is low in comparison with other types of ecosystems, which makes them more vulnerable to any kind of outside interventions. Overharvesting of trees and shrubs by local population significantly lowers resilience of the ecosystem and results in its serious degradation.

Unsustainable agricultural practices. Because of their vulnerability, rainfed, unirrigated lands demand special attention in terms of their utilization for agricultural purposes. Inappropriate patterns of land use severely affect ecosystem stability and add to existing problems of land degradation. One of the factors that have contributed to environmental degradation in many parts of the world is that different agencies have had responsibilities for different aspects of the management of what is, essentially, one system. This means that even when there is effective planning, the potential benefits that could arise from integrated planning are not secured, and more commonly one sector impacts on others, frequently due to nothing more than a lack of awareness. However, integrated land use planning (ILUP) may be a simple concept, but it is hard to deliver; it is also a relatively new concept in Uzbekistan and will need considerable support if it is to become effective. There is considerable scope for ILUP to be a foundation for better land stewardship.

Lack of Enabling environment for pasture management. For policies to be successful, they need to be enabling and inclusive. At the local and national level, all relevant stakeholders need to involve, where possible, from the design stage. Their involvement enhances the chances that policies will be effective. The active participation of pastoral communities and district-level decision-makers is required for local policies and projects, such as integrated land use planning or community-based pasture use plans, to be practically effective and successful. It is crucial that the national and international agencies make a joint effort to seek development of enabling environment for pasture management of dryland areas in Uzbekistan. It includes the strengthening of the legislative framework and the related institutions and the capacity development of officials and land users in local communities.

Climate change impacts. Central and western arid regions of Uzbekistan are highly vulnerable to climate change (UNECE 2010) given that agriculture is a key factor concerning GNP and even more so with regard to food security, employment, and social stability. Increasing aridity and frequent droughts, combined with ineffective land management policies, also cause degradation and desertification of pastures. Predicted climate variability can lead to regular drought seasons in the downstream areas of the Amu Dar'ya River delta in western regions (SNC 2009). The climatic

effects might become even more severe in the region of Karakalpakstan with current shrinking conditions of afflicted Aral Sea basin. It is expected that the composition of plant communities in the rangeland used for pasture will be significantly altered, with consequences for forage production, cattle breeding, and sheep rearing. Implementing appropriate land and water management strategies that increase soil quality and productivity in drought affected areas is crucial.

Since practices that sequester soil carbon often enhance land productivity (FAO 2010), effective institutional policies designed to encourage soil carbon sequestering management practices could lead to potential dividends in greater crop production and enhanced producer income. There is an increasing global interest in soil carbon finance mechanisms by international agencies, investors, and national governments, e.g., through the nationally appropriate mitigation (NAM) mechanism. Since soil carbon sequestration potential is very high, it is most likely that this trend will increase further and it would create additional economic incentives for the government of Uzbekistan to invest and to support SLM practices (see below) in drylands. Practices that sequester carbon in soil stocks also tend to enhance resilience in the face of climate variability and likely to enhance long-term adaptation to changing climates.

Currently, there is a significant potential to increase carbon sequestration in rangelands of Uzbekistan by improving management of vegetation resources under the moderate grazing of livestock and ecologically friendly rangeland improvement (reseeding technique and others). However, mismanagement of rangelands and increasing livestock number lead to deterioration and overexploitation of vegetation resources in desert and semidesert zones. Increased livestock number decreases directly the biomass production of vegetation and indirectly the processes of carbon storage capacity in rangelands. Learning from best practices of international pilot projects in soil carbon storage and accessing available finance mechanisms could benefit both public agencies and rural livelihoods in drylands and help to enhance grassland productivity in the long run.

Hand harvesting of range forages for feed and fuel wood and concentration of livestock around populated areas and active wells are the main concern of imbalance between fodder resources, livestock, and human population. The dramatic decreasing of rangeland's grazing capacity and lack of winter forage and fuel wood lead to overgrazing and uprooting of shrubs that will devastate forage resources for a long time. Many of valuable forage species disappeared or are replaced by less palatable plants. Distant pastures are not utilized any longer, since availability of water resources in remote seasonal pastures is limited due to high levels of salinization or obsolete infrastructure. Most of the remote water wells maintained during the former Soviet period are no longer available. During the Soviet era, local pastoral communities have lost their skillful shepherds and vast of traditional knowledge accumulated since many centuries in CA. Thus, it is impossible to recover this unique knowledge and experience at present and either to use distant rangeland zones without detailed assessment of the water cycle combined with vegetative seasonality (UNDP/GM 2007). These processes induce further land degradation and desertification process from plains into the foothills and mountain areas, consequently – food insecurity in the region.

The livestock inventory is high in CA: sheep (43,923.000), horses (1,837.000), and goats (7,463.000). They are fed in the steppes and other rangelands for about 6–7 months a year. The dramatic increase in the number of goats (2007–2011) caused overgrazing that seriously diminished vegetation and transformed foothill steppes (dominated by *Artemisia)* into desert. For improving grazing capacity of rangelands, it is most important to increase the total plant biomass per unit area by ensuring a sustainable level of harvest or uprooting perennials as winter forages. This would allow development of more forage-based production for livestock feeding and would prevent further desertification (which can deplete the soil C stock, if left unchecked), impoverishment, and migration of the poorest strata. For the poorest strata, sustainable forage production on marginal, unused land might become an additional or even alternative source of income.

The dry grasslands and shrubland have long been neglected by policymakers because they were misperceived as being degraded marginal areas, offering poor returns on development investment. There is a lack of current information of the behavior of agropastoralists to the response of rangeland degradation and reduction of livestock production and livelihood income. Despite the existence of a large database on natural resources (soil, botanic diversity, bioproductivity of rangelands, livestock sector, etc.), most of these data, however, are not in digital form and are at risk of being lost due to rapid institutional changes. These databases have never been linked for the purpose of indication of potential role of desert grasslands for carbon sequestration, ensuring food security for the poor and making ecosystems more resilient to further climate change.

Application of contemporary research methods with the combination of available data is important for providing the relevant information for sustainable rangeland management. A lack of resources and experience inhibits the application of geographical information systems (GIS) and remote sensing (RS) technologies to establish the digital databases for assessment of vegetation resources of natural rangelands. However, nowadays, availability of RS data with high spatial and temporal resolution enables monitoring and assessing the current condition of rangeland vegetation and its long-term changes under the anthropogenic and ecological disturbances. Using vegetation indices derived from satellite data, seasonal and annual changes of vegetation cover and the trends of degradation processes can be analyzed.

Rangelands of Uzbekistan were once productive with quite diverse plant communities and well adapted to sustain grazing pressure from wild and domestic animals. It was due to unique traditional knowledge and local skills on seasonal pasture management accumulated by nomadic pastoralists since many centuries in CA drylands. It was based on practical knowledge of spatial and temporal variability of climate, water cycle, and vegetative seasonality (UNDP/GM 2007). Nowadays, many rangeland areas in the region, however, are not properly managed resulting in feed deficits, soil erosion, loss of plant biodiversity, and expanding desert margins. Undesired/unpalatable annual species is increased under intense and continuous grazing, and proportion of such species in vegetation composition consisted of 42% in an area affected by heavy grazing (Rajabov 2011). Increased numbers of unpalatable plants in vegetation composition led to a decrease in the qualitative values of the wrangelands.

Presence of *Peganum harmala* can be estimated as a sign of beginning of severe changes in vegetation structure under the intense grazing.

In addition, the collapse of the Soviet Union has led to disruptions of migratory patterns between summer and winter pastures and across national borders. In Uzbekistan, however, the tradition of nomadic pastoralist production was disrupted during the "modernization" effort during the 1950s, which resulted in sedentarization and large-scale conversion of rangelands to croplands. State-owned farms, specialized on Karakul production, were forced to develop larger areas of rangelands in new desert territories. Cropping on unsuitable lands was a contributor to accelerated land degradation mainly due to inefficient use of water resources, soil mineralization, and overapplication of chemical fertilizers. However, considerable field experiments by Soviet scientists contributed to combat land degradation and desertification with practically feasible methods and sound techniques. Nonetheless, sedentarization had also led to patterns of overutilization of rangelands near settlements and watering sources, resulting in declining of rangeland's carrying capacity, a clear gap in feed supply, especially in the autumn-winter period. But in late 1950s, wide introduction of winter fodder depository system in seasonal pastures had increased livestock productivity in state farms.

Increasing human population and expanding agricultural areas have resulted in heavier grazing pressures in rangelands in spite of the increasing availability of crop residues and grains and their role in livestock production. As a result of erratic cropping in low-rainfall zones, overgrazing of the good rangelands, and cutting of shrubs by local population for firewood, the natural vegetation of these desert areas is under pressure from anthropogenic degradation factors. This leads to the eradication of useful, endemic, or rare wild animals and desert plant species and to the reduction of rangeland productivity. Instead of the valuable fodder herbs, subshrubs, and bushes, plants of low palatability to livestock have appeared. The desert forests and subshrubs have completely disappeared from large areas. The all-year-round pastures, that were rich earlier, now have low productivity of fodder plants. The fast growth of cattle numbers urgently requires the increase of productivity of the pastures. The radical improvement of such pastures is possible only by the implementation of the large-scale phyto-melioration[2] and careful intervention. All of which involves a huge investment.

Climate change accelerates the rangeland degradation caused both by intense storms, soil erosion, fluctuations of rainfall, depletion of groundwater, as well as overgrazing and human activities such as gathering fuel wood and medicinal plants. More research and monitoring is needed to assess pasture carrying grazing capacity and improvement productivity, ascertain optimal times for grazing, and assist in improving regulation for pastureland in the context of climate change. To cope with climate changes, we need a better understanding of the current carrying grazing capacity of different types of rangelands and livestock controlled grazing system

[2] Plant-based land reclamation/restoration.

and use of integrated approaches on water harvesting and oasis development programs by using mineralized groundwater. Livestock production in rangelands of Uzbekistan depends mainly on access to groundwater sources since availability of rainfall is very limited, especially in desert and semidesert drylands. Introduction of biosaline agriculture production systems has proven to be an effective way to overcome the limitation of rising salinity levels for livestock production in drylands (Toderich et al. 2009).

3.1 Institutional Settings Around Grasslands

The national agricultural strategy of Uzbekistan in the early transition period after independence was mainly concentrated on support of staple crop production in arable land areas and in strengthening of the other sectors of economy in order to avoid deepening of the crisis and food insecurity (UNDP 2010b). However, national policies toward smooth institutional transition and development of livestock sector in dryland areas have lagged behind of the country priorities (UNDP 2010c). Since early independence, the government took nationwide agricultural reform: state-induced farm restructuring, state ownership of land, and reforms to transfer land from collective farms to private farming use (IAMO 2008). The land reform consisted of land distribution to individual households and small-scale producers in combination with farm restructuring programs whereby not only the land but all state-owned and collectively operated production units were distributed to the new market-oriented agricultural producers, including smallholders and private farmers (Robinson, Chap. 11, World Bank 1999).

The Ministry of Agriculture and Water Resources (MAWR), supervised by the Cabinet of Ministers of Uzbekistan, holds a leading position in development and execution of agricultural policy, including institutional governance of agriculture production and management of national land and water resources (SNC 2009). Regional- and district-level municipalities, as well as local branches of the MAWR, are responsible for planning and allocation of resources on meso-levels. The State Committee for Land Resources, Geodesy, Cartography and State Cadastre (Goskomzem) participates in its function of land use planner and repository for land use information. Goskomzem reviews land use policies and land use legislation and develops an interagency land use planning and management system. This is basically the main national institution to govern land registration, monitoring of land use change which has responsibility to regularly assess the state of soil quality in agricultural and nonagricultural land plots.

Large-scale pastoral land areas in central and northwestern parts of Uzbekistan are allocated to Karakul farm enterprises called "shirkats." All shirkat farms specialized in Karakul fur and wool production belong to the state-owned corporation "Uzbek Korakuli." Today it comprises of 106 Karakul shirkats, and it is the main responsible Uzbek institution for production, processing, and export of Karakul produce as well as for overall management of rangeland territories allocated for pastoral livestock

management. A nationwide network of community-based traditional institutions – "Mahalla" – plays a vital role in execution of district municipality orders for management, distribution, and monitoring of resource among rural communities in grassroot levels. Practices of development projects show that although National Land Code has been established in 1998 as the major legal framework for management of land resources, property rights and institutional arrangements over pasture land resources are yet weakly defined. Monitoring and enforcement capacities of district-level public authorities are limited in reaching distant communities and rangelands due to regular shortages in budget allocations, obsolete infrastructure and equipment, reduced number of administrative staff, and lack of economic incentives for them (SNC 2009). This is also supplemented by emerging conflict of interests over utilization of pastoral resources and informal land use on local level by community livestock herds and formal shirkat farm managers (IAMO 2008, Robinson, Chap. 11).

New for the post-Soviet state, input supply markets, insurance system, and private banking sector institutions were introduced in early years of independence in order to create basic support mechanisms for development of private farming and to strengthen agricultural production (UNDP 2010c). However, many small-scale farmers faced constraints in receiving these services due to lack of farming experience, insufficient collateral, and credit histories (IAMO 2008). It has to be noted as well that legal institutions and governance structures toward planning and utilization of pasture resources still undergo transitional changes and trial-error processes. It is not surprising, therefore, that informal rent-seeking solutions and patronage are widely used by producer groups, service providers, and market suppliers as a common practice to minimize risks of market failures and contractual uncertainties and to reduce transaction costs.

3.2 Pastoral Governance Challenges and Institutional Capacity Gaps

The present enabling environment for pastureland management in Uzbekistan is relatively weak. It does not provide a comprehensive and cohesive approach for the sustainable management of pastureland. The laws and resolutions often reflect the narrow institutional goal of a particular organization with no attempt to coordinate or integrate the effort for a comprehensive approach to the sustainable management of pastureland. Moreover, most of the legislation and institutions involved in the agricultural sector focus on arable land and particularly on irrigated land and on forests, but none are strictly focused on pastures. Furthermore, pastureland is not classified as a type of land use within the current land classification system used in Uzbekistan.

This weak enabling environment for the sustainable management of pastureland leads to two major limiting factors for good pastureland management:

- *Complex land ownership:* There are different types of pastureland users (*shirkat, dehkan,* private farm, and household livestock), and each one has its own set of rules and regulations. Additionally, households do not have formal access rights

to pastures for their livestock husbandry activities, despite owning a large portion of livestock grazing in these areas. This land tenure complexity is hampering a comprehensive and effective approach for pastureland planning and management. In the context of sustainable pastureland management, these land tenure issues need to be addressed over the long term if a long-term sustainable and economically productive system is to be put in place (Robinson, Chap. 11).

- *Lack of comprehensive and integrated planning and management approach for pastureland:* Despite some existing elements of pasture management, there is no comprehensive integrated planning process to manage pastureland in Uzbekistan. There is a need for putting the existing elements together in a comprehensive integrated approach, including a stronger participation of stakeholders (see below).

Little knowledge exists on the value of pastureland ecosystems, and according to national priorities, there is little chance for more national budget allocation to this sector in the short term. Decision-makers need to analyze and as much as possible quantify the importance of ecosystems to human well-being in order to make better decisions regarding the sustainable use and management of these ecosystem services. Better knowledge of the value of pastureland would support the mobilization of more national resources to protect and conserve these pasturelands. Implementation of better SLM practices in Uzbekistan requires the development of new capacities of people involved in the management of pastureland. New skills and knowledge are required not only for officers working in related institutions – particularly at the regional and local levels – but also for communities, *dehkans,* and *shirkats* that are using pastureland for their livelihoods. Related with the need for new skills and knowledge, there is also the need to strengthen procedures – particularly for assessing pastureland – in order to provide pastureland managers with better information for assessment and to develop an integrated land use planning systems.

The mandates of institutions involved in the management of pastureland need to be strengthened. The current mechanism of coordination in place among many institutions involved in managing pastureland is not sufficient. Additionally, no institution has the clear mandate to coordinate an integrated planning and management approach for pastureland. Moving forward will necessitate the clarification of roles and responsibilities of each institution and a clear coordination mechanism to ensure an applicable integrated planning and management approach for pastureland. Water points are key elements for managing pastures in dryland areas. Yet, it is not clear which institution is in charge of managing and maintaining water wells in dryland areas, and little legislation exists specifically for this type of water wells. It is estimated that the total number of wells is more than 3,000 scattered through dryland areas of Uzbekistan; however, these water points are in a mediocre state of repair. Many water wells are not functioning, preventing the pastureland areas around the non-functioning wells to be fully exploited. Overall there is a capacity gap between the enabling environment and the institutional framework (mandates, procedures, and mechanisms) and the reality in the field. Laws and institutions exist to assess, monitor, and manage pastureland in Uzbekistan. However, there are discrepancies between

the way it is supposed to work – including the laws, policies, and institutions – and the reality in the field; numerous capacity gaps exist (Squires, Chap. 12).

3.3 Options and Potential Strategies for Sustainable Land Management

The rangelands are a national asset of high economic, environmental, and cultural value, for which the whole Uzbek community needs to take responsibility. Therefore, a *national rangelands strategy* (NRS) is needed to be developed because the rangelands under current climate change face a wide range of problems, which cannot be easily resolved with current legislation and institutions, present knowledge, and existing dispute resolution procedures.

One of the key elements in this respect is to develop an integrated participatory planning and management methodology for pastureland. It is central for the long-term sustainability of the desert communities. Hence, the development of NRS and future implementation of the national land management plan should continue to emphasize a participatory approach inclusive of all key stakeholders. The emphasis on participatory processes maximizes ownership of project activities by stakeholders who in turn should become the ultimate custodians of planned achievements. This approach contributes also to maximizing the long-term sustainability of planned land management activities. The need for a strong stakeholder participatory process is particularly true for the development of a methodology for an integrated pastureland planning process. One suggested approach is to set up small working groups of key scientists and national stakeholders to review economic valuation of national grassland resources. This process will contribute to a greater understanding about the nature and extent of land degradation impacts on national economy and environment and among producers, consumers, and policymakers and would raise ownership of NRS and future planned achievements by national stakeholders.

Another key option is to strengthen the legislation and policy framework for pastureland management since the current legislative framework is a major impediment for good pastureland management in Uzbekistan. It has to include (Bellamy 2010):

- Revision of the Land Code and to include pastureland as a type of land with specific legal considerations; using international land type classification standards
- Improvement, simplification, and clarification of the process to become pastureland user such as revising the terms upon which shirkat farms operate and introducing clear pasture user rights for households livestock owners
- Legal recognition of an integrated planning and management approach for pastureland
- Reviewing the livestock policy and to approve a specific law on pastureland

The next option for SLM is to develop an integrated participatory planning and management methodology for pastureland with templates and manuals (Bellamy 2010). Based on the lessons learned and international best practices, it is recommended to develop a participative methodology to develop a participatory land use

plan for district-level municipalities and national-level agencies, including a spatial approach using GIS. It is important that this methodology be developed with a strong participation/ownership of key government organizations, which should be involved in the development of these plans.

Considering that pastureland represents about 50% of the total area of Uzbekistan and a significant percentage of the population uses pastures as their main livelihood, an important option would be to conduct a national socioeconomic study in dryland areas to assess the value of this type of ecosystems. The study would identify the services provided by this type of ecosystem, the contribution to the local economy, the contribution to the livelihood of local communities, and more generally the importance of this type of ecosystem for human well-being. In addition to this, another option would be to conduct a study of pastureland assessments conducted by Soviet scientists over the last 30–40 years and to assess the data collected by the Soil Institute through pastureland assessments conducted over the past decades. Using an appropriate methodology, the study would try to collate this information and assess the desertification trends over time (if any) for both dryland areas in Karakalpakstan region and the Kyzyl Kum Desert. As part of this exercise, the study would also identify vegetation capacities of grasslands versus capability toward livestock production, the monitoring indicators used to monitor land degradation in these areas, and assess how the WOCAT[3] indicators and the LADA[4] methodology (international standards) could be used to strengthen the monitoring of pastureland.

As mentioned above, a clear land ownership and tenure system have been a major challenge for improving pastureland management over the long term in Uzbekistan. Land ownership in Uzbekistan is a complex issue with different types of pastureland users including shirkats, dehkan, private farms, and household livestock owners. Each type of pastureland users has its own set of laws and regulations, which leads to a competing use of pastures and, in some instances, a skewed taxation system whereby a shirkat has to pay land taxes for an area that is also used by other pasture users. However, it was also noted that the government is encouraging the development of private enterprises through more and more allocation of certificates/licenses to private enterprises to produce Karakul sheep. This is a sign of privatizing the production of Karakul; however, it may add pressure on pastureland if the land ownership is not clarified.

4 Likely Impact of Climate Change and Its Implications

As a whole, the territory of the country, located in the arid zone of Asia, is highly susceptible to land degradation, desertification, and climate change (Chub 2007). Recent research by ICARDA has revealed the limitations in current knowledge on the

[3] World Overview of Conservation Approaches and Technologies (WOCAT). www.wocat.org.

[4] Land Degradation Assessment in Drylands (LADA). http://www.fao.org/nr/lada.

impacts of climate change on dryland forests and people. Dryland forest adaptation studies are relatively recent, and only a few have documented evidence of success in the implementation of adaptation strategies. Given the diversity of dryland forests, more precise regional and local climate change projections are required. Much more research is especially needed on the forest-related social and economic impacts of climate change. Poverty may push people to invade protected areas to use wild products, possibly unsustainably, while greater wealth may lead to even more exploitation of natural resources. It is necessary, therefore, to continue to support research that will reduce uncertainty about the climate change impacts on forests and improve knowledge about management and policy measures that will promote successful adaptation. Migration and urbanization are particular challenges. Protected virgin rangeland areas potentially can provide benefits in the form of genetic resources to the pharmaceutical, biotechnology, agrochemical, seed, horticulture, cosmetic, and phyto-medical markets, but these different markets give rise to a wide range of approaches to benefit-sharing.

The Fourth Assessment Report of the IPCC identifies soil carbon sequestration potential source of mitigation from agricultural sector – from both a technical and economic viewpoint (FAO 2010). International climate change negotiations have not been yet successful in development of fully functional soil carbon finance scheme yet. However, there is currently a soil carbon finance scheme available from voluntary carbon market. Voluntary market trades emission reductions known as verified emission reductions that cannot be used for regulatory compliance. Although the voluntary market is tiny compared to compliance market, the future potential of soil carbon finance from large-scale grasslands can be utilized by Uzbekistan as well. However, this future development requires efficient contributions and efforts from both international carbon market actors and national governments.

There are major government and donor programs for environmental protection and natural resource management in CA (see below), and Uzbekistan as a case study has sought to support agroforestry. Over the last few decades, a series of low-cost technologies the efficiency of nonconventional water use in agri-silvi-horticultural and silvi-pastoral systems to meet the food and feed demands and develop adaptation strategies for vulnerable communities to climate change and water resource shortage were tested and adopted (Toderich et al. 2008). Alternatives of land use contributing to income generation such as the reclamation of marginal lands by using non-conventional water for irrigation (drainage, takyr surface rainfall water, artificial pods with slight salinity, underground water) were implemented in Central Kyzyl Kum and Priaralie and in rainfed desert and semidesert foothills of Navoi region and Fergana Valley. Furthermore, introduction of drip deep small-scale irrigation technologies significantly assisted farmer and agropastoral communities. Various low-cost biosaline technologies for crop diversification including conservation tillage (or no-tillage intervention), efficient water (marginal quality) use, feed and livestock production, and rangelands management were evaluated with participatory work of rural communities, especially women groups (Toderich unpublished data). Rural-based communities were engaged through organizing of learning alliance between farmers, animal breeders, agropastoralists, and householders.

4.1 Initiatives Under the Aegis of the UN

Land resources in CA are severely affected by desertification caused by degradation of vegetative cover, sand drifting, water and wind erosion, salinization of arable lands, human-induced desertification, and soil contamination and water pollution with industrial and domestic wastes. The Sub-regional Action Programme (SRAP) of the UNCCD entails support for a regional network of stations to monitor desertification and creation of a regional mechanism to fight desertification, including afforestation of the dry bed of the Aral Sea and adjacent areas. The SRAP also includes measures to reduce poverty, including improvement of degraded pastures and arable lands, restoration of the irrigation network, diversifying agriculture and livestock breeding, and promotion of traditional and new methods for income generation, including agriculture, handicrafts, and ecotourism.

In the mountain ecosystems in eastern Uzbekistan, land degradation and overgrazing, coupled with the replacement of useful plant species by weeds, have led to reduced biodiversity, desertification, and reduction in ecosystem stability. The SRAP entails the development of a regional system for management of CA mountain ecosystems and protection from natural hazards. Several actions are proposed to improve social and economic conditions for the inhabitants of mountain territories (e.g., alternative energy sources, recreational activities, infrastructure, biodiversity protection, and promotion of eco- and agrotourism).

The SRAP provides a number of means to enhance public participation in regional decision-making related to sustainable development. These include strategies for ensuring independent analysis of information on CA projects and environmental conditions. Farmers, pastoralists, animal herders, and householders, especially women groups, were trained and involved in the activities. Accordingly, our recent studies began to involve the farming and agropastoral communities through participatory decision-making. The research approach, on-farm testing and verification and other measures, led to faster dissemination of sustainable technologies.

4.2 Central Asian Countries Initiative for Land Management (CACILM)

CACILM is a multicountry and multidonor, long-term (2006–2016) program in the spirit of UNCCD aimed at restoring, maintaining, and enhancing productive functions of land in the five countries of the CA while preserving its ecological functions. Its ultimate goal is to increase economic and social well-being of the population who depends on the land resources. In each participating country, National Programming Framework on SLM forms its strategic basis. CACILM is implementing the programs at national and multicountry levels, through the Support Project of CACILM Multicountry Partnership Framework.

4.2.1 Recent CACILM Activities

The overall goal of the National Focal Point to the UNCCD of Uzbekistan is to combat land degradation through the strengthening and mainstreaming of SLM approaches among all land management stakeholders. Attaining this goal will result in stabilized/improved ecological integrity and better living standards of rural population affected by dryland degradation and desertification. The goals and projects of the NPF group on the seven priority program areas identified are (a) capacity building for creating an enabling environment and for the integration of SLM into policy and planning, (b) adaptation of agriculture to climate change, (c) sustainable management of forests and renewable energy, (d) sustainable management of pastures and carbon sequestration, (e) applied research, (f) integrated resource management, and (g) restoration of vulnerable ecosystem in the Aral crisis region.

Issues and challenges of land degradation have impacts which are not limited to the national borders, but which affect ecosystems of neighboring countries and are of global importance. To assist the CA countries in their efforts on implementation of the UNCCD, the Global Mechanism of UNCCD has defined the Strategic Partnership Application (SPA) of the UNCCD in the CA countries. The primary goals of the SPA are originally connected with development of coordinated, integrated, and certain donor responses for CA countries' assistance in implementation of UNCCD. The SPA has supported CACILM at the partnership forum held in Tashkent, Uzbekistan, in June 2003. The forum participants (donors and representatives of the countries) have adopted the agreement to step forward (i) to integrate basic issues of SLM both in the field of sustainable development planning and into development frameworks of external cooperation of the countries-partners, (ii) to promote inter-sectoral coordination for harmonized operation of SLM initiatives, (iii) as a strategy of resource mobilization to take advantage of the GEF financing programs to combat land degradation, and (iv) to establish in each country of the CA the UNCCD National Working Group on partnership development for implementation of the UNCCD.

5 Barriers and Challenges to Implementation of Sustainable Land Management

As with other CA countries, Uzbekistan faces several major problems – accelerated land degradation and poverty. The majority of rural dwellers face uncertainty about land tenure. Most households are involved in subsistence farming or animal husbandry. Lack of collateral, poor rural credit facilities, and lack of knowledge are formidable barriers to improved incomes. Lack of knowledge about ecological concepts and the reality of living from day to day mean that there will be some time before the concept of land stewardship can take root and be translated into better land management practices.

The steps toward the adoption of SLM are well known, and programs are in place in Uzbekistan to put these into practice. Participatory planning and the support for the formation of land and water user groups may eventually lead to better land management. In the meantime, government policy on land tenure reform, support for rural finance facilities, and the development of the national rangelands strategy will be steps in the right direction.

Related to the need for new skills and knowledge, there is also the need to strengthen procedures – particularly for assessing pastureland – in order to provide pastureland managers with better information for assessment and to develop an integrated land use planning systems.

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