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Large Scale Grazing Systems (LSGS) in the Western Region of Afghanistan: Typologies, issues and options for sustainable rangeland management

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"…We have provided in it (the earth) sustenance for you, and for those whom you do not support" (Qur'an, 15:19-20) ***and "there is a reward in doing good to every living thing."*** (Bukhari & Muslim).

PREFACE

This thesis represents a boarding work and learning under the particular situation of Afghanistan that has taken place in a period of three years (2011-2013). I started this study with my background primarily in Animal science and rangeland management. I have joint the faculty of Agriculture, Herat University since 1993 as lecturer, I have worked more than eight years in different development projects mainly relevant to agriculture and community mobilization with national non-government organization and international organization, mostly in Western Region (WR) of Afghanistan.

Considering my background and the importance of extensive grazing system on livelihood of inhabitants regard to their productive system, life style and impact of rangeland on socio economy and environment, after a long period discussion with my professor, we decided to work on this topic. It was important for me to carry out a research that really interests me. Furthermore, Large Scale Grazing Systems (LSGS) in WR of Afghanistan have changed over time under different disturbances and pressures and the path of change is an essential part of their identity.

The vast majority of people in WR lives in rural areas about 90.2% and depends largely on land for their sustenance; there is limited scope for other means of earning a living. Therefore, for rural development appropriate policies and institutional support need to be in place.

WR geographical gradient creates the condition for nomadic pastoral systems like *Kuchi* that move throughout the country all year round except for the winter. This has special implications for development.

Rangeland in the WR covered and area about 7.7 million ha that best and economic way of utilization of this resources would be livestock management with aim to improve the production. In addition, a big number of livestock (7.1 million head), of which (6.2 million sheep and goats) are rearing in WR and main food source of these animals are rangeland that nowadays the quantity and quality of production is decreased, therefore strongly needs to introduce relevant options for sustainable improvement of rangeland resource management.

The analytical framework of this study was designed in the context of the LACOPE "landscape development, biodiversity and co-operative livestock systems in Europe project" (www.lacope.net) to the study area situation (Caballero et al. 2009) through expert and stakeholder survey (structured and semi structured interviews) and field survey, including village mapping.
The comparing LSGS is useful to obtain issues and identify opportunity for sustainable development:

- LSGS are endowed with itinerant herds/flocks or particular livestock lots. Mobility and herding patterns are main features of the grazing operation.
- LSGS are generally linked to the presence of indigenous livestock breeds (mostly sheep and goats). The presence of target vegetation types and plant species or potential vegetation changes are linked by co-evolution of grazing

behavior of these breeds. Moreover, the presence of indigenous livestock breeds is a distinction for local livestock products.

- In most LSGS the grazing season is conditioned by environmental constraints (e.g., cold season, dry season), and structural grazing seasons can be defined for different vegetation types and grazing grounds, e.g., lowland or highland vegetation types.
- LSGS involve communities of livestock farmers sharing productive forms, traditions and culture values that, in turn, shape the environment
- Poverty and lack of income opportunities of rural communities as this communities are major rangeland user.

The thesis begins with an abstract, followed by three chapter, including each an abstract, introduction (include hypothesis and objectives of the chapter), material and methods, results, discussion and references. The end of this thesis is a general conclusion. An appendix is also included as separate section.

The first chapter of this thesis describes background and literature review relevant to LSGS and gives a broad overview of Afghanistan rangeland, which include: Afghanistan's biomes, topography, climate, soil composition, water resources, natural forest, rangeland productivity, grazing animals and their mobility in Western Region. Discussion section is also contextualized under this chapter.

The second chapter identifies the system's boundary set for this thesis, which is focused on the *Kuchi* and sedentary grazing system typologies and their sub typologies of Western Region of Afghanistan, characteristics of main typologies, animal feeding systems of *Kuchi* and sedentary flock energy requirements in UFL (Tisserand et al. 1989), and AUE (Tonya 2010). Case study on different grazing system typologies are also analyzed, including come out from the LSGS survey (site characteristics, social issues, livestock, grazing management and village mapping). Results of this study are discussed and positioned in the international debate.

Chapter three presents Western Region rangeland issues, challenges and options that main topics of this chapter are: Rangeland issues (drought, fire fuel, rangeland conversion to cropland, grazing pressure, land tenure, animal drinking water), rangeland challenges, rangeland options.

The thesis appendix section, include relevant and useful information that could help the reader and represents complementary information. Appendix include a glossary of some Dari words in English, the expert survey questionnaire, list of different plants species recommended by authors. As relevant detail of village mapping exercise preformed during the field survey, the fact sheets of LSGS in WR.

The glossary has the aim to address the language boundaries that represent a constraint for data collection in rural context, and I hope will be of some help for those researchers interested in developing further research on WR LSGS in Afghanistan.

Mohammad Alam Ghoryar
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I gratefully acknowledge Prof. Wolfgang Pittroff (rangeland, livestock and watershed restoration adviser) from Germany, he shared with me his scientific articles, particularly which were written about Afghanistan's rangeland. In addition, I appreciate and thank Dr. Giovanna Seddaiu (researcher in agronomy section) for facilitating and organizing field activities and Dr. Salvatore Virdis (project manager in NRD) for helpful discussions, particularly on Participatory Geographical Information System (PGIS).

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I would like to thank the Agriculture department, all the doctoral school managers, professors and researchers of the Agronomy section with whom I have worked.

Finally, I want to thank my family members for their patience, endurance and deal with all affair of life along the three years, when I have been too far from them.

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ABSTRACT

Large scale grazing systems in Western Region of Afghanistan are an essential source for nomads and a large part of sedentary farmers, which drive their income from animal rearing and employment in the livestock industry. In addition, LSGS have changed over time under different disturbances and pressures and the path of change is an essential part of their identity.

Objective of this study is to identify the different grazing system's typologies, to address the most relevant issues and identify options for sustainable management of rangeland resources, with specific reference to the most relevant LSGS in the Western Region of Afghanistan.

Expert surveys, structure and semi structure interviews as well as community mapping and participatory techniques for field survey were the main methods used.

The prevalent way of rangeland utilization in Western Region is based on sheep and goat grazing systems. Rangeland utilization has been framed in to four typologies; *Kuchi*, *Nimeh Kuchi*, *Deh nashin* (sedentary) and semi sedentary, each type has effects on rangelands in a particular way.

Lacks of an alternative resource for fire fuel collection, rangeland conversion to cropland, grazing pressure, drought, and inaccessibility of grazer animals to water, proved issues of fundamental importance in WR.

Poverty of rural population, inequitable access to rangeland and limited capacity of the government to mitigate natural disasters are the major challenges.

Participatory approaches based on closed collaboration with local communities, and improvements of their traditional institutions are vital for the sustainable management of rangeland resources and the development of pastoralist production systems.

Key words: Extensive grazing system, typologies of grazing system, livestock, community behavior on rangeland, rangeland issues and options

CHAPTER (I)

Overview on Afghanistan and Western Region's rangeland

1. ABSTRACT

Analysis of rangeland policy issues and trend of rangelands is a national priority for Afghan pastoralist

The aim of this chapter is to make a investigate the past and current rangeland situation of Afghanistan and to brief overview of the study area natural resources such as forest, water, rangeland and grazing animals, relevant to large scale grazing systems.

Secondary sources such as books, academic research papers, government publications and web sources as well as my personal notices and observations were used.

Rangeland was held to be un-owned land, "open to the public," available for use on a licensing basis controlled by government and explicitly not permitted to pass into private ownership. Furthermore, biomes are varying from desert area (southwest) with lowest annual precipitation (<100 mm) to Nuristan forests (southeast) with high precipitation (>500 mm). Six main biomes are including; Desert vegetation type, steppe vegetation type, deciduous forests, evergreen broad-leaved forests, coniferous forests and Alpine Tundra vegetation type. In terms of vulnerability to desertification, the following were estimated: 0.5% low, 6.0% moderate, 6.8% high and 67.4% very high.

Western Region covers an area of 169,617 km^2, more than 61% of the region is mountainous or semi mountainous terrain while near to 38% of the area is made up of flat semi flat land. Based on Köppen climate type map of Asia, this region has arid hot-steppe, arid cold-desert, arid cold-steppe and arid hot-desert climate.
Natural resources include natural forest, water (*Hari Rud*, *Farah Rud* and *Murghab River*) and rangeland that played a great role for the livelihood of Western Region inhabitants.

The principal and big source of Animal food in Western Region is rangeland which covers about 7.7 million ha (45.6%) of the WR territory. Based on geographical location, this region provides different seasonal grazing areas. McArthur (1979) found, stocking rate in Herat province (*Ghoryan*, *Hamdam Ab* and *Gulran* area) was 1.63 ha per ewe equivalent.

This study may open the way for future system and inter-systems research and further refinement of rangeland management options. WR experts and other stakeholders agree on that LSGS can provide environmental services and side-economics activities with government policy amendments and community institution supports.

2. INTRODUCTION

The major part of world land (50%) is covered by rangeland (Mannetje 2002) and rangeland is an important land cover type in most dryland countries, extending over 30 to 50 Percent of their territories (FAO 2011). Furthermore, dryland are home to more than 2 billion people, about 35 % of human population on earth. Afghanistan is one of the countries with arid to semi arid climate and lies on the Asian continent with an area of 652,089 km^2, between lat 29°30'-38°30'N, long 60°30'-74°50'E, it is a very mountainous land. The highest point of the country lies in the main peak of Hindu Kush (*Nowshaq* 7485 meters above sea level) and the lowest point (*Khamab* 256 m a.s.l.) is where the *Amu Darya* flows out of north central Afghanistan (Qureshi 2002, Omid 2009 and Breckle et al. 2010). The Hindu Kush is the dominant mountain range in Afghanistan and generally runs from East to West direction, somewhat in the center of the country and separates the northern areas from the southern areas. Desert is found in southern, western and northern Afghanistan. The state territory based on topography, can be divided into three groups: Lowlands with 300-500 m a.s.l., medium land with 500-2,000 m a.s.l., and highlands between 2000-7500 m a.s.l. About half of the country has an altitude of more than 2,000 m (Qureshi 2002), Thompson et al. (2009) showed that there are three geographical regions: The northeastern region, that consists of mountainous terrain with average elevations over 3,000 m, the north-central region, a fertile valley between the Hindu Kush mountain range and the *Amu Darya* River; the southwest region, mostly desert.

The climate of Afghanistan varies from arid in the south and southwest to semi-arid in most other parts of the country (Qureshi 2002). According to Peel et al. (2007), based on the Köppen-Geiger climate classification, Afghanistan has five type of climate: BWh (arid hot desert), BWk (arid cold desert), BSh (arid hot-steppe), BSk (arid cold-steppe), and Dsa (cold dry and hot summer). Furthermore, Hassanyar (1983) demonstrated six types of climates, 1) Desert climate, 2) Monsoon climate, 3) Mediterranean climate, 4) Steppe climate, 5) Alpine climate, 6) Mountain climate.

Agriculture has traditionally occupied a central position in the Afghan economy, and a high proportion of rural Afghanistan has historically depended on agriculture for their livelihoods. After years of disruption due to intermittent conflicts, drought and population movements, there were high expectations that agriculture would return to its former primacy following the establishment of the new political situation. Pittroff (2011) found that there are three fundamental importance for the intertwined role of resources of agriculture and natural resources in Afghanistan; these are water, livestock and fire fuel.

Total cultivated land area is 12.1% (5.1% irrigated agricultural land and 7% rainfed cropland), forestland 2.1%, rangeland 45.2 % and barren land 37.3%. These significantly show that there is a good potential for development of livestock farming through improvement of the rangelands. Nowadays 80% people of Afghanistan are occupying in the agricultural sector, 10% in industry and 10% in services (Thieme 2006). Farmers in Afghanistan access and utilize land for agricultural production under diverse systems of tenure, which range from full ownership to leasing (*ejare*) or share-cropping or taking possession of land as mortgage collateral, each of these systems is rooted in the social, customary and economic institutions of rural Afghanistan. Land use must therefore be investigated within this institutional context

if land management and farmer decision-making are to be better understood (Roe 2008).

Historically, the management of livestock and sale of its products have made an important contribution to rural livelihoods in Afghanistan, being large areas of the country unsuitable for cultivation, but seasonally or perennially exploitable for livestock, the rural population has commonly managed stock either as a complementary component of mixed farming or alternatively as specialist pastoralists. The importance of livestock is recognized not only in terms of livelihoods and in terms of rural food security but also it is a potential contributor to national economic growth. Although surprisingly resilient through the years of conflict, the livestock sector was damaged severely by drought, between the years 2000 and 2004, which was understood to have led to significant decline in livestock numbers. Small animal stock is often the only capital asset of the landless (Roe 2008). Zia (2005) showed that livestock cover four fundamental points in Afghanistan: a) big source for occupation, b) importance source for export of the materials and currency exchange, c) more adaptability to Afghanistan's specific topography condition, and d) source of food and raw materials. Robinett et al. (2008) showed that "natural resources found on rangelands and woodlands are vital to the survival of communities and nomads".

Moghaddam (2009) stated, "Rangeland is science and art to establish appropriate balance between rangeland useable products based on society need through management of rangeland ecosystem". Rangelands may include natural grasslands, savannas, scrublands, many deserts, steppes, tundra, alpine communities and marshes.

"Large scale Grazing System (LSGS) are cultural landscapes emerging from the interaction of human behavior and natural resources. They are broadly defined as extensive system of grassland management located mainly in harsh environments and marginal areas" (Caballero et al. 2009; Caballero 2012)

Given the current situation of competition on land and the necessity of food production on national level, the marginal land (e.g., rangeland) should be put to optimal use (Weijer 2007). Furthermore, "Human activity and natural event have an impact on the biophysical resources of ecosystems" (Squires 2010).

The three major factor that driving the rangeland degradations are a) fire fuel extraction, b) over grazing, and c) conversion to rainfed grain production (Pittroff 2011). A main cause of rangeland degradation and resulting social conflicts is the insecurity (Stanfield 2010). Therefore, another important phenomenon accompanying this degradation of rangeland is the conflict among villager and *Kuchi* people on land tenure issues.

The most important principles for sustainability of the rangeland ecosystem in arid and semi-arid regions are based on: 1) natural resource conservation, 2) decreasing risks, 3) maintaining or enhancing biological productivity, 4) economic viability, and 5) social acceptability (Snymam 1998).

Hypothesis

Three main hypotheses were in this chapter:

1- Large scale grazing systems are among the most relevant human activities in developing countries and their improvement is a major driver of the economic and social growth of Afghanistan.
2- The implementation of a diagnostic analytic framework to identify issues and priorities around these systems is a prerequisite for identifying options for sustainable development.
3- LSGS of Afghanistan have changed over time under different disturbances and pressures and the path of change is an essential part of their identity to be addressed in order to contextual policies and actions.

Objective

The general objective of the study is to identify and investigate the different grazing systems' typologies of Western Region of Afghanistan and their most relevant issues, through an expert survey.

To identify options for sustainable management of rangeland resources, with specific reference to the most relevant large scale grazing systems in the Western Region of Afghanistan**.**

Specific objective of this chapter are:

- To investigate briefly the past and current rangeland situation of Afghanistan
- To make an interpretation of the livestock census
- To introduce the study area in detail
- To brief overview natural resources (forest, water, grazing animals and rangeland) of the Western Region of Afghanistan

The methods used for the data collection reported in this chapter were based on analyzing secondary sources such as books, academic research papers, government publications and web sources as well as my personal notices.

Most of available data in literature review were analyzed at national level. In this chapter, I analyzed and interpreted data on province and region levels.

Discuss the relevance of considering the whole range of rangeland resources in designing a developmental pathway. The concept of large scale grazing system was useful to extend the analysis of the pastoral system from just the quantification of the feeding system components, to the systemic relationships between pastoral and natural resources and the other needs of the pastoral community, which appeared to be particularly relevant in such context.

The following bio-physical components of such pastoral systems were considered, beyond climate and soil as relevant for the development of the pastoral communities:

- Water
- Rangelands
- Forests

Spatial distribution of resources and institutional framework is crucial in designing strategies for sustainable use. However, these resources are currently used by pastoral communities and are often in competition for the different uses (e.g. woody plants for fire fuel and feed). Furthermore, the unsafe situation generated by the war conflicts constrains the optimization of resource use (e.g., Pistachio) leading to further conflicts. The following chapter proves the principles behind Holistic Management (Savory Institute 2012).

3. RESULTS

3.1. Afghanistan's biomes

About 50% of Afghanistan land has an altitude over than 2,000 m a.s.l., and 10 % has less than 500 m a.s.l. Five major natural landscape units can be recognized at the bases of condition (Breckle et al. 2010).

- The high mountain of *Hindu Kush* (over 4,500 m), with more than 700 mm mean annual rainfall
- The mountain region of central Afghanistan including *Koh-e Baba*, *Ferozkoh* and *Terband-e Turkistan* (1,250-4,500 m) with 200-700 mm means annual rainfall.
- The semi-desert and steppe regions of the southwest and those of north Afghanistan (less than 500 to 1,250 m), with 100-200 mm mean annual rainfall.
- The arid desert-lowlands of south west of Afghanistan (less than 500 to 1,000 m), with less than 100 mm mean annual rainfall.
- A narrow strip at the eastern part of the country comes under the influence of the Indian summer monsoon where a secondary maximum of rainfall occurs. This region has mean annual precipitation between 500 to 1,000 mm. The basin of Jalalabad and Laghman are in this so called "summer rain strip" with yearly less than 500 mm precipitation.

Afghanistan's biomes vary from desert area (to southwest) with lowest annual precipitation (<100 mm) to Nuristan forests (to southeast) with high precipitation (>500 mm). Hassanyar and Esmaty (1984) introduced six main biomes in Afghanistan as follow: Desert vegetation type, steppe vegetation type, deciduous forests, evergreen broad-leaved forests, coniferous forests and Alpine Tundra vegetation type.

According to Breckle et al. (2010) the altitudinal belts of climate in general are characterized by the vertical temperature and precipitation gradient, Figs. 1-2 show the altitudinal belts of climate and vegetation in the central *Hindu kush*, *Safed Koh* and central of Afghanistan mountain, with in two languages (English and Dari) by the authors.

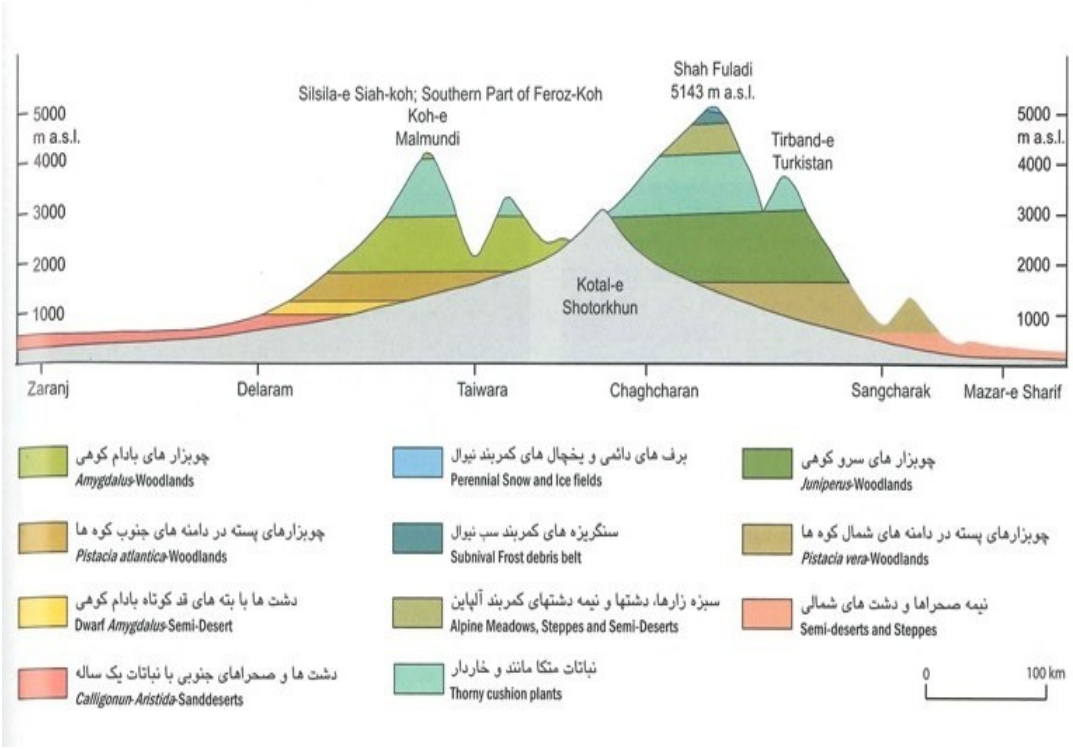

Figure 1. Cross-section of the altitudinal belts of vegetation between Zaranj and Mazar-e Sharif provinces (Breckle et al. 2010)

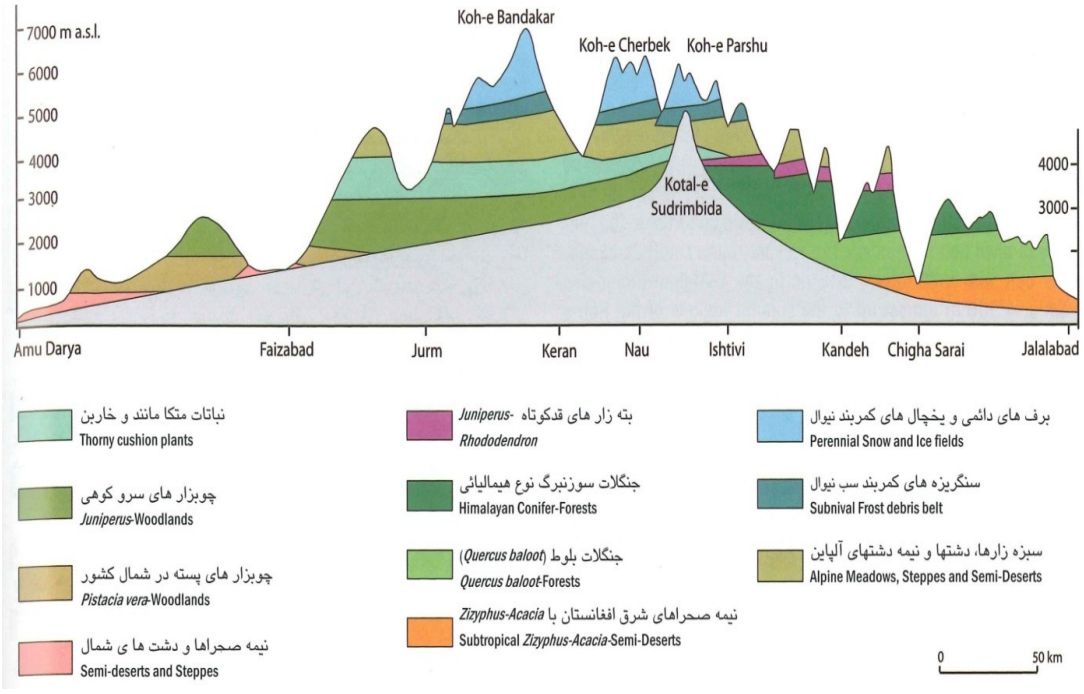

Figure 2. Cross-section of the altitudinal belts of vegetation between *Amu Darya* and Jalalabad province. (Breckle et al. 2010)

3.2.Overview of Afghanistan's rangeland

Afghanistan rangelands are important resources for grazing livestock to produce meat, fiber, peel, and manure for fuel and organic fertilizer. The grazing of small ruminants, mainly herded flocks of sheep and goat, over the last 5,000 years has been an important factor in shaping the development of country plant biodiversity.

The diversity of Afghanistan rangelands is largely associated with the extreme topographic variation in the country that influences precipitation patterns, climate, and natural productivity. There have been numerous general geographical, climatological, and ecological classifications of Afghanistan land (Bedunah 2006). The vast majority of the grazing lands low precipitation and winter is characterized by very low and the main grazing vegetation type is the *Artemisia* steppe (Thieme 2006). Hassanyar et al. (1983) described three categories of rangelands and he estimated that total rangeland area of the country was 54.70 million ha, of which the winter seasonal rangeland 16.21 million ha, the spring and autumn seasonal rangeland 16.03 million ha, and the summer seasonal rangeland 22.46 million ha. The relatively small extent of the *Artemisia* steppes that provide winter pasture in the south and west limits the number of livestock. These areas are very sensitive to overgrazing, and the recent data shows that the rangeland is covered as embracing 45 percent of Afghanistan's land area or around 29 million hectares clarity that rangeland are decreased from 54.7 M. ha to 29 M. ha(Thieme 2006). Some of this rangeland is also usable for rain-fed farming and has been customarily used in this manner, despite this being illegal under state law. It is also used for collection of thorny plants (*khar*) for instance *Alhagi camelorum*, crucial for winter fodder. Parts of the land classified as barren land (37% of the total land areas) are also usable as pasture on a short basis in summer (Wily 2004). If we ignore the barren area, it is occurred big decreasing percentage (around 37%) between rangeland areas before war and now. Estimated that total rangeland area before war was 82%, because Afghanistan's rangeland suffering from drought, plant collection for fire fuel and conversion to rainfed cropland.

On the other hand the desertification process in Afghanistan has intensified even more: Afghanistan area estimated as vulnerability to desertification is 0.5% low, 6.0% moderate, 6.8% high and 67.4% (436,480 km^2) is very high (Breckle et al. 2010).

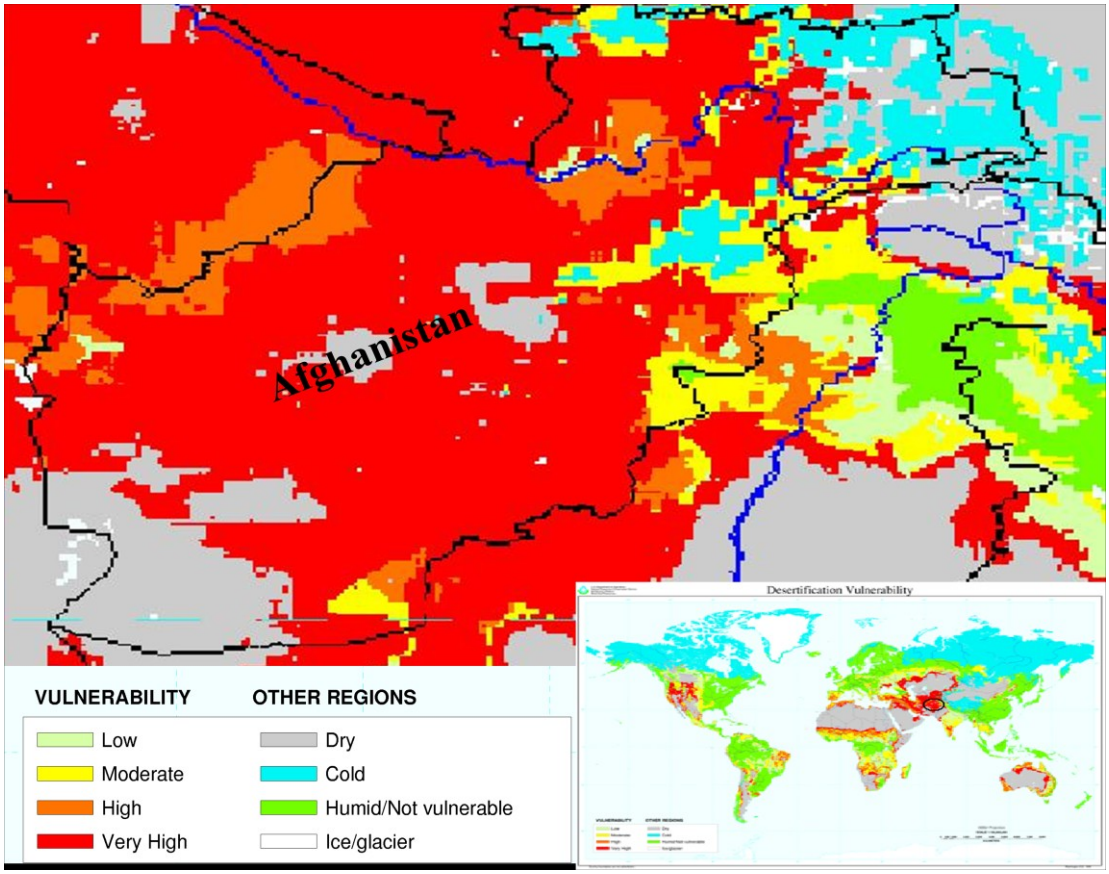

Figure 3. Map of vulnerability to desertification in Afghanistan.
Source: UNEP et al. 2008.

Rangelands in several parts of the country (because of high unpredictable and variable rainfall events) have recovered quickly suggesting long-term resilience. Under conditions of normal rainfall, these rangelands have the potential to support a substantial livestock economy that is particularly amenable to nomadic pastoralist production. Rangelands are specified as land where the predominant vegetation consists of grasses, herbs, shrubs, and may include areas with low-growing trees (e.g., juniper, pistachio, almond, cedrus, oak).

The development of appropriate vegetation maps based on remote sensing-derived vegetation indices, as such indices fail in situation of low vegetation cover (<30%, typical for Afghanistan) because soil signal tend to override vegetation signal (Pittroff 2011).

3.2.1. Rangeland ownership and accessibility

Rangelands are defined as uncultivated lands that supply a grazing or browsing resource to domestic and wild animals. Pasture is "any land used for grazing in the past and present" (Ministry of Justice 1965, Article 63). Based on Article 65 of this law, pasture was held to be un-owned land, "open to the public" available for use on a licensing basis controlled by government, and explicitly not permitted to pass into private ownership, (Ministry of Justice 1965). Pasture Law described pasture as "public property", and Glatzer (1992) identified two types of legal access to pasture: Rights to pasture and permission to use pasture (mediate and intermediate rights).

Pasture rights were held by individual households even though several households may form temporary groups for making use of their rights jointly. Weijer (2005) demonstrated the pasture rights as follows:

In the lowlands (winter pasture), there are neither individual nor corporate ownership of pastures except in the immediate vicinity of villages. Pastures are free for all as long as those who claim usufruct/eternal rights for a defined area do not appear with their animals on the scene. Reservation in absentia is not permitted. Usufruct rights can be obtained simply by using an area for several consecutive years.

In the highlands (summer pasture), the best pastures are under the control of the nearest village that owns the pastures corporately and rent them out to nomads on a seasonal basis. Nomads can acquire firm grazing rights by purchasing farmland, canals or wells in or near to the pasture. This option is rarely used because the quality of a given pasture in the western central highlands may change from year to year.

Nomads who lacked formal ownership rights to pasture or those that did not have enough pasture, could pasture on a temporary basis by formal lease or paying a fee (Bedunah 2006).

Afghan people's livelihoods depend entirely or partially on rangelands, whether they are from nomadic, or sedentary, among them, pastoralists are the main rangeland users and managers. More than 85% of the rural Afghan population holds livestock as a key component in their livelihoods.

According to the National Multisectoral Assessment on *Kuchi*, some 2.43 million identified themselves as *Kuchi* (Weijer 2005, 2007), this represented close to 8 percent of the estimated total population of the country. Of these *Kuchi*, the majority described themselves as long-range migratory (52%), while about a third was short-range migrants (33%), only a small proportion of these *Kuchi* (15%) are as settled.

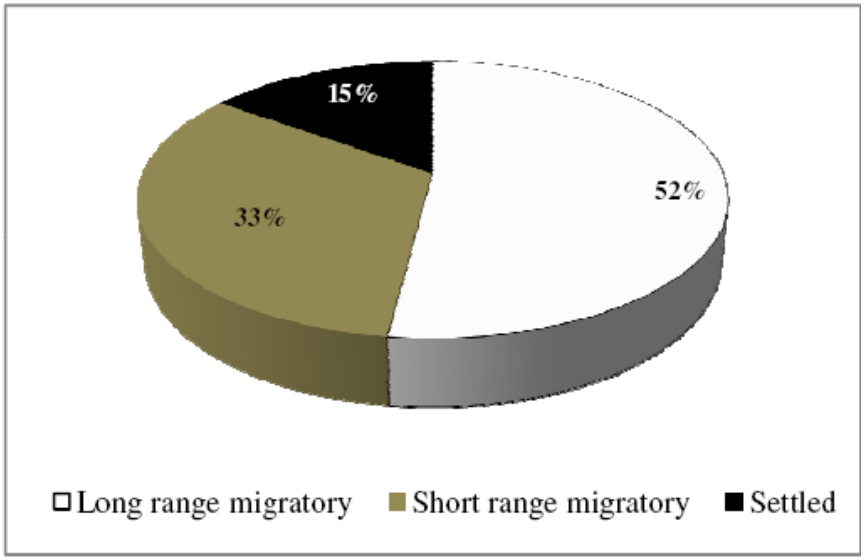

Figure 4. Estimated *Kuchi* Population of Afghanistan by migration categories

Source: Weijer 2007.

This simplistic categorization doubtless masks the true complexity of *Kuchi* residential strategies, whereby some household members may migrate, while others

do not, or whereby households migrate in some years, but not others. These findings show that migratory *Kuchi* represent a considerable population in Afghanistan.

Weijer (2007) found that "only through a migratory system can the marginal lands of Afghanistan be put to economic use". The larger majority of *Kuchi* are *Pashtuns*. Among Pashtun *Kuchi*, there are distinctions between the *Ghilzai Pashtuns* of eastern Afghanistan and the *Durrani Pashtun* nomads of western and northern Afghanistan, often referred to as *Kandahari* (and who often refer to themselves as *Powindahs*). They speak different dialects of *Pashto*, use distinctive styles of black tents and have different labor practices. Non-Pashtun *Kuchi* groups who also use black tents include the *Baluch* and *Brahui* in the southwest

The migration practiced by most *Kuchi* clans follows regular routes between the same high altitude summer pastures (*ailoq*) and lowland winter camps as vertical. The distinct topography of Afghanistan, with its central highlands, means that most Afghan nomads migrate from the outlying lowlands into these central highlands to exploit the pastures. One of these provinces is the Ghor province that is located in Western Region (Fig. 5).

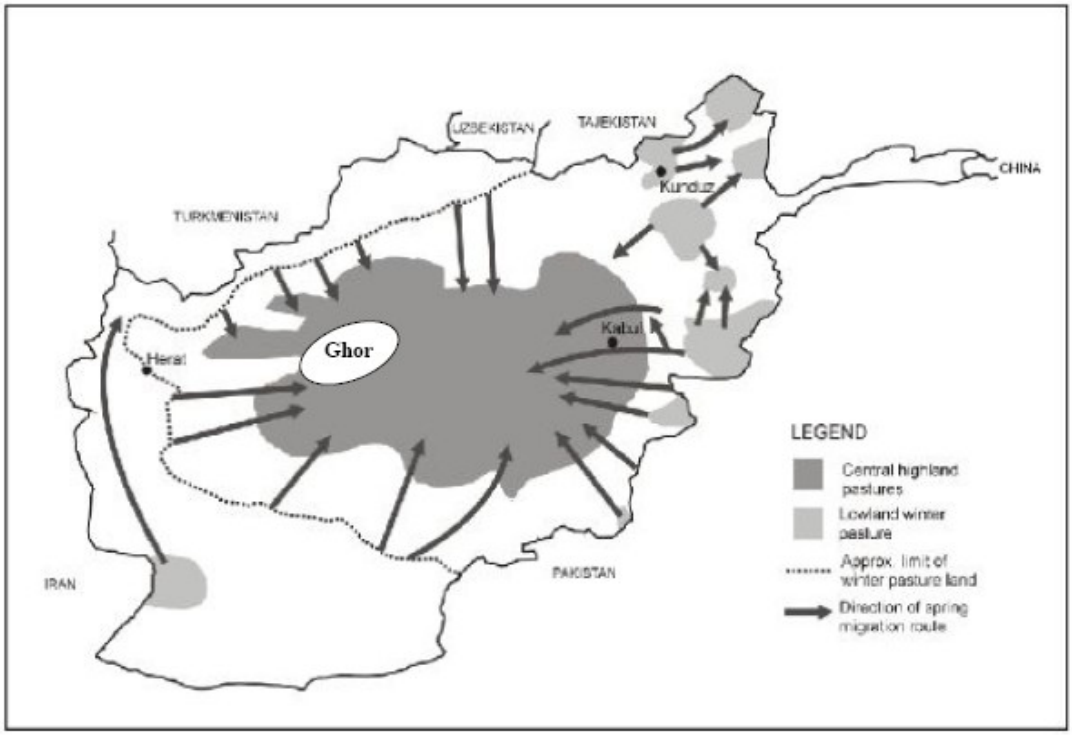

Figure 5. General pattern of nomadic migration in Afghanistan.

Source: Roe 2011.

Drought and in generally many other factors including war, the collapse of the veterinary services, and livestock diseases are riddling a weakened national herd. All of these factors acted to reduce livestock numbers. In addition, the "longest drought in living memory" has raged since the late 1990s, reducing the pasture available and further decimating the livestock herds.

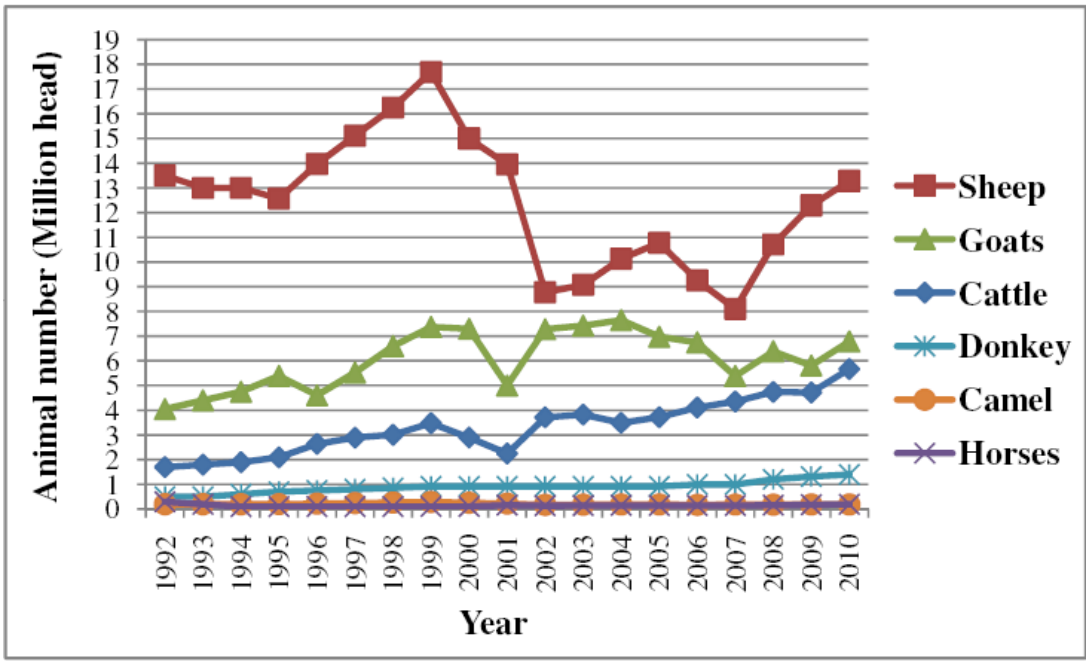

Figure 6. Different categories of livestock of Afghanistan.

Source: http://faostat3.fao.org/home/index.html#VISUALIZE. Accessed 28.06.2013

A big part of the livestock in Afghanistan is managed by *Kuchi* (around 30-50% of the national herd) that own primarily sheep but also take baggage animals with them (camels and donkeys). The proportion of households in all ethnic groups who live primarily by nomadic livestock-keeping has declined over the last century; by need or choice, some of them are now settled farmers or urban dwellers, or live largely through mobile trading, a traditional specialty of some *Kuchi* groups.

3.2.2. Soil composition

In Afghanistan, the research status on soil is still in its infancy, in contrast to other topics. The widespread dry climate in Afghanistan and the lack of vegetation cover and/or their extremely high degradation lead to steady soil degradation through soil erosion caused by torrential heavy rains, by aeolian processes, by soil out-wash, and not least through a variety of anthropogenic activities.

The extreme contradictions in the soil quality in Afghanistan are a result of the varied topography, the petrology basis, the climatic differentiation in its hypsometric arrangement and the vegetation cover (Breckle et al. 2010).

Omid (2009) identified different types of Afghanistan's soil, which depend on the climate, landscape and morphological structure.

- **Desert areas soils**: These areas are located in north and south and cover 17% of the Afghanistan soil. Most of these areas are used as pasture for *Karakul* sheep grazing. Desert sandy soil, rangeland and Takyr soils **(**Ashen and Brown soil with some quantity of humus 0.5-1% in weight, capacity of top surface are 3g. cm^{-1}, and vacuum in mud 44-46%), humidity of this zone in summer season 10 % and in winter 40 %, so amount of evaporation from water and soil surface is 2,500 ml. $year^{1}$.

- **Mountain areas soils:** These areas covered around 26% of total Afghanistan soils that include highland 13.8% and lowland 12.2%.

- **Sierozem soil areas:** These areas are located between 1,000-3,000 m a.s.l. In the south part, underground water depth is 3-5 m and in flat area, this water reduces the depth of 1-3 m, it causes soil salinity. Climate of Sierozem soil is warm in summer and temperate in winter. Humidity stored as rain and snow. Precipitation**s** not reach more than 400 mm, especially during the cold days of winter season. Average annual temperature is 14 °C, average minimum annual temperature is 5°C, and maximum temperature is 40 °C. Evaporation from surface water reached to 1,600 mm annually and evaporation is 4-6 degrees more than stored humidity.

  The rainfed agriculture (*lalmi*) is based mainly on the soil group of so-called Torrifluvents, these young (a few hundred years old) alluvial soils of dry regions are mostly developed on alluvial fans, fanglomerates of valley outlets, pediments, and on the alluvial terraces at the bottom of large valley. On the predominantly rock slope foots of upper reaches of some major rivers in the south west (*Farah Rud*, *Khash rud*, *Helmand* and *Arghandab*), soils from the group Lithic Haplocambids are developed.

  General characteristic of Afghanistan's soil

  - Development of Profile is very low and not specific.
  - Soil has brown and light ashen color.
  - High quantity ($CaCO_3$) in all profiles.
  - The soil pH is generally > 8.
  - High quantity of K in soil combination.
  - Low quantity of organic materials, between 1-2%.
  - Hard structure of soil, especially when soil dried. It is depends on the high quantity of clay, $CaCO_3$ and silicon and low quantity of organic.

  Most of Afghanistan's soils are alkaline and have $CaCO_3$ characteristic. Estimated that 50% of Afghanistan soil has pH between (8.0-8.5), 35% has pH (8.5–9.0) and 15% has pH between (9.0-9.5).

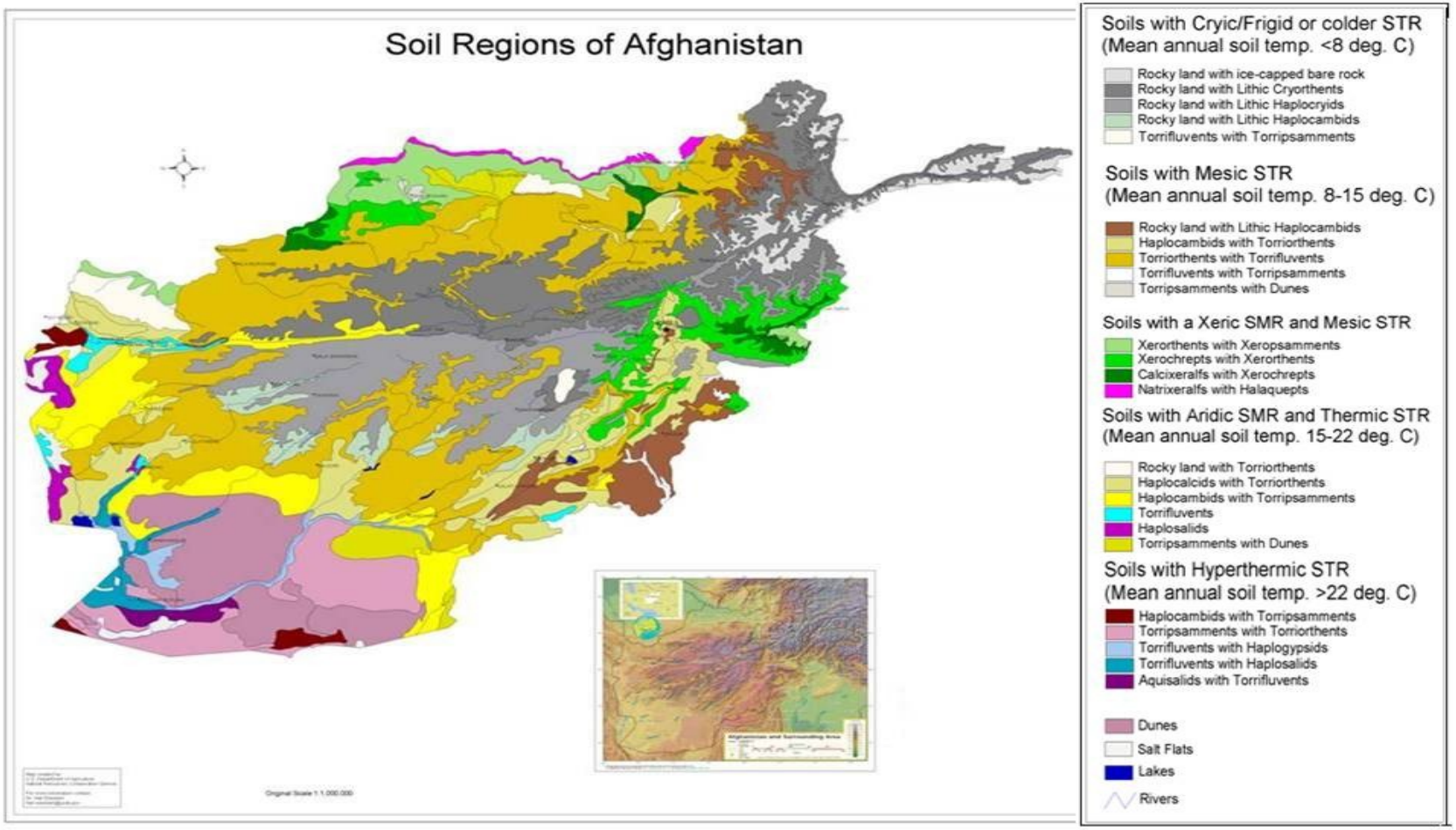

Figure 7. Different soil regions of Afghanistan
Source: http://soils.usda.gov/use/worldsoils/mapindex/afghanistan-soil.html. Accessed 05.06.2013

3.3.Study area (Western Region of Afghanistan)

Western Region of the country includes four provinces Herat to the west, Ghor to the east, Badghis to the north and Farah to the south of this region.

People are concentrated in the provincial cities and urban centers scattered throughout the provinces. The city of Herat, one of the outposts along the ancient silk route of the east, is the main urban center of this region.

In comparison to other parts of Afghanistan, the rural areas aren't overpopulated. Three main rivers, *Murghab*, *Hari Rud* and *Farah Rud*, flow through the area where irrigated agriculture and horticulture take place along their banks. In the arid lands of southern Herat and Farah provinces, farming relies on *karez* (traditional underground canal system tapping subterranean water sources).

The majority of rural families are small landholders and the main crop is wheat, with secondary production of barley, peas, corn and cumin. In normal years, many farmers cultivated a second crop of rice, corn and lentils, though this has decreased due to water shortages, with the exception of the irrigated lands along the Murghab River in the Badghis and *Hari Rud* in the Herat province.
Total population in Western Region is estimated about 3.4 million people, in which 90.2 % rural and 9.8 % urban inhabitant

Table 1. Population of different categories of people in west region.

Province	**Total area (km^2)**	**Total population (1000 person)**	**Population (%) in**		***Kuchi* population (1000 person)**
			Rural	**Urban**	**In summer**
Herat	63097	1780	71.9	28.1	112.3
Ghor	38666	657.2	99	1	166.6
Badghis	20086	471.9	97.1	2.9	115.1
Farah	47786	482.4	92.7	7.3	44.1
Total	169635	3391.5	90.2	9.8	438.1

Sources: http://cso.gov.af/en/page/3897/6449 and http://www.foodsecurityatlas.org/afg/country/provincial-Profile. Accessed 21.06.2012

The most relevant community of nomadic breeder is *Kuchi* community, that in Western Region are estimated 46.2% long, 47.5% short term migratory, and 6.3% settled.

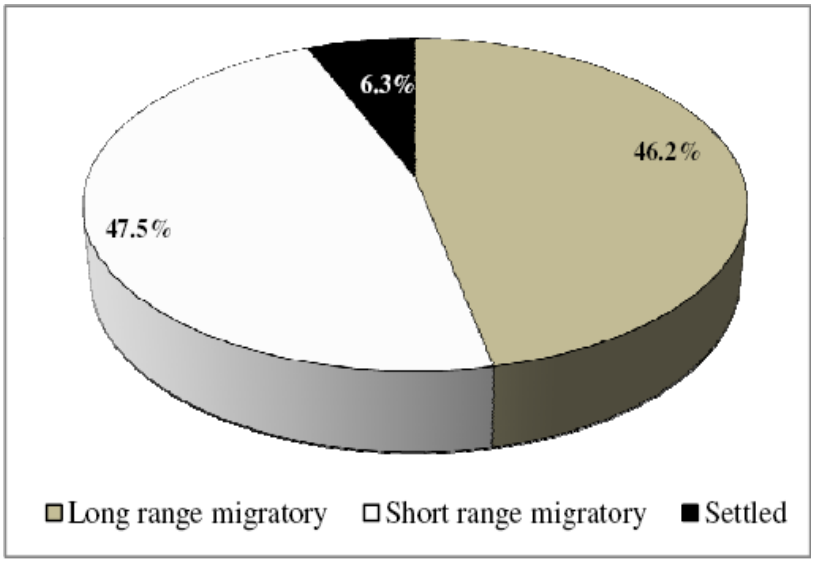

Figure 8. *Kuchi* people migratory typologies in Western Region.

Source: http://www.foodsecurityatlas.org/afg/country/provincial-Profile. Accessed 21.06.2012

3.3.1. Topography

Western Region covers an area of 169,617 km^2. More than 61% of the region is mountainous or semi mountainous while near to 38% of the area is made up of flat to semi flat land.

Table 2. Type of topography of Western Region provinces.

Province	Topography type in percentage					Total
	Flat	Semi flat	Mountainous	Semi mountainous	Not determined	
Herat	53.3	6.7	25.4	13.6	1	100
Ghor	5.1	2.8	68.9	22.9	0.3	100
Badghis	22.1	8.4	43.7	25.3	0.5	100
Farah	49.9	3.4	39.2	6.8	0.7	100
Average	32.6	5.3	44.3	17.2	0.6	100

Source: http://www.foodsecurityatlas.org/afg/country/provincial-Profile. Accessed 21.06.2012

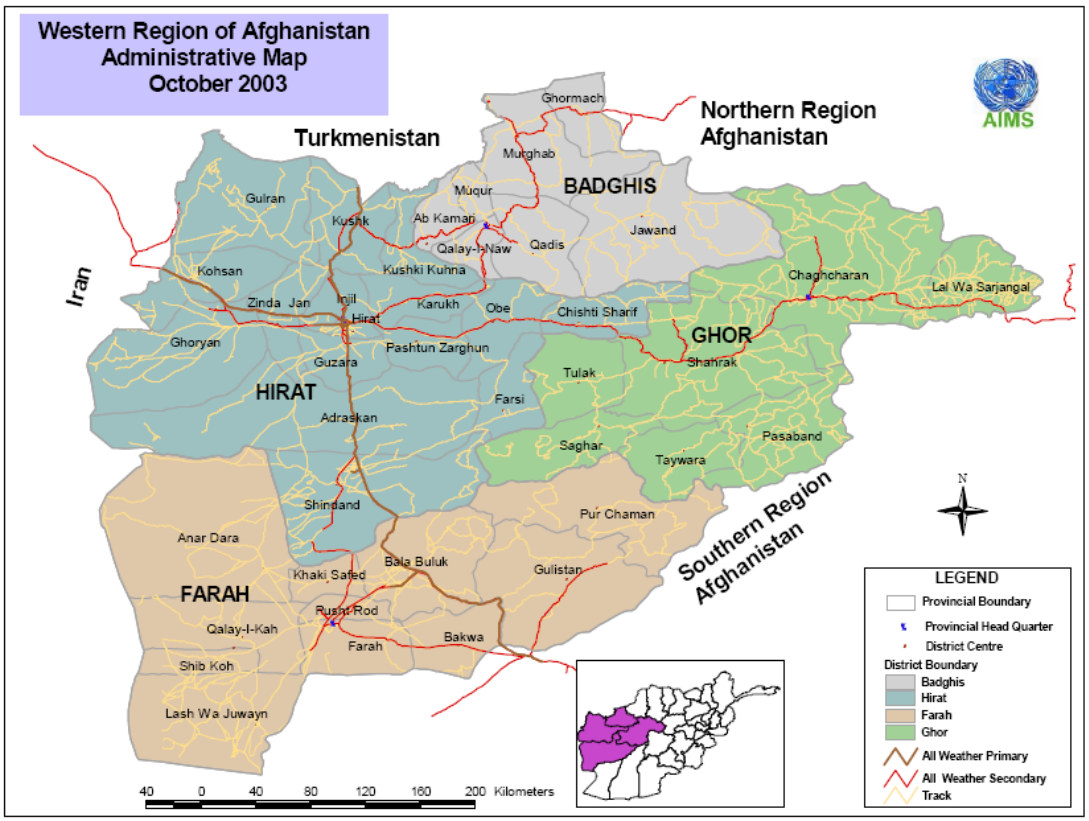

Figure 9. Administrative map of Western Region of Afghanistan
Source: http://www.nps.edu/programs/ccs/Herat/herat_administrative_map.pdf
Accessed 10.09.2013

Herat province is located in the western part of the country, its coordinates are (lat 34°13′N, log 62° 12′E) and borders with Iran (*Islam qala* crossing) to the west and Turkmenistan (*Torghundi* crossing) to the north. It has internal borders with Ghor to east, Badghis to north east, and Farah to south. The province covers an area of 63,097 km^2. More than one-third 39% of the province is mountainous or semi mountainous while more than half (53%) of the area is made up of flat land.

The Ghor province (*Chaghcharan*), central coordinates are (lat 34° 32′N, long 65°16′E). The province covers an area of 38,666 km^2. More than nine-tenths (92%) of the province is mountainous or semi mountainous terrain while a small part of the area (5%) is made up of flat land. This province is dominated by the Herat province to west, Bamian to east and Sarepul to north east, Badghis and Fryab to north, Helmand and Daykundi provinces to south and Farah to southwest.

Badghis province is located to north part of Western Region and its central coordinates (*Qala naw*) are (lat 34°98′N, long 63°12′E), surrounded by Herat to west, Faryab to the east, Turkmenistan country to the north and Ghor to the south. The province covers an area of 20,068 km^2. More than two-thirds of the province (69%) is mountainous or semi mountainous terrain while more than one-fifth of the area (22%) is made up of flat land.

The Farah province is located in the south part of Western Region, its central coordinates are (lat 32°22′N, long 62°11′E), bordered by Iran country to west, Ghor to east, Herat to north, Nimroze and Helmand to the south. The province covers an area

of 47,786 km^2. Nearly half (46%) of the province is mountainous or semi mountainous while the other half of the area (49.9%) is made up of flat land.

3.3.2. Climate

Based on different topography and altitude between west to east (Herat-Ghor) and south to north (Farah and Badghis) provinces, this region has different climates.

According to Köppen climate type map of Asia, this region has BSh (arid-hot steppe), BWk (arid-cold desert), BSk (arid-cold steppe) and BWh (arid-hot desert) climate.

In this chapter, different climatic data available for different areas of region are reported (Figs. 10 to 18, Table 3)

Average precipitation during the last five year (2007-2012) in this region was around 200 mm.

In general, rainfall season starts from November to May and lack of rainfall regularly occurs from June to October.

The rainfall in Western Region as shown in Fig. 10 there is a clear difference between rainfall in 2007-2008 and 2011-2012, as average rainfall in 2007-2008 was 142 mm and in 2011-2012 was 232 mm.

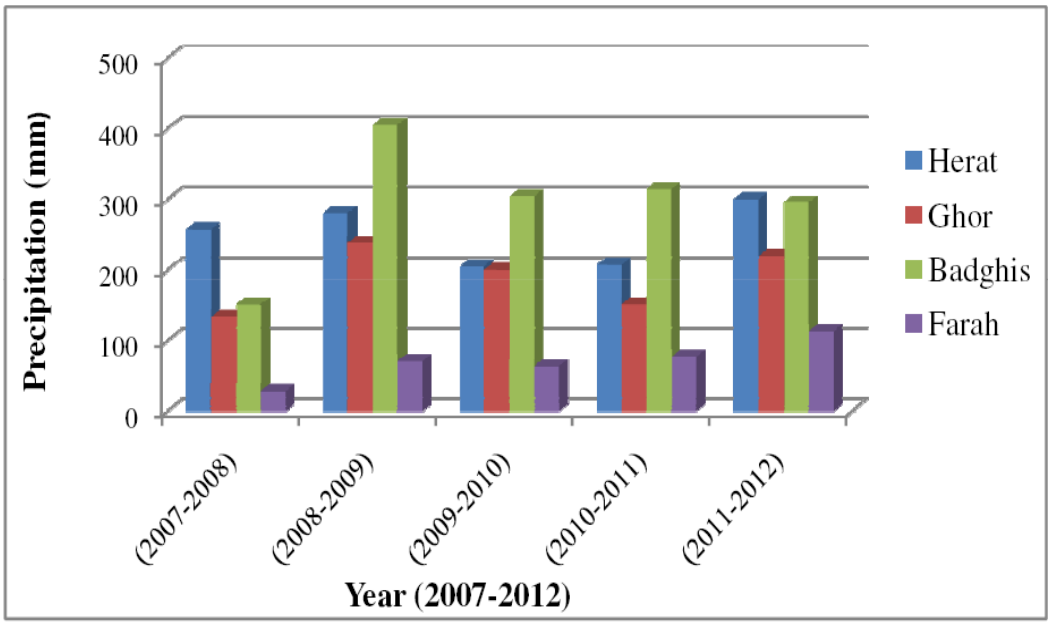

Figure 10. Precipitation (mm) in the Western Region.
Source: http://afghanistan.cr.usgs.gov/agrometeorology. Accessed15.10.2012

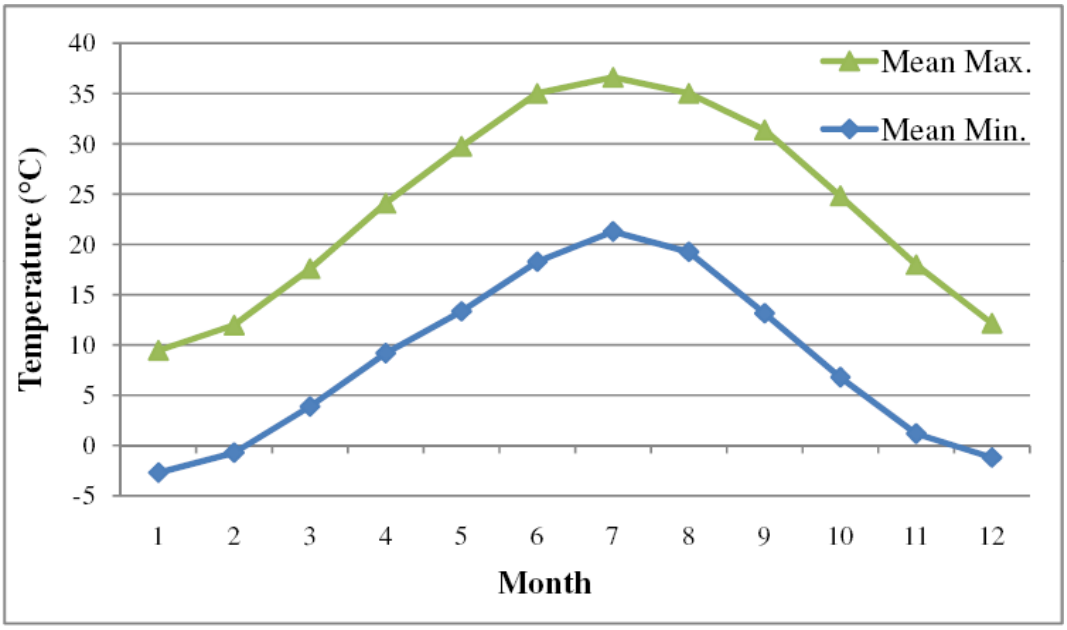

Figure 11. Herat center (964 m a.s.l.) mean maximum and mean minimum temperature (°C), year (1958-1988).

Note: All historical climatic data (Figs.11-18) were analyzed based on information, which is obtained from PEACE project 2009.

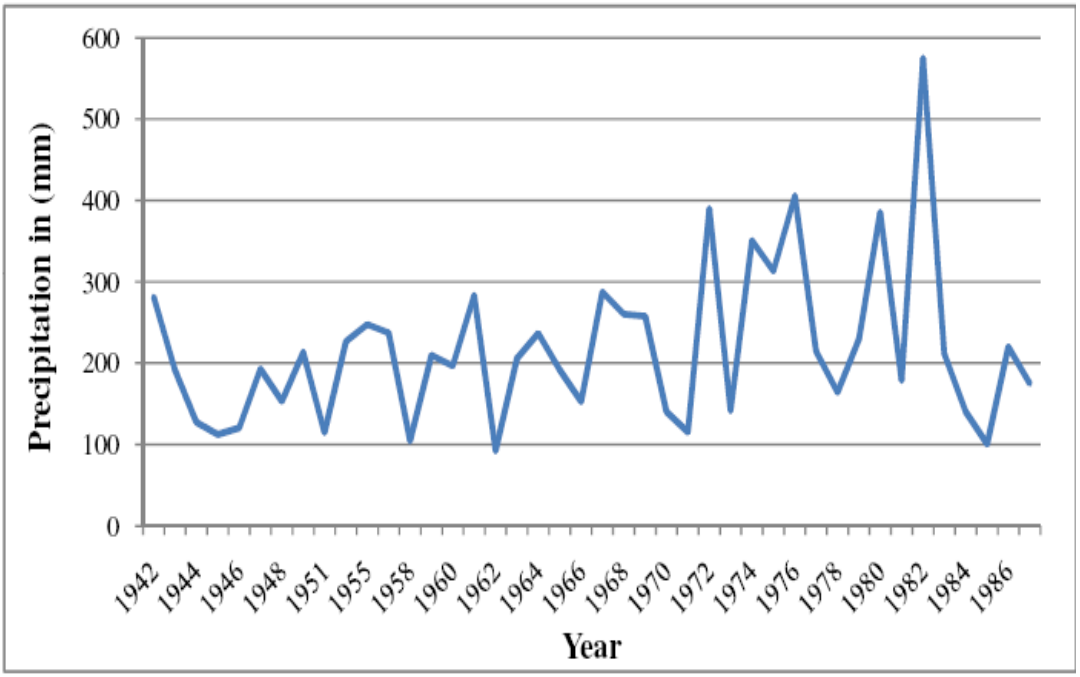

Figure 12. Herat center (964 m a.s.l.) total annual precipitation (mm), year (1942-1988).

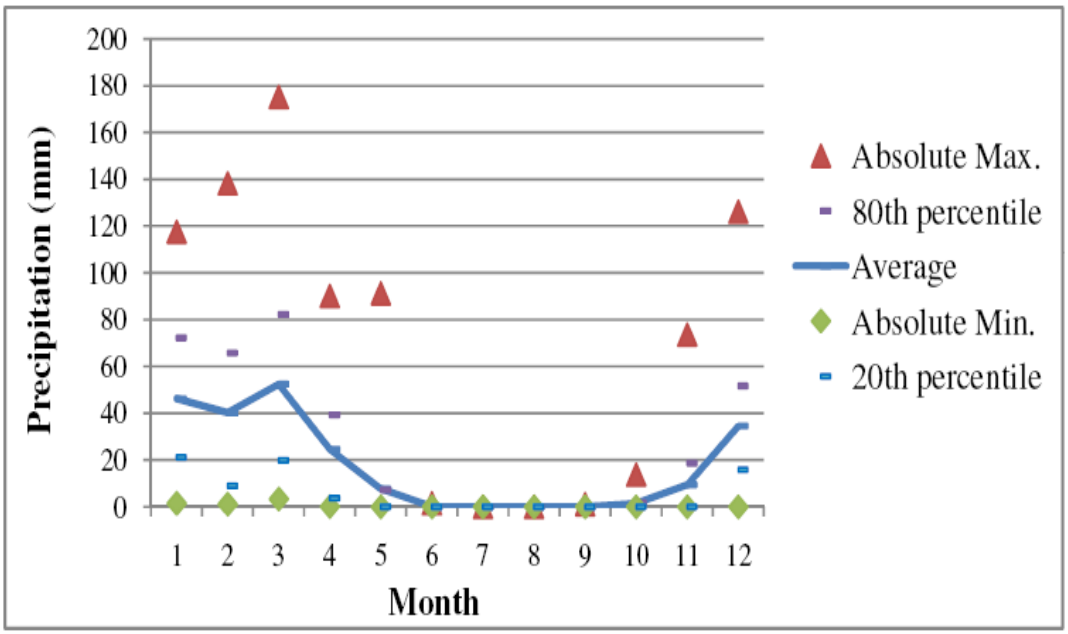

Figure 13. Herat center (964 m a.s.l.) absolute maximum and absolute minimum monthly precipitation (mm), year (1942-1988).

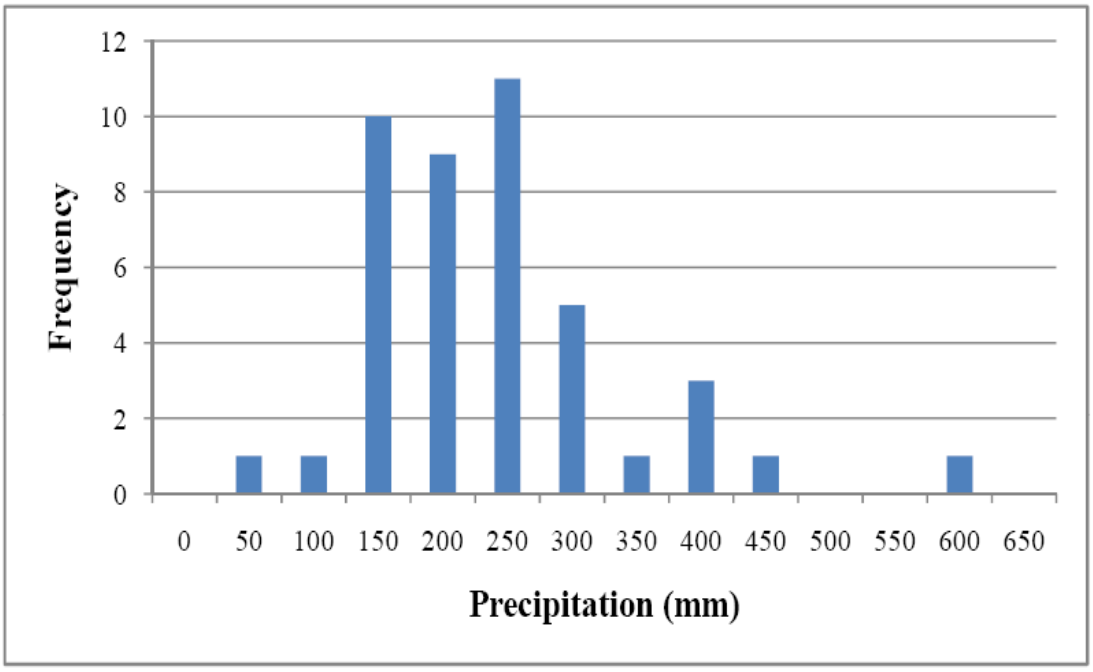

Figure 14. Herat center (964 m a.s.l.) province frequency distribution of annual precipitation (mm), year (1942-1988).

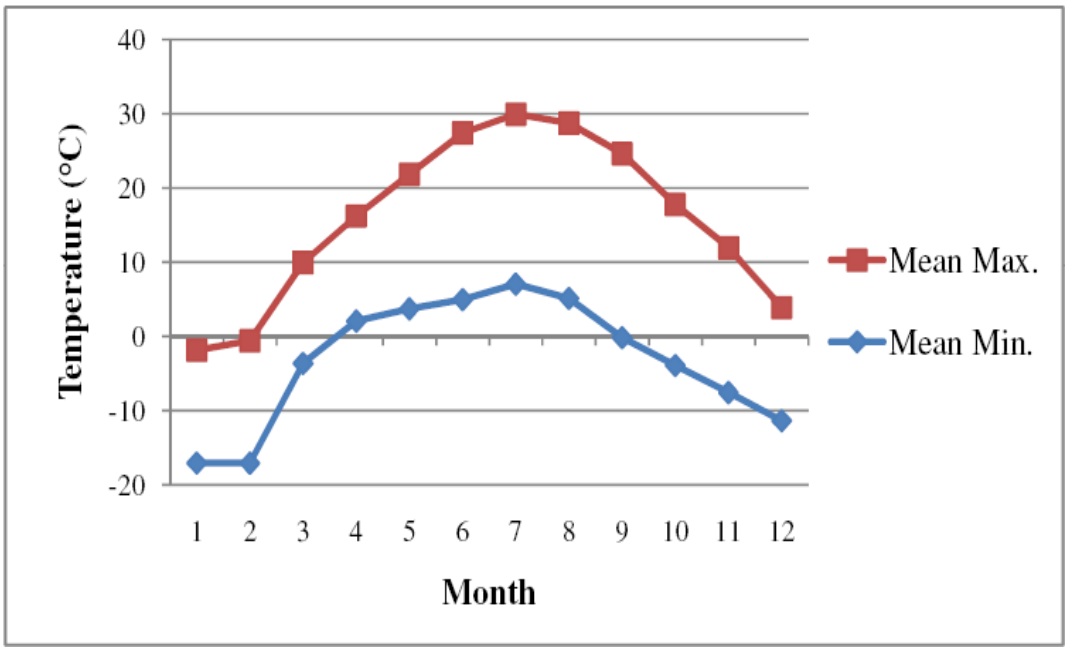

Figure 15. Chaghcharan (2,230 m a.s.l.), Ghor province mean maximum and mean minimum temperature (°C), year (1969 -1977)

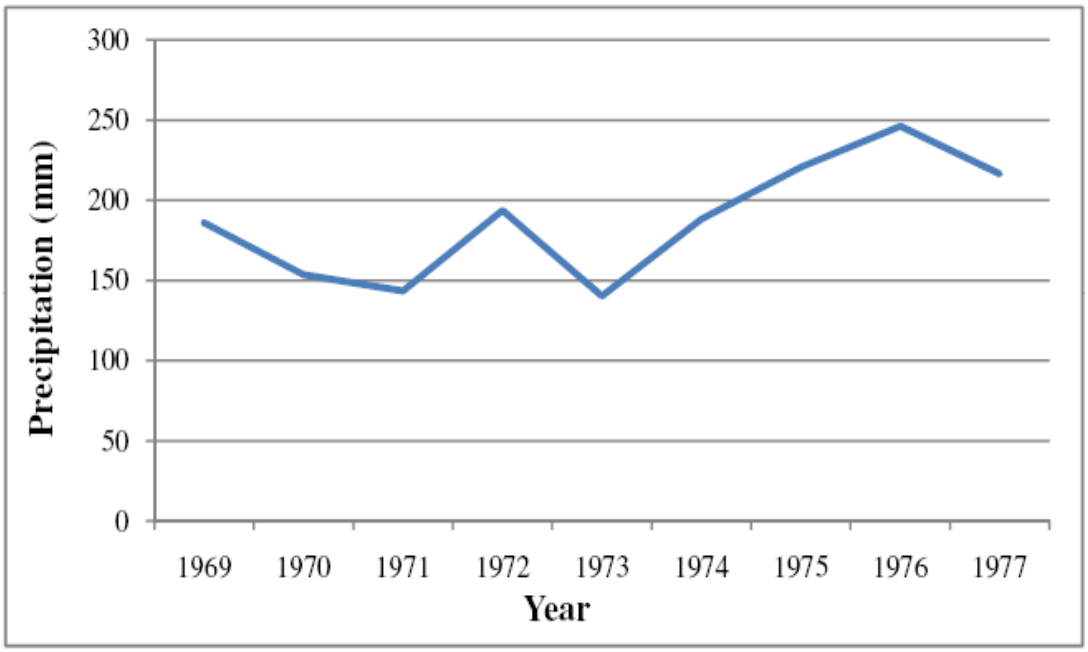

Figure 16. Chaghcharan (2,230 m a.s.l.), Ghor province total annual precipitation (mm), year (1969-1977).

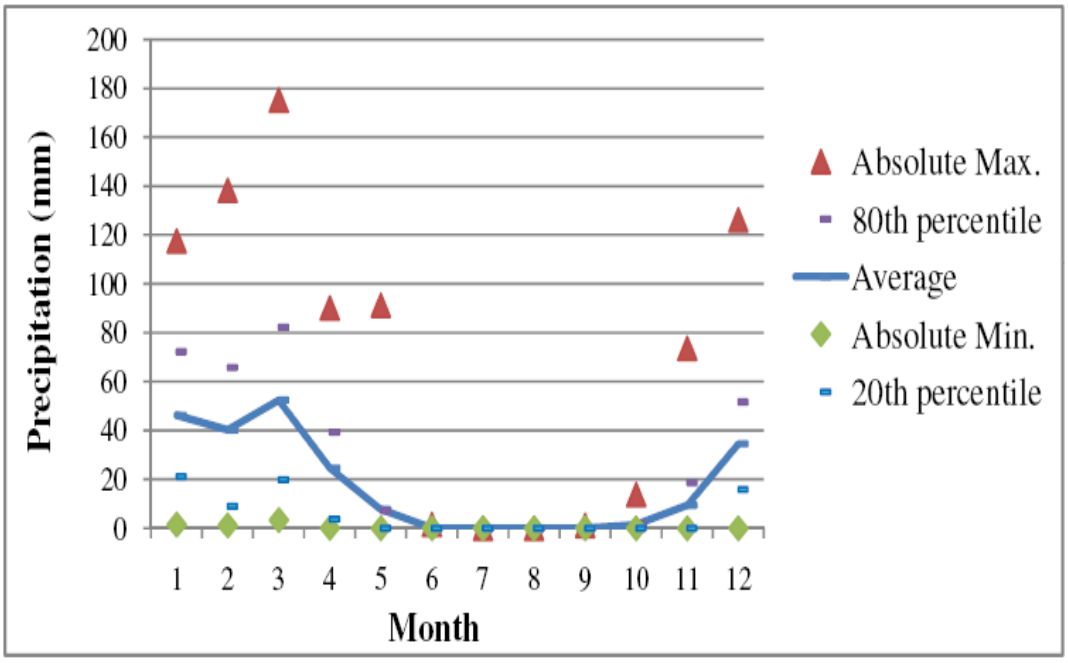

Figure 17. Chaghcharan (2,230 m a.s.l.), Ghor province absolute maximum and absolute minimum monthly precipitation (mm), year (1969-1977).

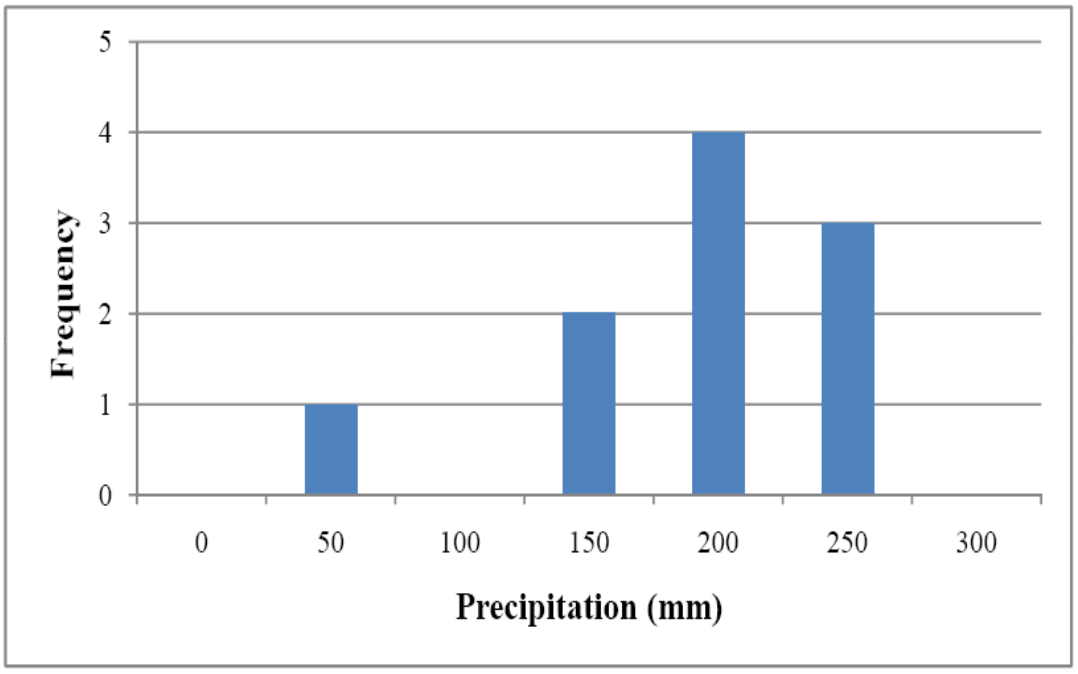

Figure 18. Chaghcharan (2,230 m a.s.l.), Ghor province frequency distribution of annual precipitation (mm), year 1969-1977.

Table 3. Western Region provinces last five years annual precipitation analysis (mm).

Provinces	Elevation (m)	Year				
		(2007-2008)	(2008-2009)	(2009-2010)	(2010-2011)	(2011-2012)
Herat (Center)	964	257	280	205	207	300
Ghor (Center)	2230	134	238	200	151	219
Badghis (Muqur)	1000	151	405	304	314	295
Farah (Center)	700	28	71	63	77	113
Average		142	248	193	187	232
Standard diviation		94	138	99	100	87
Max.		257	405	304	314	300
Min.		28	71	63	77	113
80th percentile		193	330	244	250	297
20th percentile		91	171	145	121	177
CV%		66	56	51	53	38
Median		142	259	202	179	257

Source: http://afghanistan.cr.usgs.gov/agrometeorology. Accessed 15.10.2012

3.3.3. Soil composition

It is a fact that Afghanistan in terms of soil research and availability of information on whole territorial is very poor as well as in Western Region. However In the deserts and semi–desert of the southwest, soil are developed from the group of *Torripsamments* in varying ways, there are also soils from the group of *Arenolsols*, typical for arid regions, but with a so –called *ardic* (or *toric*) moisture regime. Sand dunes, barkhans and moving sand hills as well as saline soils and clays are other pedologic elements of this region (Breckle et al. 2010). In addition, the high altitudes of the Hindu Kush and the mountainous region of central Afghanistan (such as Ghor province) are characterized by weak soil formation from the group of *Cryorthents* on rocks, also known as the *Aridosols* of the high mountain deserts and desert-steppe.
In all the major valleys of the country (such as along the Hari Rud) fertile soils have evolved from the group of *Torrfluvents* (*Fluvesols*, FAO-Classification) mainly on alluvial deposits. These soils have generally an arid (*torric*) moisture regime. These valleys are the most intensively cultivated areas of the country based on artificial irrigation.

During the past decades some survey were used in Herat province, to be not completed. On basic of this survey, Herat province soils were classified into four groups:

- Sedimentary soils (alluvial soil), this type of soil is located near *Hari Rud* and *Adraskan* River.
- Sierozem areas soils, this type of soil can be find to the north and south of Hari Rud.
- Sandy soil, organic matter and water capacity in this type of soil is very low. These types of soils can be found to the north and the west of Herat province that establish by wind**.**
- Sudic soils, these type of soils can be found to the west of Herat particularly in *Ghoryan* and *Shindand* district

Agriculture research department of Ministry of Agriculture, Irrigation & Livestock (MAIL) found the following major characteristic of Herat soils:

Table 4. Characteristic of Herat soils.

Characteristic of soils	**Quantity**	**Characteristic of soils**	**Quantity**
Soil dept (cm)	15.0	Nitrogen (%)	0.09
pH	8.2	Soluble salt (%)	0.02
$CaCO_3$ (%)	16.5	Soluble Na^+(mmole$100g^{-1}$)	47.9
Organic material (%)	1.2	K^+ (%)	0.07

Source: Omid 2009

Western Region is characterized by resources, which can be exploited for economic regeneration. Development of mines (extracting Oil, Gold, Salt, Lime, Barite, Sulphur and Marble stone mine) are potential opportunity to invest and exploit these mines for economic regeneration. There is a cement factory in Herat, but it is not producing anymore, by reactivating, it can produce many economic regeneration opportunities especially for employment.

3.3.4. Water resources

Three large rivers *Hari Rud*, *Farah Rud* and *Murghab* provide surface water in WR, also there are different ground water sources such as spring, *Karez*, and wells, in a general view, most formers use these water resources as traditional irrigation system in small scale and large scale.

Karez is underground gallery that taps groundwater from the aquifers of alluvial fans underground tunnels with gentle slopes carry water from the source to the settled areas, in addition 614 *Karez* are under used in Western Region.

Karez water is used for irrigation purposes (irrigated area ranges from 10 ha to 200 ha) as well as for drinking water supply (Qureshi 2002).

The technique has been used for thousands of years in Afghanistan, Iran, and the Middle East and North Africa. It is one of the most economical methods of tapping groundwater for irrigation purposes. It is environmentally safe and water is drawn by use of gravity.

Shallow wells ground water is lifted from shallow wells with the help of Persian wheel (*Arhad*) supplying irrigation water to the fields of an individual farmer. The size of the irrigated land does not exceed three hectare.

Spring, when groundwater table reaches above the ground surface, it starts flowing on the surface and form springs. There are about 867 springs in the Western Region, springs are directly dependent upon the groundwater level. When the groundwater level goes down (e.g., during drought years), it results in a reduction of outflow from springs.

Currently there are no big dams but there is a big potential to construct dams on *Hari Rud* and *Farah Rud*, thus providing both electricity energy and irrigation water.

Recently government is working on *Bande Salma* (this dam will produce electricity and water for irrigation) on *Hari Rud* in Herat province the construction activities are under progress.

Beside of *Hari Rud* and *Farah Rud*, *Murghab River* is another important water resource in this region (Badghis province) as there is annually a big quantity of water, running into Turkmenistan without any use in to the Badghis province. Only the *Murghab* district uses the water to some extent for irrigation purpose.

Table 5. Estimated surface water potential of three big rivers in Western Region.

Name of river and province	**Drainage area (km^2)**	**Mean Ann.vol.(Mm^3)**
Hari Rud (Ghor-Herat province)	39000	1600
Murghab (Badghis province)	26200	1350
Farah Rud (Ghor-Farah province)	27800	1250
Total	93000	4200

Source: Qureshi 2002

Table 6. Distribution of different irrigation system in Western Region (No.).

Province	Canals	Springs	Karez	Wells
Herat	302	153	228	450
Ghor	804	570	4	263
Badghis	120	50	30	-
Farah	312	94	352	327
Total	1538	867	614	1040

Sources: Omid 2009 and Qureshi 2002.

Spring: when groundwater table reaches above the ground surface, it starts flowing on the surface and from springs.
Karez: Traditional underground canal system tapping subterranean water sources

3.3.5. Natural forest

In Western Region the Forest land is 242,510 ha (USAID 2008) and the main group of forest and wooded plants in this area vary and depend on different geographical and climatical zones (e.g., *Pistacia vera*, *Pistacia khinjuk,* Tamarix spp, *Amygdalis Spp, Acer Spp, Haloxylon Spp*, *Caligonum Spp*, *Cedrus deodara*).

Natural pistachio forest is another important resource in this region, that seems there are not any protection measures in present and in future of these forests, there are need to protect and to plant new sapling of pistachio, where the forest destroyed especially in Herat and Badghis provinces. There are found different medicinal plants (e.g., liquorice, black cumin, ferula) and needs to be exploited on sustainable basis for economic regeneration. There are different medicinal plants (e.g., liquorice, black cumin, ferula) are found in this region and needs to be exploited on sustainable basis for economic regeneration.

The Herat province has about 120,830 ha of forest, *Kushk-e- kohna* district to north east of this province is an important area for *Pistacia vera* naturally grow in this area. In the Ghor province, the forest area 23,921 ha and *Pistacia khinjuk*, *Amygdalis* Spp and *Acer Spp* are the majority of this wooded land.

Badghis province has about 93,200 ha of forest (FAO estimated some 155,800 ha of forest in this province) and about 50% of this area was damaged during the war, the extension of the forest is a good opportunity as an economic potential to the area. The people clear-cut this forest for fuel, soil erosion occurs because of cutting trees, and collection of nuts is not technically done. The protection of existed pistachio from excess cutting and over grazing will let the forest area to re-generate and fill the gap naturally and increase potential for more production. *Abkamari* district is the main area, which is *Pistacia vera* naturally grow and shaped wooded land in Badghis province.

Figure 19. Pistachio woodlands, North of *Qala e Naw*, Badghis province, Afghanistan.

The Farah province has 4,559 ha of forestland, that majority of this forest is located in *Purchaman*, *Balaboluk* and Farah center.

It is clear that production of fruit forage and livestock in the same place, at the same time is viewed as an attractive management alternative that has potential to improve cash flow for communities

Diversified woodland income by added livestock:

- Reduced need for chemical or mechanical vegetation control underneath the trees
- Recycled nutrients from animal wastes benefit forage and tree growth
- Delayed forage maturity in the fall and earlier green-up in the spring
- Increased livestock protection from summer heat and winter chill
- Improved cover and forage for wildlife
- Increased opportunities for recreation, e.g., hunting, wildlife watching

3.3.6. Rangeland productivity

The principal source of animal food in the Western Region of Afghanistan is rangeland and cover about (7.74) million ha or (45.6%) of the region, and based on geographical location, WR provide the best main grazing area in different seasons, summer and winter rangeland.

Western rangeland, like other parts of Afghanistan has been degraded in recent decades, so many formerly viable rangeland turned in barren land. The degradation, fragmentation and cutting shrub and bushes for fuel by different communities, are opening new space for utilizing these areas as rainfed cultivated areas, particularly under normal rainfall conditions.

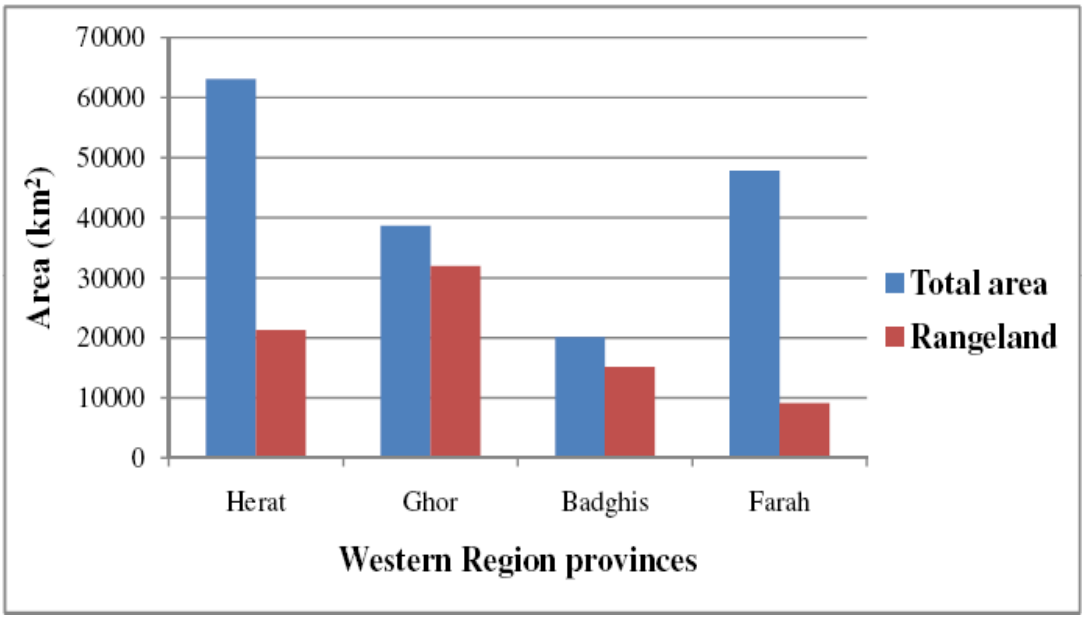

Figure 20. Western Region total area and rangeland (km^2).

Unlike agricultural systems in the marginal area of this regions, pastoral systems are characterized by a true synergy with natural systems rather than a control over nature (Squires 2010).

The quality and quantity of rangeland forage production varies tremendously depending on climate and a range of other environmental factors (Kirkman and Carvalho 2003).

For sustainable animal production, the rangeland ecosystem should be managed in such a way that output never exceeds input and losses, especially soil erosion by wind must be limited, while output such as animal products (meat and fiber) should remain economically viable.

Management of animals on rangeland involves manipulating three variables, namely animal movement (within and between seasons), animal numbers (stocking rate) and animal type (ratios between types), as well as reproductive patterns, which influence seasonal forage demand (Kirkman and Carvalho 2003).

Above ground, net primary production is an important variable in natural resources management because it determines forage availability for both wild and domestic herbivores (Ahmad and Islam 2011).

Casimir (1980) found that in *Dashte Shoraw* and *Dawlatabad* village, *Artemisia siberi*, *Cousinia stockii* and *Scariola orientalis* species together comprised more than 40 percent of all dwarf bushes. All three species belong to the family of *Asteraceae* and together with *Stachys trinervis*, *Acantholimon sp*, and *Peganum harmala*, account for 83.5 percent of all bushes in these areas.

During the winter season, the adult animals live almost exclusively on *Artemisia* and *Carex* production. Unfortunately, it is very difficult to get information on rangeland productivity and affective stocking rates, the only available data are from McArthur et al. (1979), that estimated that stocking rate in Herat province rangeland (Ghoryan,

Hamdam Ab and Gulran area) was 1.63 ha per ewe equivalent. Annual average productivity and carrying capacities along three year in the same locations are shown in Table 7.

Table 7. Stocking rates, average productivity and estimated carrying capacities in Hamdam Ab, Ghoryan and Gulran districts of the Herat province.

Productivity	**Hamdam Ab (1977)**	**Ghoryan (1977)**	**Gulran (1978)**
Average productivity (kg. dry matter of current season's growth per ha)	630	410	1040
Carrying capacity (ha per ewe equivalent)	1.32	2.03	0.80
Annual stocking rate (ha per ewe equivalent)	2.09	3.03	0.95

Source: (McArthur et al. 1979)

Table 8. Results of protein content analysis of the seven main food plants from Western Region rangeland.

Food plant	**Life forms**	**Part of plant**	**Number of probes**	**Protein in (% DM)**
				Mean ± standard deviation
Artemisia siberi	Ch	Leaves	3	14.1 ± 2.9
Artemisia siberi	Ch	Leaves	1	6.1
Stachys trinervis	Ch	Leaves	2	12.2 ± 5.1
Acantholimon sp.	Ch	Leaves	2	10.1 ± 4.7
Cousinia stockii	H	Leaves	1	17.5
Gamanthus gamocarpus	Th	Young plants	2	4.3 ± 0.2
Gamanthus gamocarpus	Th	Dry seed and stalks	2	2.2 ± 0.8
Carex cf.stenophylla	G	Grass	1	18.8
Peganum harmala	H	Dry stalks and seeds	1	8.4

Sources: (Casimir et al. 1980), modified by this study.
Note: Ch=Chamaephytes, H=Hemicryptophytes, Th=Therophytes, G=Geophytes

From the two most important, *Artemisia siberi* and *Gamanthus gamocarpus*, seasonal difference is obvious. Average and standard deviations are given where replication samples were analyzed.

3.3.7. Grazing animals and their mobility in the Western Region

Except for an insignificant amount of intensive production, all categories of livestock owners in Western Region graze their animals on rangeland. Although sedentary are important contributors to the provincial flocks, the majority of sheep and goats are owned by nomadic groups, further more each flock is supervised by a shepherd (*Chupan*) and an assistant (*Gumary*), and protected from wolves by one or more dogs, so in some cases shepherd has gun for protect the flock, especially in recent years. Shepherds are employed on an annual basis, receiving one-tenth of weaned lambs, this institution useable by both, nomadic and sedentary systems.

There are different sources of information about pastoral communities and livestock numbers on Afghanistan, some time contrasting numbers average.

The number of livestock in whole Afghanistan is not a unity; deferent source and deferent organization survey showed deferent data, so population of livestock in Western Region based on different sources are shown in table 9.

Table 9. Population of deferent type of livestock in Western Region of Afghanistan

Province	Type of animal (1000 head)												Total	
	Cattle		Sheep		Goat		Donkey		Camel		Horse			
	1	2	1	2	1	2	1	2	1	2	1	2	1	2
Herat	186	162	791	1035	697	1196	155	137	14	18	5	5	1848	2553
Ghor	185	89	447	491	177	607	41	101	0	18	9	10	859	1316
Badghis	41	69	631	471	275	866	94	119	10	17	3	3	1054	1545
Farah	79	88	165	795	493	759	40	43	6	22	2	1	784	1707
Total	490	408	2033	2792	1642	3428	330	399	30	75	19	18	4545	7121

*****Note: FAO 2003 has done survey just in three district of Ghor province and total population of livestock in Ghor province (205 149 head) were underestimated. So here, the number of animals cited from Omid 2009.

Sources: Data for column 1 for each type of animal cited from FAO 2003 and Omid, for column 2 cited from National Risk and Vulnerability Assessment (NRVA 2005).

Figure 21. Rangeland near a village in *Zandajan* district, Herat province.

From autumn to early spring is the critical period for animals that their feeding are mostly depend on rangeland and they need strongly to addition feed during these period, Figure 22 shows sheep and goat lost their weight mainly the end of winter in Herat province.

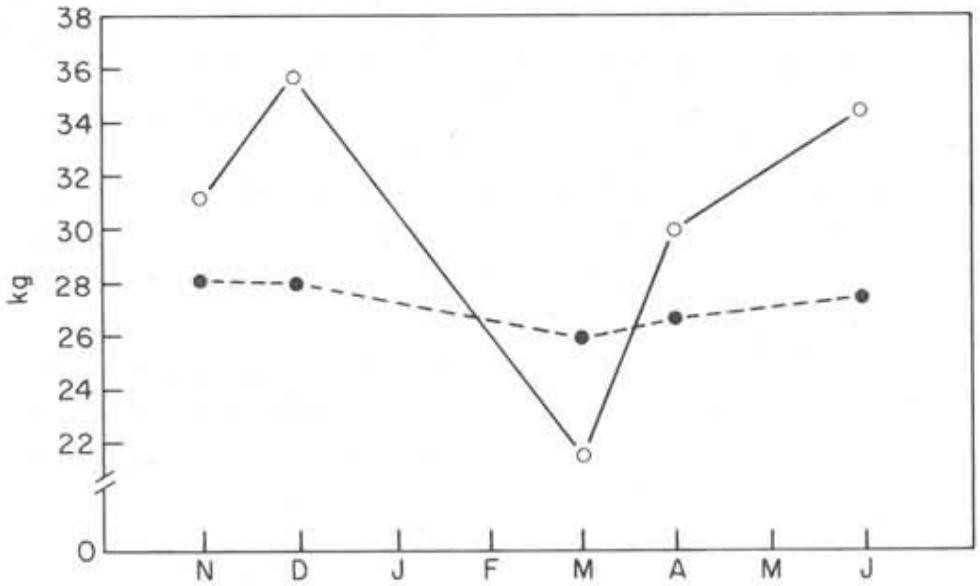

Figure 22. Average weight of 10 (more than 8 months old) goats (○ ——○) and 10 sheep (●- - -●) over the winter period (from November to June).
Source: Casimir 1980.

The author showed that the average crude fiber digestion to be 64.6 % for the goat and 59.1% for the sheep. It becomes evident that goat in arid zones not only find more food than sheep, but as digestibility of the crude fiber is better, and therefore utilize the dry matter better.

Animals of the *Kuchi* communities graze all year around along altitude gradient. As altitude increases, animals are grazed for a shorter time, depending on the duration of the snow-free season. Small ruminants graze throughout the winter, except during bad weather and snow cover when they are taken to shelters in the winter settlement.

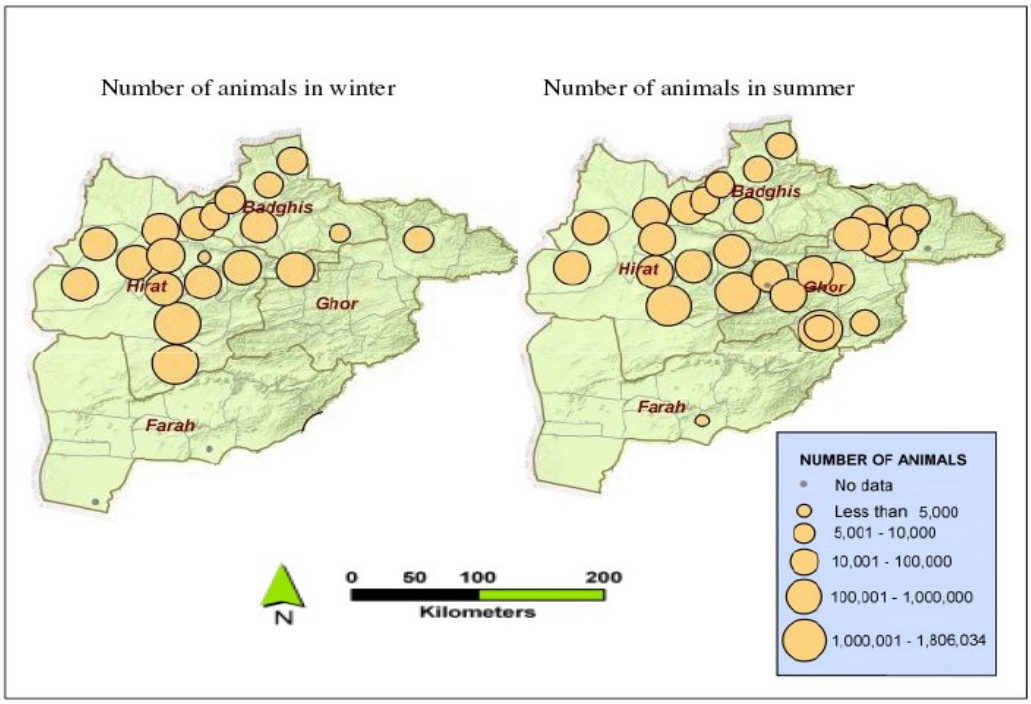

Figure 23. Numbers of animal in summer and winter season in Western Region.

Source: http://www.afghanpeace.org. Accessed 10.05.2011

4. DISCUSSION AND CONCLUSION REMARKS

1) Agriculture and pastoralism are the most important activities of the country, at the basis of its economy and society structure: any sustainable development strategy must consider an equitable rural development. However, given the close interconnections between farming activities and societal structure, changes require a systemic approach addressing the socio-eco-agroecosystem issues from multiple perspectives and not just from a socio-technical system vision.

National and international scientific community emphasize on equilibrium use of rangeland and sustainable rangeland management, Kreutzmann (2009) described, nomadic and combination of livestock with mountain agriculture are two major adaptive strategy. Robinett et al. (2008) showed rangelands and woodlands are vital to the survival of communities, and Pittrof (2011) fund water, livestock and fire fuel are the fundamental of the agriculture and natural resources in Afghanistan.

There is no doubt that collaborative management of natural resources is necessary to achieve sustainable use and to lower costs to government. A rangeland

Policy must conserve (provide for sustainable uses) rangelands for future generations, but must also develop policies that balance local community(s) needs with its policy.

An attempt by the Afghan government to project some authority over pasturelands was the "Afghan Pasture Law" (Barfield 2004). As this law was enacted to "protect" pasture from degradation, it is likely that pasture conflicts have long been a common occurrence. However, Glatzer (1992) and Barfield (2004) note that the law had no real impact on rural Afghanistan and reports that few nomads were even aware that such a law existed. On the other hand, government institutional and policy framework on the natural resource management and environment is young, and is still very much in the process of formulation and development.

2) The insufficient and fragmented information available about agricultural and climatic dynamics are a serious constraint for the identification of pathways for the rural population to identify concerted development strategies. The current fragmented structure of the society, which is embedded in the variety of farming system typologies and pastoral traditions, make the identification of shared developmental options a challenge for the future of the country. This implies that the investments in rural development cannot be disentangled from investments in education systems that are suitable for any typology of pastoral community, including those adapted to the exploitation of the remote areas (e.g., *Kuchi*).

Improved *Kuchi* people education and health can be only further entrench this trend (Weijer 2007). According to the Afghanistan's Millennium Development Goals (MDG) for education, "By 2020 all children in Afghanistan, boys and girls alike, will be able to complete a full course of primary education" (Ministry of Education 2007).

3) One of the key special issues of the region is that the geographical gradient creates the condition for nomadic pastoral systems like *Kuchi* that move throughout the country all year round except for the winter. This has special implications for development, as the trend of settling them near urban areas would leave many territories unexploited; on the other hand, it is difficult to provide education and services to nomadic pastoral communities. However, the cultural and adaptive habits of these communities are invaluable in such harsh environment. Hence, the identification of the options is crucial and for many reasons common to many other nomadic communities in the world.

WR has about 3.4 million inhabitant, which is 90.2% living in rural area and mostly their livelihood depend on natural resources and LSGS is immerged from interactive of these communities behavior and natural resources

Rangeland covered and area about 7.7 million ha that the best and economic way of utilization of this resources would be livestock management. In addition, a big number of livestock (7.1 million), of which (6.2 million sheep and goats) are rearing in WR and main source of these animals are rangeland that nowadays the quantity and quality of rangeland is decreased and strongly needs to introduce relevant options for sustainable improvement of rangeland resource management.

Impact of different factors (e.g., drought, fuel collection, rangeland conversion to cropland, land tenure) accelerated the rangeland degradation in WR; more than 50% of lowland rangeland is degraded

The analysis of rangeland policy issues and trend of rangelands should become a national priority for the Afghanistan country (Pittroff 2011): the current situation of

competition on land and necessity of food production in the marginal land (rangeland) should be put to optimal use (Weijer 2007). In addition, a systemic approach could support the rangeland development policy (Caballero 2011).

Strengths

Livestock is one of the main sectors in country, which is played important role on socio-economy as big source for occupation, food and export of the materials, in addition adaptable sector to Afghanistan's specific topography condition. According to Hassanyar et al. (1983), total rangeland area was 54.7 million ha, which estimated more than 80 % of total territorial of country.

The numbers of small ruminants (sheep and goats) showed huge fluctuations in the period 1992–2010 (Fig. 6): the number of sheep significantly decreased of some 56% (from 17.7 in 1999 to 8.1 million in 2007) but in 2010 were as much as in 1992. In contrast, number of goat in the same period steadily increased of some 60% (from 4.0 in 1992 to 6.7 million in 2010).

Large scale grazing systems in Western Region played important roles on socio-economy of *Kuchi* and sedentary households, because rangeland supply forage for the livestock, habitat for wildlife, and water for people and animals, beauty and pleasure for everyone and an economic base for rural communities. Rangelands occupy 45 % of the total study area and support feeding for some 4.5 million different kinds of animals in WR. Furthermore, rangeland is playing important roles as cooking and heating resources like bushes and firewood especially for rural inhabitant. Except for an insignificant amount of intensive production, all categories of livestock owners in Western Region grazed their animals on rangelands. Although sedentary communities are important contributors to the provincial flocks, the majority of sheep and goats are owned by *Kuchi* communities and are well adapted to the topography and climate of this mountainous region, which offers gradients of altitude corresponding to a shift in the seasonality (time and duration) of the rangeland productivity.

Bedunah (2006) found that *Kuchi* people faced to inaccessibility to rangeland and acquire rangeland on a temporary basis by lease or paying a fee. The lease or payments of fees to use pastureland can be a useful practice when concerning rangeland ecology as it helps to prevent overgrazing, as owners would allow no more than a specific number of animals or flock on each pasture. Balance between herd numbers and rangeland available forage is also maintained through the sedentarization of both rich and poor herders, the poor settled people don't have enough animals and in contrast, rich settled will rent or pay for more rangeland and agriculture lands. Therefore, this kind of tradition in the access to rangeland can be considered a way to decrease the rangeland pressure and to help them to self-conserve natural ecosystems as well as get economic benefit.

Pistachio production in this region is a national capital and communities from different provinces move every year to this area to collect the nuts in late September.

Weaknesses

Thieme (2006) estimated that rangeland covered an area of 45% of total country territory. It shows that during the past decades, the rangeland area significantly decreased and it linked to vary factors such as drought, war, rangeland degradation, rangeland conversion to cropland.

The productivity of the rangelands in the WR decreased in the three past decades, particularly (from 2000-2004) between 50 to 60% because of the competition of fire fuel collection, conversion of rangelands into croplands and drought affected. Vegetation of grazing area has reduced widely and the traditional attitude of native pastures has often involved poor management and low stocking rate, resulting in poor pasture quality and productivity, this leads to inefficient livestock production. In addition, the productivity of some native pastures is lower than the potential that could be reached through introduced species.

Many communities have had to significantly reduce livestock numbers because of the reduced quality of rangeland.

Poverty of rural community have resulted to pressure on rangeland resources not only for animal food, also exploring firewood and bushes as two main sources that they get from rangeland, as average estimated that households in Western Region consumed for cooking 59% of firewood and bushes in summer and 65% in winter season.

During the past 20-30 years, the lack of control on pistachio forests, particularly on the proper time of collection or harvesting, is generating degradation. In fact, people harvest pistachio nuts before ripening and some warlords use violence or the threat of violence for people willing to collect the ripened nuts. Unripe nuts are of lower quality and fetch lower market prices.

Opportunities

WR has possibility and opportunity for conservation and improvement of rangeland resources through enabling human resources, because 80% Afghanistan's people is occupied in the agriculture sector.

To combat rangeland degradation in Western Region the improvement of accessibility is a key driver as well as the effective and sustainable use of water from the *Hari Rud*, *Farah Rud* and *Murghab* rivers. These rivers are strategic to provide alternative source of feed and fuel to reduce the pressure on rangelands. For instance, *Murghab River* (Badghis province) annually flows a big quantity of water, running off into Turkmenistan without effective use upstream. Only the *Murghab* district uses the water to some extent for irrigation purposes and it has potential for building a new dam (*Band Murghab*) to produce electricity for the whole province. This river is a good potential source of fish production and supply in Western Region of Afghanistan.

The *Abkamari* district is the main area where *Pistacia vera* naturally grows and shapes wooded land in the Badghis province, therefore conservation and improvement of this forest is another opportunity to contrast land degradation and support livelihood of the pastoral communities.

Threats

Throughout the last half of 20th century, expanding human population have led to an increase in cropped areas (Squires 2010), furthermore according to Pittroff (2011) fire fuel, overgrazing and conversion to rainfed cropland are major driver of rangeland degradation.

The result of war and severe drought during the past decade (35 years) as well as low productivity of rangeland particularly in lowland played negative roles on livestock management and social economy, for instance population of sheep and goat in these period varied from year to year.

The most important reason why many of the existing rangeland evaluation techniques are not widely applied by farmers is that they are time consuming, complicated and not user-friendly. On the other hand, hundreds of development and emergency projects were implemented during the past years by different national and international organizations and through these projects, people received benefit directly as cash, food and other materials. Therefore, these are the expectations of local people from such kind of projects. Most people are looking for the immediate outcome of the project and they are not interested in long-term outcomes, while rangeland conservation and sustainable rangeland management projects need to long time. Zintl and Krämer (2010) described, "We don't find evidence that development aid is positively, consistently, and significantly associated with threat perception, more aid does not reduce threats".

To conclude, sustainable rangeland management can emerge from a new process in which scientific knowledge is effectively integrated with the local knowledge of the pastoral communities and the various stakeholders in the rangeland areas taking care of herd mobility, marketing of livestock and maintenance of rangeland facilities.

In most LSGS the grazing season is conditioned by environmental constraints (e.g., cold season, dry season) and can be defined for different vegetation types and grazing grounds (lowland or highland vegetation types).

This study may open the way for future system and inter-systems research and further refinement of rangeland management options.

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CHAPTER (II)

Typology of grazing systems in the Western Region of Afghanistan

1. ABSTRACT

Several production systems, ranging from *Kuchi* to sedentary and from small to large scale livestock rearing exist in the Western Region of Afghanistan. Officially, rangelands are owned by the State, and used by different typologies of grazing farm, who herd sheep, goats, cattle and other type of animals.

In such context, the identification of different grazing system's typologies, with specific reference to the most relevant large scale grazing systems, is relevant to understand the different traditional grazing management. The estimate of the seasonal dynamics of *Kuchi* and sedentary flock energy requirements represents a key factor to explore issues and options of these grazing systems.

In relation to the current difficulties in designing field measurements, data collection was performed through an expert survey using structured and semi structured interviews as well as community mapping and field surveys.

The most relevant grazing systems in Western Region rangelands are based on sheep and goat. Four typologies of grazing systems were identified: *Kuchi*, *Nimeh Kuchi*, *Deh nashin* (sedentary) and semi sedentary. Each type has effects on rangelands in a particular way. Increasing shepherd population and on the other hand, the poor condition of the rangelands has caused severe threats to the equilibrium between livestock needs, rangeland resources and users.

The Western Region has a population of *Kuchi* with short-term and long-term migration of which the Ghor province is only a summer area for long-term migration *Kuchi*. No *Kuchi* farms stay in this province during winter. *Kuchi* move to the Ghor province from Herat, Farah, Badghis and Helmand provinces. While the winter grazing area are located in Herat (south and west) and Farah province, most of Badghis *Kuchi* are short-range partially migratory and exploit the rangeland in both seasons. In relation to the seasonal dynamics of animal feeding requirements, February and March are the most critical period for flocks, because in this period supplementary feed are almost finished and flock requirement is increasing.

The *Kuchi* and sedentary way of life of these communities is the oldest method for exploiting natural resources and climate adaptation. Under the traditional informal arrangements, which have existed for ages for the use of these lands, controversies about use rights can emerge. Security of tenure is not assured; hence the users are not motivated to invest in the improvement of these lands.

Rangeland improvements in the rural communities of the Western Regions are crucial for their socio-economic development and for reduction of poverty, uncertainty, vulnerability, and such improvement could be strategic in increasing the overall security in the region.

2. INTRODUCTION

Large scale grazing systems are managed by communities of livestock farmers sharing productive forms, traditions and cultural values that, in turn, shape the environment (Caballero 2012). Caballero et al. (2007) in Europe showed that farming extensification in marginal areas is progressing through the reduction of fertilizer inputs, management intensity and stocking rates at the farm level and is central for addressing sustainable rural policies.

Farming practices are crucial in exposing people directly or indirectly to natural hazards or contextual changes and in this country; they represent the actual institutional context in which economic activities occur. As SLIM (2004) suggested, "Favorable institutions will have an increasing role to play in progressing more sustainable forms of resource management. Institutions influence how we think and what we do".

The purpose of documentation of local knowledge is not to conserve, but to learn from it in order to create new concepts, methods, or strategies for improvement and sustainable local coping mechanisms (Dekens and Siddiqi 2009).

Two major adaptive strategies of utilization of the pasture potential of western high Asia are nomadic animal husbandry and the combined livestock and mountain agriculture (Kreutzmann 2009). Omid (2004) showed that Afghanistan communities could be classified based on kind of employment income into three groups: sedentary farmers and gardeners, *Kuchi* and urban artisans and craftsmen.

In Afghanistan, agriculture and animal husbandry are prevalent and represent the historical occupation of Afghanistan people. Nowadays some 90% of the population is living in rural areas and 10% in urban areas.

In the Western Region of Afghanistan, rural and *Kuchi* population are the major rangeland users, with 35.2 % of livestock being managed by *Kuchi*, 64.2% managed by rural people and only 0.6% managed by urban communities (MRRD and CSO 2007).

Kuchi systems are used primarily in the cold arid and semi-arid regions of Asia, followed by East Africa. The largest concentration of sheep and goats managed under a migratory system of production are in Asia and in countries located on the range of mountains extending west of the Pamir to Hindu Kush in Afghanistan (Chizari et al. 1982). This region extends to the Elburz and Zagros mountains in Iran and to the Taurus and the Black sea range in Turkey.

Zaroug and Mirreb (2009) found that several types of production systems can be found in the pastoral areas from Morocco to Central Asia, such as nomadic, semi nomadic, transhumant to sedentary smallholder production systems and semi intensive and intensive large scale commercial operations which are characterized by the exploitation of large geographical areas.

Habibian et al. (2004) reported that the condition of production and exploitation of the rangeland is often better in the volunteered settlers' nomad ones than in other planned settlers groups.

Kuchi is the most widespread term to describe pastoral nomad groups and communities in Afghanistan, although Omid (2004) explained that pastoral in some

areas, *Kuchi* groups are known by other names (e.g., around Kandahar province, they are called *powindah*). Traditionally, most *Kuchi* have been migratory herders, so their livelihood strategies are highly opportunistic and so, where possible, they may diversify their portfolio of economic activities. Tapper (2008) wrote that "*Kuchi*, an Afghan Persian word meaning 'those who go on migrations, is the common generic term, used by both Afghans and foreigners, for the nomads of Afghanistan, as it has been for many decades", furthermore Weijer (2007) explained that "*Kuchi* is a term that is generally used to describe the transhumance of *Kuchi* pastoralists of Afghanistan". Allen et al. (2011) have defined that *Kuchi* as a system includes "systems based on extensive movement of herds and flocks in search of forage, led by human family units with no permanent home base". Ismail et al. (2009) defined "This is a system practiced by mobile pastoralists or *Kuchi*, whose main livelihood and lifestyle is based on raising livestock for the production of meat, dairy products, and wool, and who live tented lives". Access issues, appropriation of land, insecurity, conflict and lack of winter fodder are at the heart of many of the *Kuchi* problems (Jacobs and Schloeder 2012).

Pashtun nomads seem to occupy a favored position with respect to the government, since they are ethnically identified with the ruling dynasty and were utilized as its political allies in the past (Rosman and Rubel 1976).

According to Allen et al (2011) definition, a sedentary system is "Grazing systems managed at a particular location by resident management. May be managed by either or both extensive and intensive grazing management and can include rangeland, pastureland, cropland and forestland within the grazing system". Ismail et al. (2009) report, sedentary farmer is "A system practiced by farmers whose main activity is the production of field and fruit crops, and who also raise cattle, sheep, goats, and poultry. Many villages also have access to nearby designated areas for common grazing or rangeland".

The importance of growing grain crops, for livestock in particular should be emphasized because the crop residues provide vital winter-feed, similarly, the small amount of cottonseed and other oilseed residues, which are produced, are valuable sources of protein, a commodity that is desperately short in this region, with the exception of the Herat province.

Historically, the management of livestock and sale of its products have made an important contribution to rural livelihoods, in a region that is characterized by large areas unsuitable for cultivation, but seasonally or perennially exploitable by livestock. The rural people share has commonly managed livestock either as a complementary component of mixed farming or alternatively as specialist pastoralist.

The following hypotheses were developed for this research:

To address the identification of different grazing system's typologies we need to integrate available knowledge about rangeland based livestock rearing, institutions, framing stakeholders' profiles and geographical grazing pathways.

The distinction of the main grazing system typologies helps to identify which grazing systems are managed by the different communities and how the resources have been traditionally managed.

The assessment of the seasonal dynamics of livestock feeding requirements in the different typologies of grazing systems is crucial to understand the needs of the pastoral communities and to identify options for sustainable rangeland management.

The improvement of existing grazing systems in this region has relevant implications on the overall social and economic development of the pastoral society.

The specific objectives of this chapter are:

- To investigate and identify the different grazing systems' typologies, with specific reference to the most relevant large scale grazing systems of the Western Region of Afghanistan.
- To estimate *Kuchi* and sedentary flock energy requirements.
- To investigate different grazing management through case study analyses in order to contextualize the different livestock rearing situations.

3. MATERIAL AND METHODS

Several tools/method were used sequentially or jointly in relation to the specific situation on the field and by adapting the method/tool/technique to facilitate the achievement of the objectives (Ghoryar 2006).

The methods and tools included expert and stakeholder survey, participatory-community mapping, and field surveys.

Contacts with some experts out of the study area, both inside and outside of the country who involved to this context) as taken the range of methods used allowed for different circumstances the study area, and similar types of data (e.g., qualitative, participatory information) were obtained at area.

3.1. A quantitative and qualitative questionnaire

The first step was to adapt the large scale grazing system questionnaire designed in the context of the LACOPE project "Landscape development, biodiversity and co-operative livestock systems in Europe" (www.lacope.net) to the study area situation (Caballero et al. 2009). The second step was to contact different experts in the Western Region and the third step was to select the different typologies of stockholders based on geographical boundaries, accessibility to rangeland, livestock owning and typology of grazing systems.

The questionnaire included two main sections: the first section contained quantitative and qualitative descriptors of the farming systems, biogeographically region, location and area, type of dominant pastoral resources, type of dominant property grazing-rights and seasonality of pastoral resources, potential forage, dominant livestock operation, regional stocking, and subsidy scheme. The second section contained 20 qualitative-linguistic questions grouped under five criteria: pastoral resources (A), environment (B), economic (C), social (D), and market and development (E). Under each criterion, various questions were submitted (Appendix-2).

The first step of the expert survey evidenced the lack of updated quantitative information on rangeland productivity, stoking rates and feeding potential. Therefore,

this information was collected through literature review that was mainly referred to decades before in the study area. Quantitative information relevant to animal feeding and quantity of livestock's food that provided by different typology of grazing system were obtained through direct interviews to experts in the context of different typology of grazing systems.

For livestock owners, a simplified separate questionnaire was designed and used for structure and semi structured interviews in Dari language, to facilitate the discussion and the data collection at local level.

3.2. Expert and stakeholder survey

Stakeholders are persons or groups with interests in a programme. They include both winners and losers and those involved or excluded from decision-making processes. Key stakeholders are those who can significantly influence, or are important to the success of the project (Quan et al. 2001).
Pastoralists as a group and pastoralism as livestock production system encompass multiple wide-ranging interests across sectors, disciplines, state and non-state groups. To draw stakeholder mapping, first is prepared a list of relevant groups, organizations, and people and the second step with understanding of stakeholder perspectives and interests as well as relationships to objectives and other stakeholders, there are identified the following stakeholders:

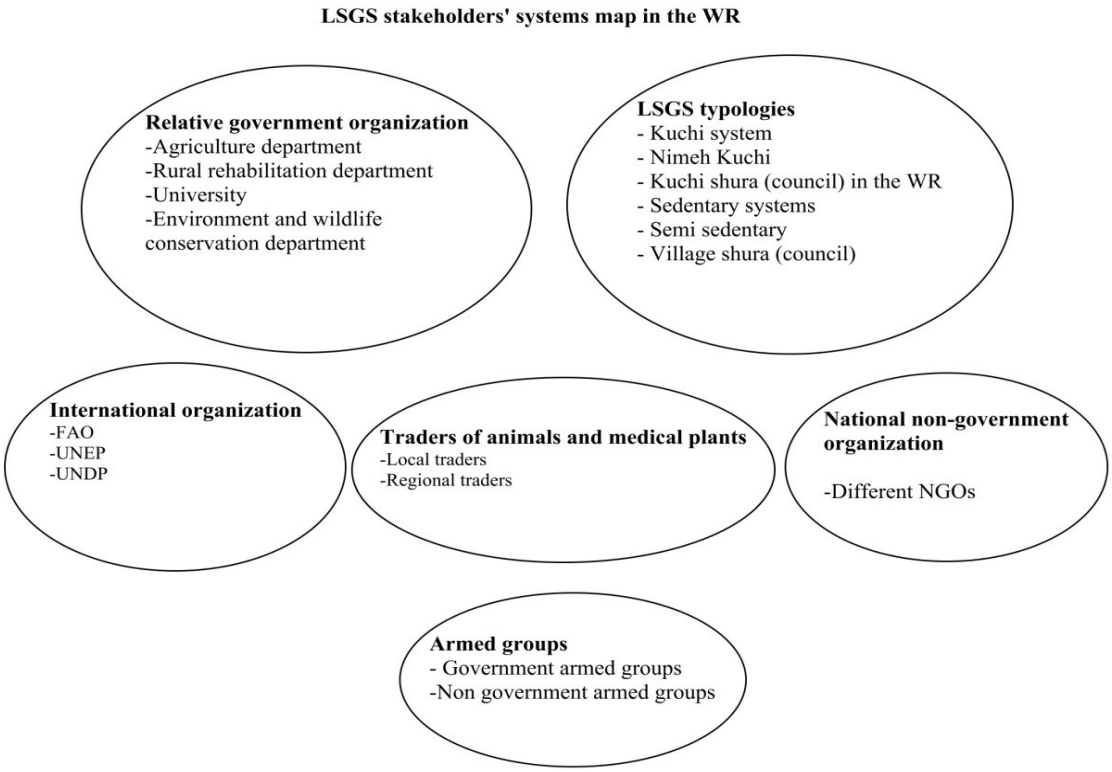

Figure 24. Map of main identified LSGS stakeholders in the WR of Afghanistan
FAO (Food and Agriculture Organization), UNEP (United Nations Environment Programme), UNDEP (United Nations Development Programme) and NGOs (Non-Government Organizations).

There have done the interview in three phases and after each phase, has tried to cover the pervious gaps and remained information. Therefore, it was a good opportunity to collect and completed all necessary information in better way as an interactive process (Sessoms 2008), which is used my new lesson learning from the previous step to the next step and so on.

The first phase of the analysis was implemented in summer 2011, when interviews were made with six stakeholders groups and three experts from university, UN organization and NGO. The second phase of the analysis was implemented in summer 2012, when interviews were made with one expert and six stakeholders groups. In the two phases, a total of four experts and twelve groups of farmers belonging to different typology of grazing system were involved in the survey. Some 3-5 persons composed in each group.

In addition, there has contacted with different governmental offices, including department of Agriculture in Herat province, Forest and rangeland section in Badghis province, Agriculture department in Ghor province and planning department of MAIL (Ministry of Agriculture, Irrigation and Livestock in Kabul).

Interviews and field survey with sedentary farmers and semi nomad were conducted on the same period, but with *Kuchi* groups was conducted only interview without field survey.

Both structured and semi structured interviews were conducted with the aim addressing relevant topics from respondent(s) as well as to collect data related to grazing system and rangeland's resources usage and access by the different typology of LSGS.

Figure 25. Interview with stakeholders and *Nimeh Kuchi* shepherd.

3.3. Field survey

Participatory techniques (Cavestro 2003) were used during the interviews especially when interviewers were villagers. Villagers were involved in a participatory mapping exercise (Duvail et al. 2006) at village level to illustrate the village resources and the location of the managed rangelands and *Quruq* (a traditional practice for resting of rangeland/rest-rotation).

The village mapping tool involves the community members in drawing a map of their community to tell their story together.

In order to gain access to this information by the villagers, we contact with local leaders and officials that enabled us to make the field survey in the agreed dates.

In order to perform the field survey, after the village was reached, the following consecutive steps were planned, taking into account of the social custom and security issues in the study area:

- Meet the *Arbab* (leader of village) or head of village *shura* (head of village council).
- Select a place for meeting with villagers following the consultation of the head of village that was often found in the *Masjid* (Mosque), Village *shura* room or at the house of *Arbab*.
- Explain the reasons and objective of the visit to the village very clearly, that had already been mentioned in the first contact with the head of the village.
- The *Arbab* introduced a group of villagers, among which some were members of village *shura*.
- Before start talking on the topic, asked the knowledgeable people about a subject that was important for villagers (e.g., drought affect, livestock productivity situation).
- Start talking with showing genuine interest in the local issues.
- Continue talking as friendly and with iteration technique for confirming the given information.
- After the collection of information, participants were asked to identify one of them who would be able to draw the village map with others villagers. If there was no volunteer, facilitator was performed in order to draw all direction and location of different resources following the indications of the villagers.
- The final step included transects walks and guided field walks. By this way with key informants was conducted a walking tour through areas of interest to observe, listen, and identify different zones or conditions, and ask questions to identify problems and possible solutions based their traditional knowledge. This method was intended to allow an outsider to quickly learn about topography, land use, rangeland, watersheds and community assets. In a subsequent step, the first village map draft could be further adapted to make it clearer.

Figure 26. Village mapping by villagers.

3.4. Data analysis and interpretation

During the research period, secondary data have been collected for background information and to check the basic assumptions of facts that the stakeholder have provided. Furthermore, a careful review and assessment of the secondary data was done from literature before and during the fieldwork.

The analysis of data collected during the field survey started with debriefing the field notes and organizing the data on the bases of the research questions. The spatial data gained from the interviews were classified as different types of grazing areas and paths of seasonal livestock movements.

The expert survey and stakeholder interviews allowed obtaining information at different levels such as experts and local people. The following steps were followed to analyze this information:

- The collected data from expert and stakeholders were summarized separately.
- The results of the interviews were used to prepare a table comparing the characteristics of the main typologies of grazing systems, in terms of livestock management and socio-economy.
- The flock (sheep or goat) energy requirements were estimated on the basis of the quantitative information obtained from the interviews with different livestock owners belonging to different typology of grazing systems as well as by expert surveys. Energy requirements were expressed as *Unite Fourragère lait* (UFL) for each type of animal (Tisserand et al. 1989), and animal unit equivalent (Tonya 2010).
- The animal energy requirements were estimated on the basis of the different type of animals and the physiological period such as adult ewe dry (maintenance), adult ewe pregnancy 6 week before lambing, adult ewe pregnancy 2 weeks before lambing, adult ewe milking early, adult ewe milking late, male (maintenance), male (mating), young sheep (growth).

- The number of animal in different month is estimated according to market information such as different type of animals that are going to market for selling or slaughtering.
- The average UFL per animal, by distinguishing adult females, males and youngs are based on the number of sheep and goats. The requirements per flock take into account of the proportion of the three different animal categories and the animal species - sheep or goats
- For each typology of grazing system, the following information concerning the traditional livestock husbandry and grazing management practice was derived from the interviews: 1) Site characteristics, 2) Social issues, 3) Livestock, 4) Grazing management, and 5) Village mapping (except *Kuchi* case study).
- The data on climate, population of different typologies, livestock population, grazing pathway and village map were treated using MS Excel, Google earth and MS Paint software.

4. RESULTS

4.1. Typology of grazing systems

As an outcome of the expert survey and interviews, two main typologies of grazing systems were identified on the basis of the community organization associated to the animal mobility pattern: *Kuchi* (nomad) and sedentary (*Deh nashin*). Each of them can be clustered into two sub categories.

1- *Kuchi* (Nomad)
   A- *Kuchi*
   B- *Nimeh Kuchi* (Semi nomad)
2- *Deh nashin* (Sedentary)
   A- Sedentary
   B- Semi sedentary

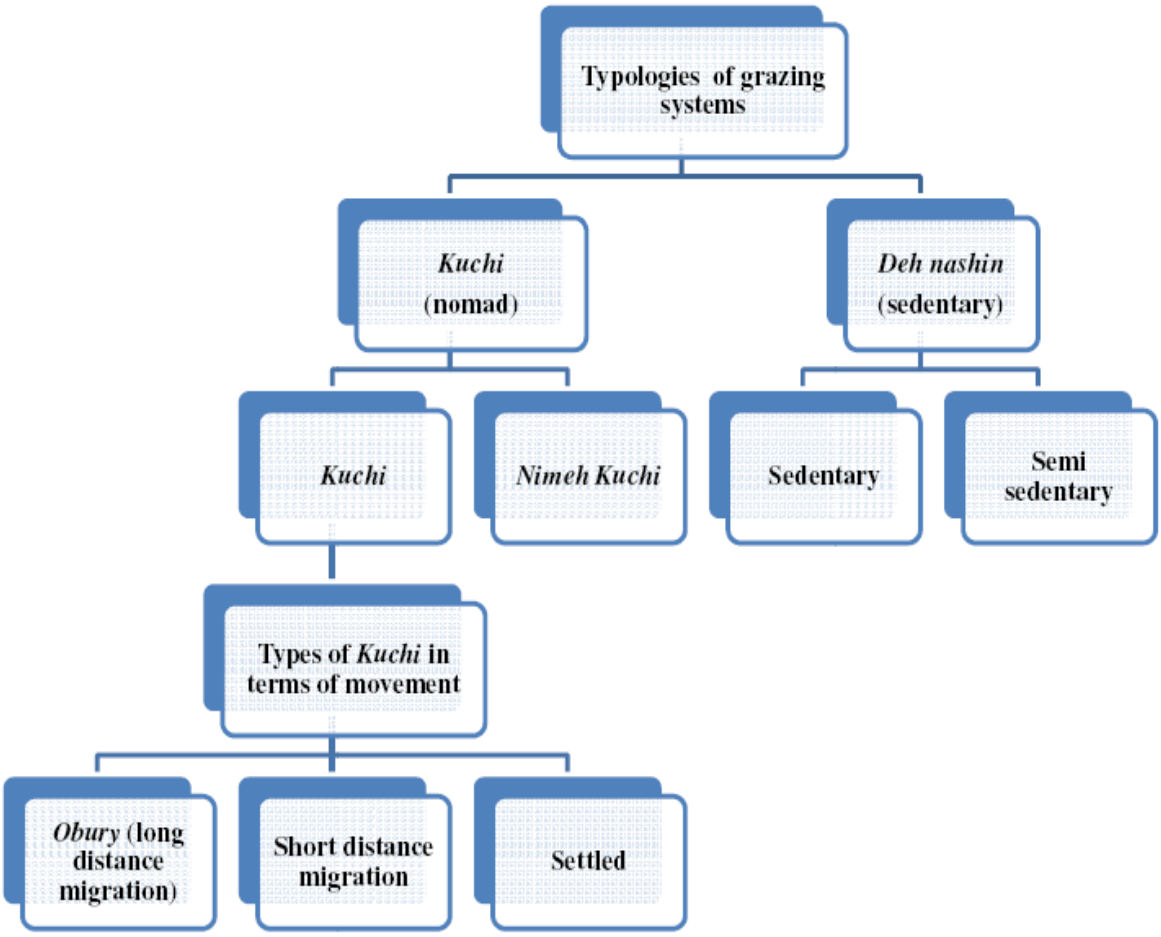

Figure 27. Typologies of grazing systems in Western Region of Afghanistan

In this paper, terms of "*Kuchi*" and "nomad" are used as the same meaning.

Each these four typologies of grazing system has implications on the societal traditions and practices of the pastoral communities and on the specific effects on rangeland ecosystems. The four categories are not mutually exclusive: one family may have both nomad and semi-nomad or sedentary and semi sedentary members and there is a continuous interaction between the different communities as fortunes fluctuate, changing from one sub type to another sub type but within each main typology. This depends on many factors that can change year by year in the context of Afghanistan: accessibility to rangeland, security problems for movement, availability of food for their animals, available facilities for movement or migration to long distance.

On the basis of ethnic group, Pashtun divided in to two main group include *Durrani* and *Ghilzai*, which the most of Pashtun *Kuchi* nomads in the WR are *Durrani*. In additions *Durrani* group is also divided to: 1) *Pangepay* which is include *Ishaqzai*, *Nurzai* and *Alizai,* 2) *Zirak* which is include *Achakzai*, *Barakzai*, *Alikuzai* and *Popalzai.* Furthermore, the term *maldar* is preferred for the migratory communities- in particular non-Pashtun pastoral communities, such as *Aimaq*, *Arab*, and *Baloch*. In addition, these non-Pashtun pastoralists' communities in Herat and Ghor province also migrate with the entire household to the pastures in summer season.

What follows is a general description of each sub-type of grazing system of the Western Region derived from the interviews and expert surveys.

4.1.1. *Kuchi* grazing systems

4.1.1.1. *Kuchi* (nomad)

The *Kuchi* system is one of the oldest migratory sheep and goat husbandry techniques in Afghanistan. In the *Kuchi* system, families move with their flocks in constant search of grazing and water.

Kuchi are more numerous in the south, the southwest and the west of the country. Migration routes still remain much the same for those nomads who still have livestock. In recent years, the movements to summer pastures of pastoral communities were constrained or prohibited because of the continuing conflict and security problems.

Kuchi communities spend winter in the lowland areas to the west of the Hindu Kush Mountains and migrate to the highland areas in summer. These people continually discuss where and when to move, and why, and are constantly searching for, evaluating, and reevaluating relevant information from direct experience and secondary sources, in order to support their decisions about migration, and the decision make by men and head o f *Khe*l (a Pashtun tribal division/ tribal groups).

These groups are major providers of meat, wool, and dairy products. Recently, the *Kuchi* system has been associated with poor quality of life and environmental degradation; furthermore, governmental officials have shown little concern for these issues because few social or economic costs of *Kuchi* systems are borne by the government.

In the past *Kuchi* from Herat and Farah provinces used to be mostly long distance-migratory pastoralist, but in recent years this pattern has been replaced by short-distance migrations. In addition, evidence of interviewers should that the process of migration pattern being changed from long distance migration to short distance migration and short distance migration to settle. If this process continues in future, number of settled *Kuchi* will significantly increase.

Through our interviews, Haji Mohammad Arif Khan Ishaqzi, president of *Kuchi* Shura in Western Region, explained that they distinguish other sub-types of *Kuchi* grazing systems depending on the distance of migration: "*Obury* and *Badieh nashin*"

Obury people move to long distance, from lowland to highland and beyond the province (e.g., from Farah and Herat province to Ghor province as long distance migration) to reach in summer grazing area.

Badieh nashin *Kuchi* people leave in a specific area, distant from villages such as near Turkmenistan and Iran border in winter, and in spring they move to the plain pastures of the *Dashte Hamdam Ab* area, west of Herat province. *Badieh nashin* grazing systems are mostly short distance migration and this term used in Herat province.

- The long distance nomadic communities spend some 30-40 days more than 150 km to move from the winter settlement (lowland) to the summer grazing area (highland) and the same days for returning.
- The short-range migrating *Kuchi* spend some 10-15 days less than 100 km for moving from one geographical point to another and the same days for returning. These types of *Kuchi* pastoral communities are frequent in the Herat and Badghis provinces.
- The settled *Kuchi* are often those who lost their animals because of the frequency and severity of drought and the internal war, and are then forced to settle near to urban areas. Their income mostly depends on daily work, some of them being busy with purchasing and selling the animals (sheep, goat and cattle) in the local market.

The choice of camping sites is usually determined by kingship ties and personal relations. Kinsmen tend to occupy pasture territories in common with one another so that there is a close relationship between kinship ties and territorial location for most *Kuchi* pastoralists. The labor duties of women may involve more than 10 hours of work each day including (e.g., cooking, milking, bringing water, washing, milk processing, fire fuel collection if the girls or boys involved in other activities, and installing tent in each new camping site)

4.1.1.2. *Nimeh Kuchi* (semi nomad)

Semi-nomad communities remain in their settlement areas throughout the year, moving to short distance as pasture grows, depending on weather. These communities are often impoverished, owning insufficient facilities to make the migration to the highland areas. They try to adjust their income through seasonal laboring, daily jobs or agriculture activities. In this case, some of them live in the village and have a house and some land to cultivate.

This group originated from *Kuchi* communities. Depending on the amount of land property, agricultural practice and number of animals, during the summer some members of the *Nimeh Kuchi* household may migrate to their seasonal grazing area or some households migrate only in certain years, but not in others. Some *Nimeh Kuchi* might settle if they had access to the agricultural land, but they continue the *Kuchi* system if they have no viable alternative.

Nimeh Kuchi people move in search of pasture for their animals within the province (e.g., from south of Herat province to north or south east of province such as *Farsi* district as short distance migration).

4. 1. 2. Sedentary grazing system

4.1.2.1. *Deh nashin* (sedentary)

The management of small ruminants owned by villagers varies within the province in the Western Region. Sheep and goats are usually herded together and both depend on grazing all year round. Large livestock owners employ their own cowherd (cowboy), or family members take their own large animals out for grazing, but normally the small ruminants are herded in joint flocks. The great majority of flocks move out of

the hotter lowland areas in the early summer to reach the better grazing areas and cooler weather in the near hills or mountains.

The main staple crop of sedentary communities is wheat; other major crops include barley, which is sometimes mixed with a legume, and maize, which is used as a livestock food. Fodder crops, such as alfalfa, Persian clover (*Shaftal* or *Shabdar*) are used for hay, making up about 10 percent of the cropped area. A variety of other crops are also grown e.g., chickpea (*grams*), millet, cotton and potatoes, furthermore they grown wheat, caraway, melon, watermelon and chickpea under rainfed condition mostly in Badghis, Ghor and to north of Herat province.

Sedentary communities live in villages all year round, own stock and may their shepherd to take stock to summer rangeland.

Summer grazing areas for the herds of sedentary farmers are usually close to villages, their flocks may move with shepherd further away, but this movement is shorter distances than *Kuchi* or Nimeh *Kuchi*.

4.1.2.2. Semi sedentary

The semi-sedentary pastoral communities, who have house, own their agriculture land and all or part of household members move with their animals during the summer season. The movement of this community under business as usual will be at short distance with the aim to search forage of better quality for their animals in the rangeland. Meanwhile they want to protect their agricultural production during the growing season within and around the village.

In terms of grazing system management, this system is very common in the Ghor province. In this case, sedentary households settle in villages surrounded by irrigated and rainfed land. In the summer, they move with their animal herds some 10-15 km away and set up tends, forming a single great camp.

The primary activity of semi-sedentary farmers is raising livestock and agriculture activities e.g., cultivate grain, barley and fodder crops. Traditionally, these communities move with their livestock between different seasonal settlements in generating winter and summer settlements. This movement occurs within the same district, hence differently from the vertical transhumance of *Kuchi* or *Nimeh Kuchi*.

In semi sedentary systems, all flocks are recovered at night during the winter season in the stables around the village. Some 20 or 30 days before winter, depending on weather, they keep their flocks during the night into *Gash,* which are stables made only with thorny plants without mud, in the grazing area. Shepherds receive food by shepherd assistants (*Gumary*) from the village every afternoon. In late autumn and during the winter animals receive a daily or additional supplementary food like barley grain and lucerne hay. Furthermore, in summer, flocks remain in the grazing area at night, but once per day (around midday) shepherd brings the flock in the settlement for milking.

4.2. Characteristics of *Kuchi* and sedentary in terms of grazing management and socio-economy

Table 10. Characteristics of the main typologies of grazing systems in Western Region of Afghanistan.

Characteristics	Main typologies of grazing systems	
	***Kuchi* (nomad)**	***Deh nashin* (sedentary)**
Grazing and livestock management		
Size of flock (sheep/goats)	More than 500 head	Less than 500 head
Flock feeding depend to	Rangeland and supplementary food (only in winter season)	Rangeland, cropland and stall feeding
Group of household who share their livestock	Less than 10 household	More than 10 house hold
Payment for grazing access	In some case yes	No payment
In winter season flock keeping in:	Tent and sheepcote	Stable/barn
Movement/Migration	Long-term and short-term	No long-term, mostly short-term (semi sedentary)/
Rangeland accessibility	They have difficulty (specially in summer grazing area)	Accessibility to grazing area is easier than *Kuchi* sysytem
Experience on livestock management	High experience on extensive management of livestock	High experience on mixed forming (livestock and agriculture)
Vulnerability to natural events	Higher than sedentary	Less than *Kuchi*
First need for the system	Livestock and rangeland	Water for irrigation and agriculture inputs
Access to veterinary services	No, in some case accessibility is in very low level	Yes, in marginal area accessibility is in very low level
Rangeland utilization	Based on season (winter and summer)	Based on season and continuous along the year
Shepherd employment	Hired shepherd based on annual, he received one-tenth weaned lambs or kids per year	Hired shepherd based on annual, he received one-tenth weaned lambs or kids per year

Characteristics	Main typologies of grazing systems	
	***Kuchi* (nomad)**	***Deh nashin* (sedentary)**
Socio-economy		
Social relationship	Simple and guileless	More complicated
Main income resources	Livestock productions	Agriculture, livestock productions and laboring
Collective cooperation (*Hashar*)	Based on clan and livestock rearing management	Based on decision of village *shura* and agricultural affairs
Productions	With low skill and more for their self utilization	With more skill and their surplus products for selling to local market
Accessibility of health services and other life facilities	Low/No (particularly during the seasonal migration)	Yes/low (in most case health service point is far from the village)
Level of literacy	Lower than10 %	Higher than 20%
Design of their tents	Bigger, flat, not square or roundish, mostly opened and black	Smaller, square or roundish, mostly closed and black
Accessibility to city and market	Their traffic/footwork in city and bazaar are low	Their traffic/footwork in city and bazaar are medium

4.3. Animal feeding

The most important perceived management issue with regard to domestic animals reared in the Western Region is nutrition. The primary feed resources in summer are the highland rangeland, most common winter feed produced on the farms is wheat straw, followed by barley grain, alfalfa hay, maize stover and grain, and clover hay.

In winter it is wheat straw mixed with some alfalfa and clover hay to supplement the winter grazing area in the lowlands.

Animals that move to mountain rangelands in summer recover body condition better than those left in the villages, because of the abundance and better quality of grazed plants in these rangelands.

The feeding calendar of livestock is generally divided between rangeland grazing in the spring and summer, and tethered with stall-feeding in the late autumn and winter season. Whilst grazing of the range provides a balanced intake of nutrients, winter-feeding does not because wheat straw is the main basal feed with few supplements or concentrates being offered. Therefore, animals are short of protein. This is quite a critical issue.

In general, hand feeding in winter lasts for four to six months, from October or November until March. For example, in the Ghor province it starts earlier and continues for more than six months. The length of the winter feeding period varies, depending on the severity of the weather, but animals are still taken to graze each day whenever the weather conditions allow. Farmers therefore still need to conserve substantial amounts of feed stocks; the amount increases as the altitude increases.

Winter-feeding practices varied somewhat between the different animal types and between males and females, but practically the farmers made no distinction between male and female small ruminants, which are usually fed together.

A wide variety of basal and supplementary feeds is used in winter by sedentary farmers, some of which is produced on the farm and some purchased from the market. *Kuchi* people do not have any particular storage and they keep wheat straw by plastic bags, therefore they can't purchase all their animal requirement for winter in one time

The level of productivity of the rangelands varies significantly between areas and from one year to another depending on weather.

It is difficult to get reliable information on the quality and quantity of sheep and goat products, as well as upon the production bottlenecks.

Shearing of sheep is done twice a year and that of goats once a year. Males not kept for breeding are castrated before they are 12 months old. Mutton from sheep is preferred as compared to goats. For this reason, fattening of young lambs is practiced for selling and slaughtering.

4.3.1. Energy requirements of *Kuchi* flocks

The *Kuchi* flocks depend heavily on the rangelands to provide for their animals needs. They are important small ruminant producers, as they own about one third of the national livestocks. The number of animal in one single flock varies and more than 500 head of sheep /goats. In this study, we found that the ratio between sheep and goat in *Kuchi* flocks changed considerably from before the war to nowadays. In the past, sheep were generally more numerous than goats; some interviewee estimated that this ratio was 9:1 (9 sheep and one goat in flock). Recently, the number of goats is increased and some of interviewees estimated this ratio is now near to 50:50 because the rangeland quality has declined, drought and accessibility of *Kuchi* to summer rangeland is decreased.

Kuchi are more numerous in the south, the southwest and the west of the country. Migration routes remain much the same for those *Kuchi* who still have livestock. In recent years, others were prohibited from using some of the summer pastures because of the unsecure land tenure.

Kuchi are largely of Pashtun ethnics and some of their traditional grazing grounds are located in the *Hazarajat* and central part of the country and areas dominated by the non-Pashtun group. A number of *Kuchi* have settled and become farmers, because of the severe drought that occurred in the past decades that caused loss of their animals.

The other hand problem of land tenure is caused to decrease the accessibility of summer rangeland.

Kuchi flocks from the late autumn to the end of the winter receive supplementary feed and for the remaining months of the year, they graze on the rangeland.

February and March are the critical time for the *Kuchi* flock, because in this period supplementary feed are almost finished and flock requirement is increasing, because of lambing and the start of the milking period. For this reason, most animals lose their body weight in this period. If animals do not receive enough food, they are estimated to lose 150 g of their body weight per day for a shortage of one UFL per day.

The supplementary feeds provided by *Kuchi* generally are wheat straw, barley grain and sometime small quantity of alfalfa hay or mixed with wheat straw. The estimated average animal requirement for January is 3.8 UFL AU^{-1} day^{-1}, of which some 3.0 UFL are provided by supplementary food and rest is provided by winter grazing (Fig. 28). When pasture is not available, animals will lose body weight. In February, the average estimated requirement is 4.0 UFL AU^{-1} day^{-1}, of which 3.0 UFL are provided by supplement and rest is provided by grazing.

The highest energy requirements are reached in June: 6.63 UFL $AU^{-1}.day^{-1}$. This period corresponds to the *Kuchi* transhumance to the summer grazing area, where they will access to better rangeland condition with good quality of food for their flock in the highlands of the Ghor or Badghis provinces.

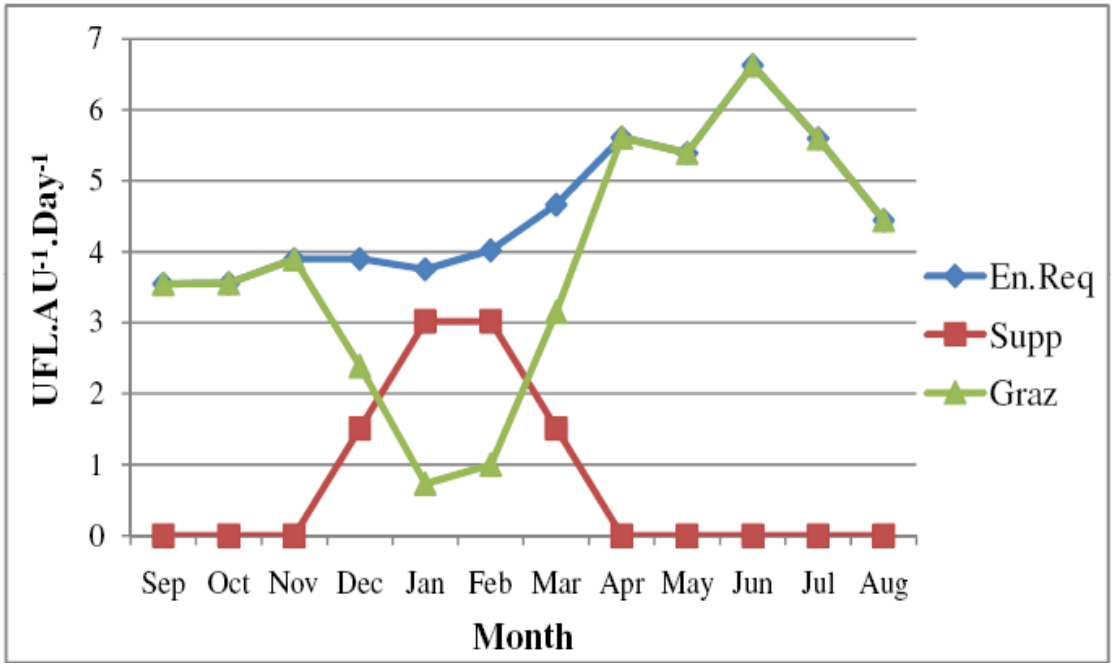

Figure 28. Monthly dynamics of estimated average animal energy requirements of a typical *Kuchi* flock.

Not: En. Req = energy requirement, Graz = grazing (estimated by difference), and supp = supplementary food. AU = animal unit. UFL = *Unitè Fourragère Lait*

4.3.2. Energy requirements of sedentary flocks

The sedentary sheep and goat livestock are herded together as it happens for the *Kuchi*, but the size of the flocks is smaller than the *Kuchi*, never more than 500 heads of sheep/goats in one single flock.

Families take turns in herding the animals, although in the case of some big flocks the owners hire herders. Sick animals remain in the village. Sheep generally produce milk, meat and wool, with two shearing per year. Female small stock is milked once a day for about four months, with sufficient milk being left for suckling lambs.

Goats also provide hair and cashmere. Local breed shearing takes place once or, sometimes, twice a year, but not all breeds of goat are shorn

Farmer's perceptions of the desirable ratio of female to male livestock is 40 female and one male, but the actual ratios for sheep and goats are greater than generally recommended. Much higher ratios (reaching up to 80 ewes per ram) have been mentioned by interviewees and are a potential cause of low fertility, for instance for one flock with some 500 animals many shepherds keep only 6 males.

The target yield of rangeland of Ghor province (the main summer grazing in the Western Region) is estimated 656 kg ha^{-1} $year^{-1}$ DM.

Sedentary flock feeding is more dependent on supplementary food, farm residues and village pasture availability than *Kuchi* flock that is more dependent on rangelands.

The quantity of food that sedentary farmers need to provide for their flock in winter is variable and it depends on the available agriculture land area, their economical situation, the vicinity of rangeland and rangeland productivity. One interviewer estimated that he needs 400 kg of barley, 4,000 kg of wheat straw and 800 kg of mixed straw with forage for 40 sheep/goats for 3 months during the winter. Usually sedentary provide the requirement food for their animals before the winter and stored in the village.

The average energy requirements in January is 3.8 UFL AU^{-1} day^{-1} of which some 3.6 UFL are provided by supplementary food and 0.15 UFL by village pasture and farm residues. In February, the estimated average energy requirement are 4.0 UFL AU^{-1} day^{-1}, provided 3.9 UFL by supplement and 0.13 UFL are provided by village pasture and farm residues.

The maximum energy requirements are reached in June (6.6 UFL AU^{-1} day^{-1}), when sedentary flocks are moved to the summer grazing areas located not far from the village, where rangelands can cover the whole requirements and animals recover the weight lost in winter.

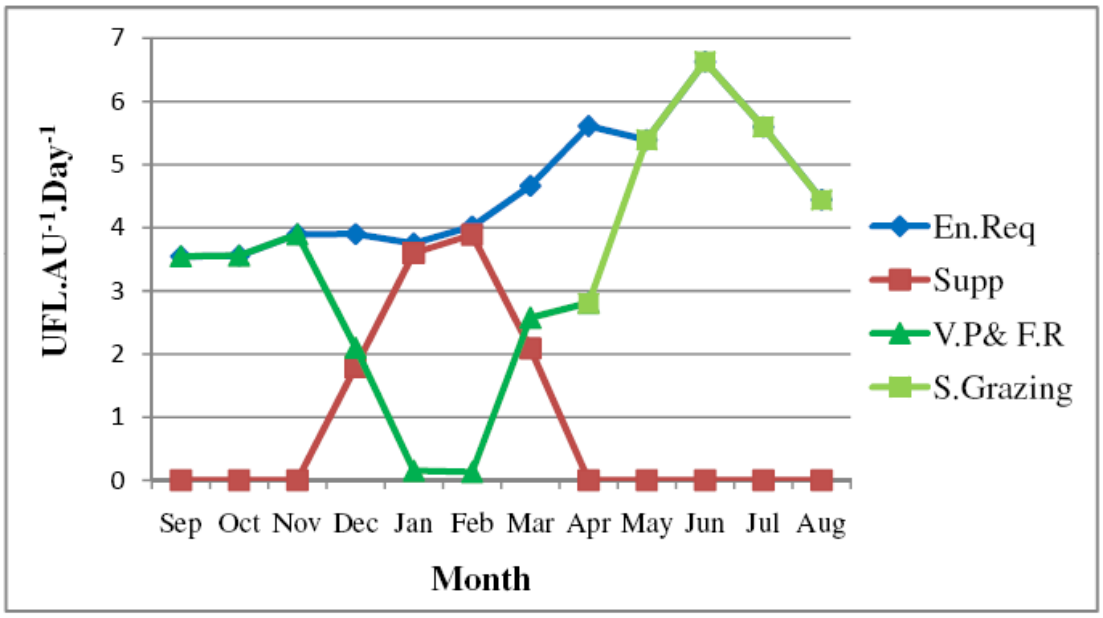

Figure 29. Monthly dynamics of estimated average animal energy requirements of a typical sedentary flock

Note: En. Req = energy requirement, supp = supplementary food, V.P & F.R = village pasture and farm residue, S. Grazing = summer grazing

The increase in energy requirements after March is related to the increase in the number and requirements of new young animals and to the increase of adult animal requirements for the milk production. The maximum requirement is reached in June. The fluctuation of the animal number during the year was estimated on the basis of the market information for each type of these animals (e.g., from 350 animals in September, a flock reached 433 head in June)

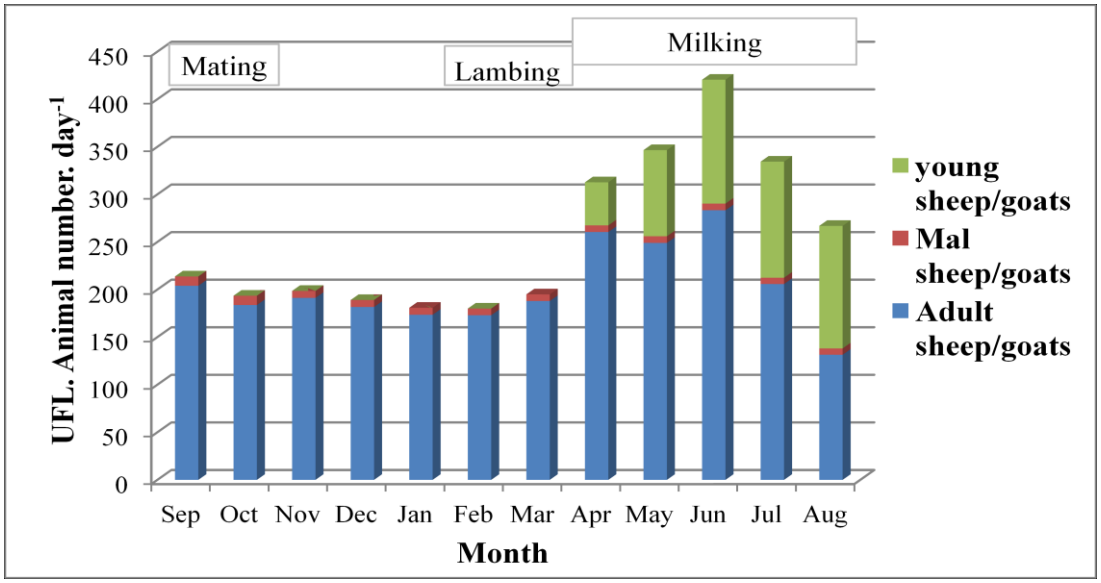

Figure 30. Monthly dynamic of the average UFL requirements for a sedentary flock (roughly 50% sheep and 50% goats) ranging from 350 animals in September to a maximum of 433 in June.

In additions the target yield of rangeland of Ghor province (the main summer grazing in the Western Region) is estimated some 656 kg he^{-1} $year^{-1}$DM.

4.4. Case study on different grazing system typologies

Climate, soil types and the altitude gradients of the Western Region are the basic natural elements that generated the different types of rangeland management systems in the area.

In the **Herat province** the most important summer areas for the short range migratory *Kuchi* are *Kushki Rubat Sangi*, *Gulran*, *Kushk Kohnah, Farsi*, *Pashtun Zarghun*, *Chisht Sharif*, *Obeh,* east of *Adreskan*, and *Dashte Hamdam Ab.* These areas are used for grazing during the year.

The long-range migratory *Kuchi* are predominantly fully migratory, their summer areas are the Ghor province, winter grazing area are located south and west of Herat and in the Farah province. The **Ghor province** is only a summer area for *Kuchi*, no *Kuchi* stay in this province in the winter. Ghor is the third most important province, after Kabul and Logar provinces, for the long-range migratory *Kuchi* communities of Afghanistan. Most of the long-range migratory *Kuchi* move to the Ghor province from Herat, Farah, Badghis and Helmand provinces. In the Ghor province, Safed *Koh,* north of *Hari Rud*, and *Siah Koh,* south of *Hari Rud*, are two main summer grazing areas. Every member of the *Kuchi* community is familiar with these names. The **Badghis province** also has a population of *Kuchi*, mostly those short-range partially migratory. Overall, some 94% of the *Kuchi* community people, which living in Baghdis province are short range migratory nomadic. However, in this province *Kuchi* use Badghis rangeland for grazing along the year in different seasons. In some cases, part of the *Kuchi* pastoral community migrate in Ghor province in summer, behaving as long-range migratory nomadic and camp in *Shahrak* and *Dulayna* districts and near to *Chaghcharan*.

Badghis is a province of beautiful grassy downs, sloping gently to the northward. The soil of the valleys, and also of the high ground when near the hills, is exceedingly fertile and produces excellent crops of wheat and barley without irrigation.

The **Farah province** is home of a population of *Kuchi*s whose numbers vary in different seasons. Almost three quarters of the *Kuchi* population in this province are long-range partially migratory, while the remaining part are short-range partially migratory and settled. In the winter, all *Kuchi* groups stay mostly in one area and do not move around during the season.

In the summer, the most important areas for long-range migratory of Farah *Kuchi*s are Ghor and Herat provinces (to southeast), while the short-range migratory *Kuchi* prefer *Anar Dara*, *Purchaman* and *Gulistan* districts.

When *Kuchi* groups move from winter to summer rangeland, they cross through the spring rangeland, which is grazed in autumn and spring with a higher grazing pressure than the summer rangeland.

4.4.1. *Kuchi* case study: Shindand district, Herat province

Site characteristics

Shindand district (33°29′99″N, 62°14′44″E).located 123 km south of Herat center at an altitude of 1,066 m a.s.l.

Shindand *Kuchi* communities spend their winter season in a number of camps in different location of the Shindand district named *Biabanha* (west band of district), *Dashte Shoraw* and *Aziz abad* (east). *Dashte Shoraw* is a salty plain located 15 km away south east from the Shindand district at an altitude of 1,260 m a.s.l.). It is surrounded by a chain of hills and mountains and crossed by the Herat-Kabul highway. It covers approximately 94 km^2**.** This area is used by *Kuchi* peoples as winter grazing rangeland since decades.

Social issues

Since the last century, *Dorrani* Pashtun has been dominant in Western Region, with different ethnic backgrounds. They include both sedentary and *Kuchi* members. A camp is composed of one or several herding units, depending on the maximum sustainable stocking rate in a given locality, the maximum number of animals in flock depend to number of families that they share their animals in one flock and numbers of animal of each family.

Different factors play a role in defining the composition of a camp, including tribal or clan rules, family relations, relation with the state and sedentary communities, ecological opportunities and security context.

Livestock

The typical herd composition range from 400 to 500 between sheep and goats, which correspond to a maximum 100-150 and a minimum of 40-60 sheep/goats per household. Groups of household who share their livestock are referred to as herd unit; their average membership is 5 to 10 household. Because of recurrent drought, in the last years in Ghor, Badghis and Herat provinces the animal population has decreased significantly. The interviewers estimated that the number of goats and sheep decreased some 50%. In this case, the numbers of households wanting to share their livestock increased in recent years.

In terms of seasonal grazing management, at least for 3- 4 months from late autumn to early spring, *Kuchi* household come back from the summer rangelands and establish their winter camps away from the vicinity of the villages. In this period flocks graze in open areas near to the winter settlement and *Kuchi* people prepare to get some straw, hay or grains to feed their flocks during the winter. One *Kuchi* shepherd said that for three months, they need approximately 2000 kg wheat straw and 1200 kg of barley for a flock of 40 sheep/goats, in addition to the possibility of grazing the winter grazing area. To get feeds from the market, they sell their animal or their animal production such as wool, *Qurut,* or they pay using the money that their family members obtain from labor.

Haji Mulla Amir (camped in *Kahdanak* village) estimated that about 700 sheep/goats of which 50% is goats compose a herd unit. Another interviewee, Mullah Abdul Rahman (camped in *Chahargush* village), estimated that in his own camp the herd unit was made of some 450 animals, some 50% sheep and 50% goats.

Grazing management

The Western Region winter grazing is treeless, except some parts of Badghis and Ghor provinces. The dominant vegetation is made of dwarf bushes like *Artemisia sp. pl., Cousinia sp. pl., Acantho limone sp. pl., Stachys sp.pl., and Pegonum sp. pl.. Artemisia* is one of the most frequent plants together with perennial grasses that grow actively only in early spring.

Where *Kuchi* camp, in a few months deterioration of pasture becomes noticeable, not just for the effects of overgrazing but also because of firewood harvest that is destined to camps, villages and towns.

From the beginning of *Hut* (20 February), when the additional feed stocked for the winter is almost finished and their herd composed for grazing, the settlement, usually at the beginning of *Hamal* (21 March), move to the spring grazing area. This is the lambing and milking period. Lambing needs human assistance that mostly occupies younger persons and milking takes place in front of the tents once a day, usually in the middle of the day, when lambs are brought to their mother for feeding and manually milking practiced by women. To manage their herd, they employ on an annual basis a *Chupan* (shepherd) for each herd. Shepherd is a poor person from an economic point of view, but he has good experience in terms of herd management so he knows the different grazing management unit and pathways of movement. *Chupan* received daily bread and one tenths of the newborn lambs or kids in the following spring.

In this case study Mullah Abdul Rahman estimated that it takes some 30-40 days to reach the summer grazing area in the Ghor province. The locations that they crossed during the seasonal migration are *Banowshak*, *Sia sang*, *Shirzad*, *Farsi*, *Tik* and *sheshyar* these two last locations belong to *Tulak* district in the Ghor province.

Usually they graze the public rangeland in highland during the summer season but in some cases, rangelands are under control of the nearest villagers who preserve the rangelands collectively and rent it to *Kuchi* on a seasonal basis. The quality of a given rangeland may change from year to year so there is no fixed price for rent. For example, the interviewee described that sometimes they paid for grazing with a medium quality of forage for one flock (500-1,000 head of sheep/goats) 50,000 Afs (corresponsing to about 1,100US$ or 1.5 US$/animal - 1US$ = 45 Afs). If the quality of such area is good, evaluated on the basis of the botanical composition of the pasture, namely legumes such as wild medics and lucerne they can pay double price (e.g., 100,000 Afs).

The duration of the seasonal movement, depend on the availability of forage on the pathway, security issues, accessibility to the grazing area, condition of livestock and time necessary for the flock to go or comeback.

The interviewee also mentioned that when the way back to the winter settlement is much faster that the way forward to the summer rangelands, in relation to the climate conditions and the lack of forage. According to his experience, he estimated that in the way back animals move some 10-15 km per day, while during the spring from lowland to highland pastures their flocks move less than 10 km per day.

Table 11. *Kuchi* mobility and grazing pathway throughout year (Herat and Ghor provinces).

location	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Char Gush												
Sia sang												
Sherzad												
Farsi												
Tik												
Sheshyar												

The *Kuchi* that they camped in *Dashte Shoraw* in winter season, they crossed different location such as showed in (Table 12)

Table 12. *Kuchi* mobility and grazing pathway throughout year (Herat and Ghor provinces) from two settlements

location	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Dashte Shoraw												
Shindand (Mandel)												
Deh Khak												
Khamgal												
Siyah Koh												
Sang meshine												
Tik												
Sheshyar												

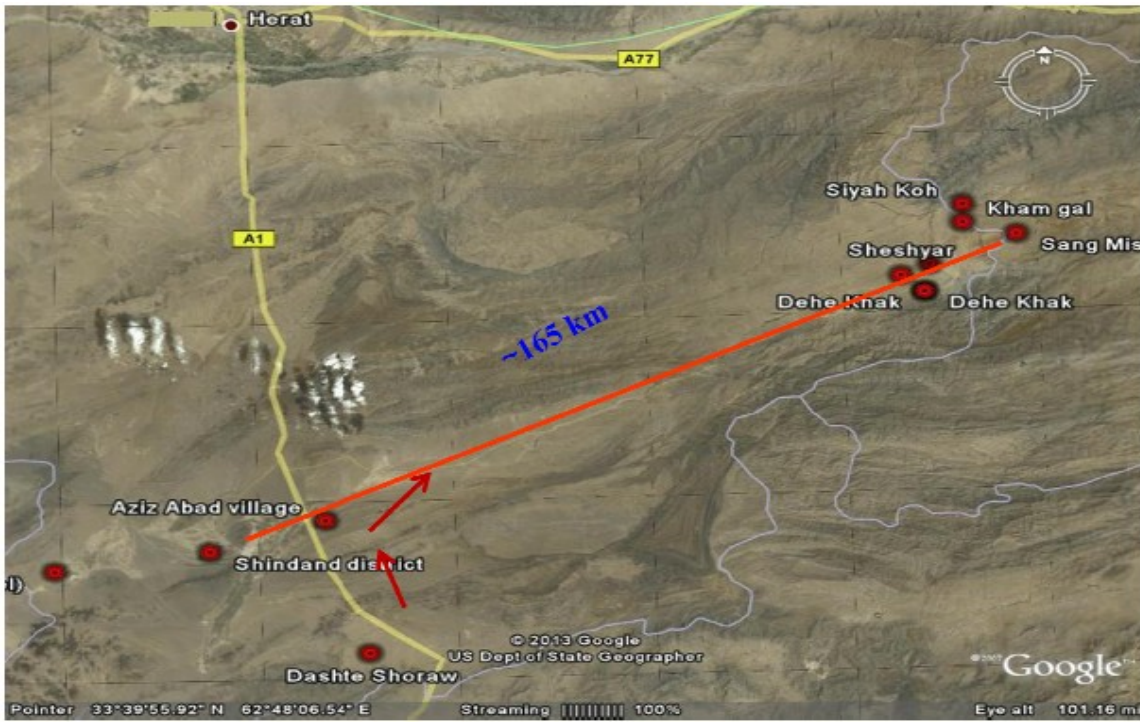

Figure 31. Shindand *Kuchi* grazing pathway.

4.4.2. Nimeh Kuchi case study: *Taghi Nighi* village, Zendajan district, Herat province

Site characteristics

Taghi Naghi is a small village located 30 km west of Herat center and 15 Km north of *Zendajan* district center (34°25′025″N, 61°51′966″E) at an altitude of 918 m a.s.l. Neighboring communities are *Sayed Abad* (south), *Hotel safid* (west), *Deh Gholam Nabi khan* (north) and *Deh Surkh* (east).

In this area, there are some 2,500 *Jerib* = 500 ha (one *Jerib* = 2,000 m^2) of cropland, of which 12 ha are irrigated land. The lack of water does not allow double cropping, but villagers plant vegetables in small plots in or near their houses as kitchen garden. Wheat and barley are grown both in irrigated and rainfed land.

Social issues

The interviewees describe themselves as *Sultan zai* and *Noor zai*, there are indications that they used to be *Kuchi* that settled here within the last few generations and now, as they mentioned, they are *dukhanaghi:* part of their family moves seasonally with their flocks to summer grazing areas and part of their family remain in the village. The villagers estimated a total of households of 130 families of which 30% are landless. Some 60 men immigrated to foreign country in search of work.

Livestock

About 3,500 sheep and goats are reared in the village, grouped into four flocks including 10% goats, 15 cows and 15 donkeys.

There are two flock management systems in terms of movement or migration:

1) In summer 2011, their flocks with parts of their family moved to the highland rangeland of the Tulak district in the Ghor province that they reached after some 20 days. In this case, they are considered as long distance transhumant.

In 2012, they rented an area named *Sia sang* and *Lukah Sang* (3-4 hours distance to north of village located to east of Kohsan district) and paid overall some 280 000 Afghani corresponding to some 6,200 US$ to allow 3,500 sheep/goats grazing for 5 months. Furthermore, this area is an open plain and hilly that during to the spring season, is preserved by people from another community and is hired to the *Taghi Naghi* community on the basis of oral agreements. The procedure of payment is based on the number of sheep and goats per family. In this case, they are considered short distance transhumant.

In both flock management systems, they hired shepherd annually for each flock as well as an assistant (*Gumary*) when required, and shepherd received one lamb from ten female sheep/goats per year.

Table 13. *Nimeh Kuchi* mobility and grazing pathway throughout year (Taghi Naghi village, Herat province).

location	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Stall feed												
Village closed rangeland												
Dashte Hamdam Ab												
Lukah Sang												

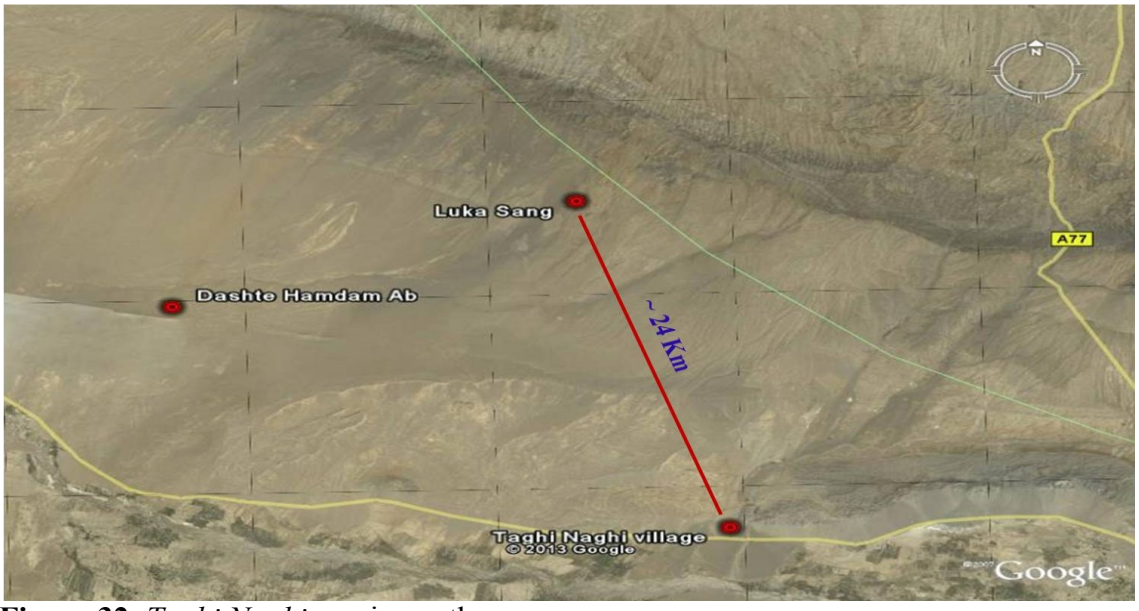

Figure 32. *Taghi Naghi* grazing pathway.

Grazing management

In terms of seasonal grazing, sheep and goats, rely for most of the year on being able to graze the open area for which the community has traditional rights, including the *Dasht* and the hills.

Each community takes advantage of the available options. The seasonal use of different parts of the available grazing land, whether on the *Dasht*, on the hills, in the mountains or on the stubbles, is opportunistic rather than consciously managed. They operate as well as they can within the limitations of their situation.

Dashte Hamdam Ab (North West of the village), provides its grazing in the spring season, when there is a brief flush of perennial grasses and Artemisia steppe. Later in the autumn and winter, this area provides coarse, low quality grazing on woody perennial. After the spring flush on the *Dasht* is over, the flocks move up to the summer grazing area in relation to the possibility and accessibility to long distance or short distance migration. They return to the lower elevations as the weather cools in autumn. In winter, they return to the villages where the sheep are stall fed on straw and residues.

The sheep and goats are herded for 10 months of the year from the beginning of *Hut* to the end of *Qaus* (from 20 February to 21 December), after which they are stall fed for the next 3 months, this varies slightly from year to year depending on the weather. While herded, the flocks graze the community rangeland in the hilly and plain immediately around the settlement and return to the village in the evening, each one go to the house of its owner where they receive an evening feed.

This continues until a shortage of grazing and colder weather makes it necessary to provide the animals with fodder. It is a highly opportunistic system dependent on what is available in each season. As far as possible, they maintain a balance between the uses of inexpensive grazing and the by-products of the cropping system to support their flocks. Livestock owners rely on being able to graze the wheat stubbles after harvest and on fallow land.

The villagers preserved (*Quruq*) about 400 ha as showed in village map; also, they cultivated 14 ha from this *Quruq* area with *Kochia prostrata* plant as rainfed in year 2010 in close collaboration with a non-governmental organization.

Village mapping

In order to do the village mapping, was discussed with *Arbab* (leader of village) and members of the village. They have irrigated land and livestock and made the village map together, then walked in the surrounding of the village and adapted the map, as well as the *Quruq* and non *Quruq* areas, the grazing areas, the irrigated land and the spatial distribution of water sources. Figure 33 reports a translated map. The original one is in appendix.

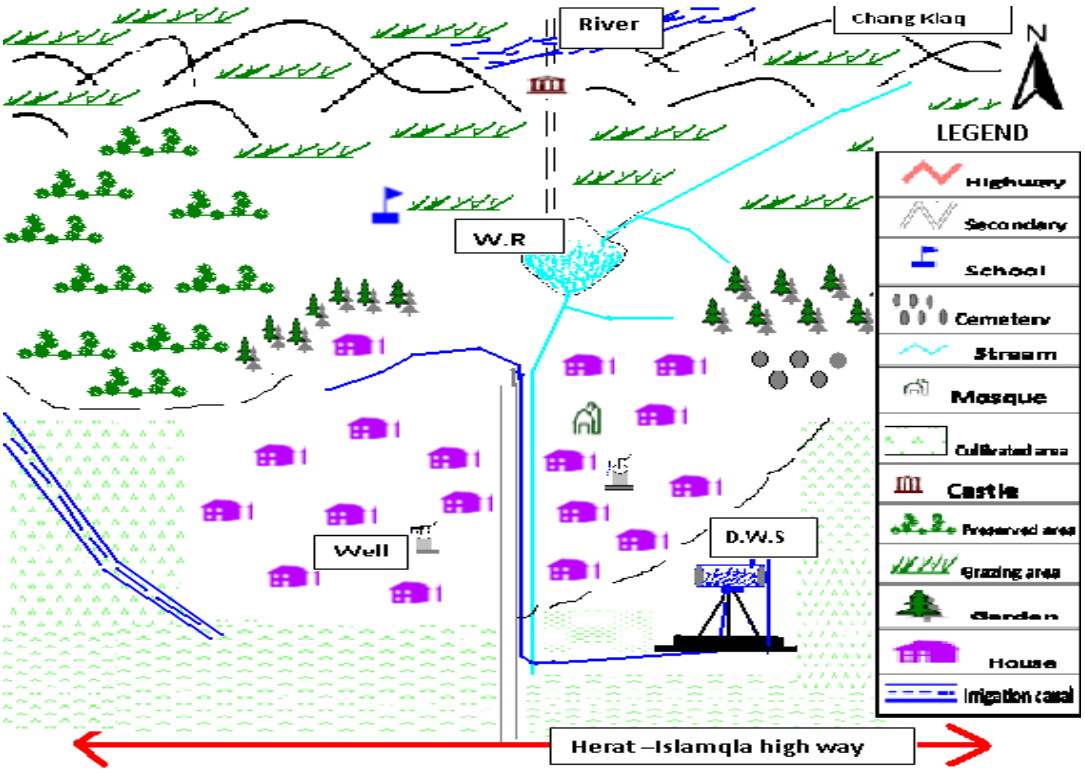

Figure 33. Taghi Naghi village translated map.

Note: W. R=Water reservoir, D. W. S=Drinking water store (Tank).

4.4.3. Sedentary Case study: *Ruch* village, Ghoryan district, Herat province

Site characteristics

Ruch is a big village located 15 Km north of Ghoryan district center (34°27′794″N, 61°24′525′E) at an altitude of 779 m.a.s.l. Village surrounded Herat-*Islam Qala* Highway (north), *Hari Rud* (south), *Nang abad* village (east) and *Sabol* village (west).

In this area, there are some 1,470 *Jeribs* = 294 ha (one *Jerib* = 2,000 m^2) of two-type cropland:

- Extensive open land surrounding the village with limited access of irrigation water, this is cropped with autumn-sown wheat on a wheat/fallow rotation and there isn't sufficient irrigation water to grow summer crops. Wheat fulfills the double purpose of providing grain for human consumption and straw as the main bulk fodder for cattles and sheep. Those who cultivate wheat also share the right to graze the stubble after harvest. Wheat is dominant, cultivated on at 2/3 years, that called *Aesh* (cultivated as fallow rotation one at 2/3 years).
- Enclosed land within the precincts of the village with access to irrigation water, this is more intensely cultivated with legume fodder crops, pulses, potatoes and other vegetables in rotation with wheat and barley. Fodder crops such as Lucerne and Clover are cultivated in these enclosures. Nothing is wasted, including weeds and fallen leaves from the mulberry trees; full use is made of all available resources, estimated to be about 6 ha orchards.

Social issues

The villagers describe themselves as *Alizai, Alakozai* and *Noorzai*, there are indication that most of them are Pashtun. Villagers estimated a total of households of 280 families of which 30% families are landless, community is organized by *Arbab* and Village *Shura,* the most important source of employment are agriculture, livestock and laboring, some 150 persons every year leaved village for work to foreign country (e.g., Iran).

Livestock

About 700 sheep, 300 goats, 200 cows, 40 oxen and 100 donkeys (donkey mostly use for transfer baggage, fodder crops, bushes (for fire fuel that collected from long distance) and transportation in some case, one of the interviewers said that villagers need about 20 hours walk (going and returning) to reach on fire fuel collection area.

Sheep and goa**ts** are kept to provide the household with milk, as a source of meat and fiber, and as a moveable asset that may be sold to raise cash for household necessities, meet emergencies and finance social obligations. Those who have more than 20 sheep/goats may have the ability to manage the flock as a commercial proposition, with a surplus of animals, milk products or wool to sell but in most villagers such households are in the minority.

About 50-60 % of families own one or two milk cow (s) and oxen or cattle are herded communally, during the day, returning to the family compounds each evening. Households with sufficient fodder tend to keep cattle within the family compound rather than with the herd. Cattle are fed green forage and dry fodder (straw and hay). Milking cows and oxen may get a supplement of barley/pulse meal.

Most family have between 5–15 sheep /goats, each flocks is include two thirds sheep and one third goats and shepherds received one lamb from ten at weaning, or cash on the basis of lamb price.

Table 14. Sedentary grazing pathway throughout year (Ruch village/Herat province).

location	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Stall feed												
V.P. and C.P.												
Dashte Hamdam Ab												

V.P. and C.P. = Village pasture and crop residue

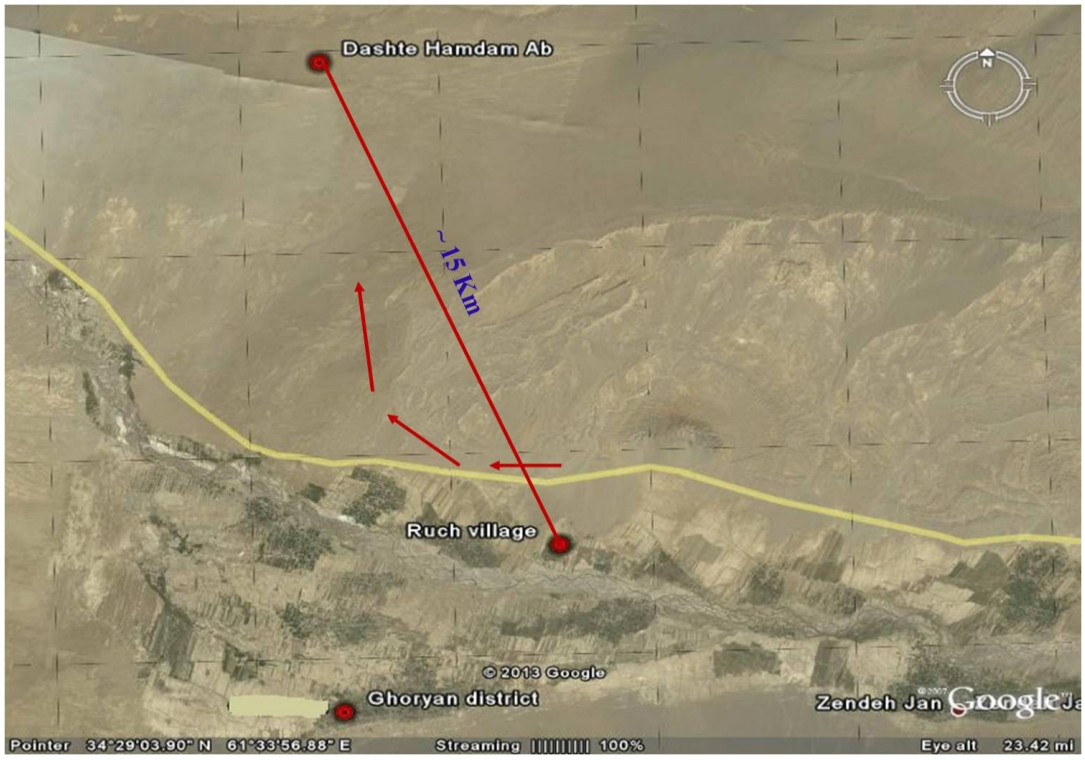

Figure 34. *Ruch* village grazing pathway.

As grazing calendar shows 8-9 months flocks kept and graze closed to village and 3-4 months their flocks move to short distance from the village.

Grazing management

Most of households of which own livestock, particularly sheep and goats, rely to some extent on the natural grazing provided by the open areas and mountains to north of the village and over which the community has traditional rights of grazing area. Much of this grazing is seasonal.

Villagers usually have the right to graze their animals on all kinds of fallows, stubbles and crop aftermaths regardless of individual ownership, particularly where cattle and small stock are grazed communally.

Seasonally, the flocks graze on open *Dasht* surround of their village and during the summer their flock move to *Dashte Hamdam Ab* to North West of their village (Fig. 34).

Winters are mild and flocks graze out all over except in bad weather. Small stock are fed forage or fodder (according to season) to supplement grazing during the autumn, winter and early spring. Animals requiring special feeding for sale or slaughter are kept at home. Breeding rams run with the ewes in *Mizan* (September to October) and lambs are born during *Hut* (February to March).

Livestock are managed as an integral part of the farming system and fit into rather than dominate the cropping pattern. In the case of small ruminants in particular, a balance is maintained between the use of common grazing land, stubbles, fodder crops and use of the by-products of the cropping system.

Their main problem is wind from north and flood from *Hari Rud* River; further more villagers with supporting by head of *village Shura* preserved about 75 km^2 rangeland area which is closed to village (north west). In addition, they planted a small parts of their privet land with bushes (*Haloxylon*) and vary trees in the north of village with aim to decrease the wind erosion.

Village mapping

To do the village mapping, discussed with *Arbab* and members of the village. They have irrigated land and livestock and made the village map together, then walked surround of village and adapted the village map, as well as *Quruq* area and non *Quruq* area, the grazing areas, the irrigated land and the spatial distribution of water sources. Figure 35 reports a translated map. The original one is in appendix.

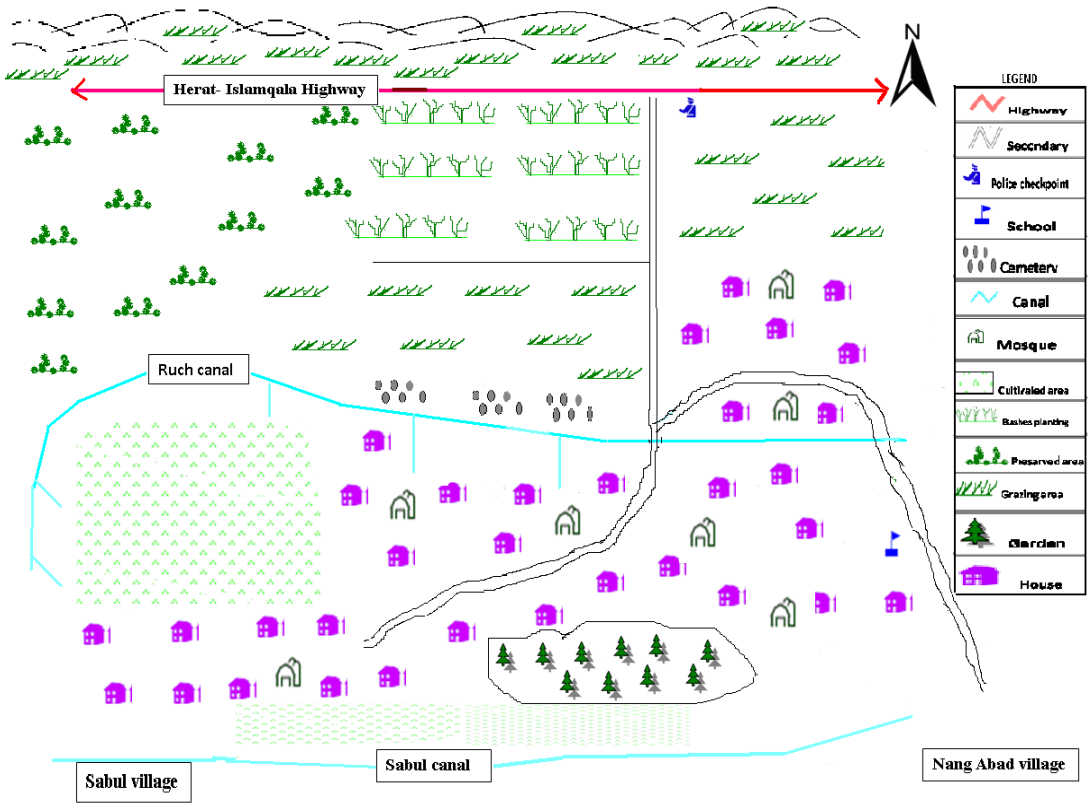

Figure 35. Ruch Village translated map.

4.4.4. Semi sedentary case study: *Dahan Tunik* village, Tulak district, Ghor province

Site characteristics

Dahan Tunik is a small village, located 215 km west of Ghor center and 40 km northwest of Tulak district center (34°04′21″N, 63°45′11″E) at an altitude of 2,500 m a.s.l. Neighboring communities are *Rizqa* (east), *Qefchaqa* and *Tawa Sang* (west), *Safed Koh* (north) and *Somchak* (south).

In this area, there are some 40 *Jeribs* = eight hectare (one *Jerib* = 2,000 m^2) of cropland, of which two hectare has more facility for irrigation. Villagers use double

cropping, the main crop plants are wheat, barley and maize, and wheat mostly cultivated in under rainfed condition, furthermore the rainfed land cultivated as fallow rotation one at 2/3 year.

Social issues

The interviewers describe themselves as *Ganji* (they are not Pashtun) and this village with another village that called *Qefchaqa*, both have one village *Shura* (council) that this council is the decision point for importance subjects among the villagers. The total of households is 70 families, of which five families migrated to Herat province, and 20% of families are landless.

Livestock:

About 350 sheep/goats (one flock with 50 % of goats), 25 cattle and 50 donkeys are reared in the village. Interviewers described, ten years ago they had some 800 sheep/goats in two flacks, in this case some members of their family had been moved with their animals in summer grazing area that called *Safed koh*, but now all villagers remain in the village and use the closed rangeland area include closed mountain for their animal grazing. In case of food shortage, just shepherd with flock will move to *Safed koh* during the summer season.

Table 15. The semi sedentary mobility and grazing pathway throughout year (Dahan Tunik village, Tulak district, Ghor province).

location	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Stall feed												
Rangeland around the village												
Safed Koh												

Mohammad Alam Ghoryar
Large Scale Grazing Systems (LSGS) in the Western Region of Afghanistan: Typologies, issues and options for sustainable rangeland management.
PhD. thesis in: Produttività delle piante coltivate, XXVI ciclo - Università degli Studi di Sassari, Italy.

Figure 36. Dahan Tunic village grazing pathway.

Grazing management

In general, all parts of Ghor province in terms of rangeland condition is better than Herat and Farah province and it is the main source for *Kuchi* flocks in summer season.

The sheep and goats are herded for 8 months of the year from the beginning of *Hamal* to the end of *Aqrab* (from 21March to 20 November), these people has more accessibility to rangeland because of their village extremely isolated and surrounded by mountain that provide good grazing area for animals in the spring and summer season. Other opportunity that they have it is collection of forage/herbs from closed mountain, dried and save for winter-feeding.

When the weather being cold, villager establish a corral (*Gash*) by thorny plants, with aims to keep flock into *Gash* during the night for from the village, it will be continued as average for one month and then because of severe cold weather, flock regularly come to village every evening and receive an evening feed. Duration of cold season in Ghor province (4 to 5 months) is longer than Herat province as temperature of Ghor province showed in Fig. 15, this varies slightly from year to year depending on the weather.

This community is complain from *Kuchi* flocks and described that the grazing pressure of *Kuchi* flocks are more than sedentary flocks, in this case they not agree to *Kuchi* flocks come to near their village.

Village mapping

To do the village mapping, there was discussed with number of villagers. They have irrigated land and livestock and made village map together. Figure 37 reports a translated map. The original one is in appendix.

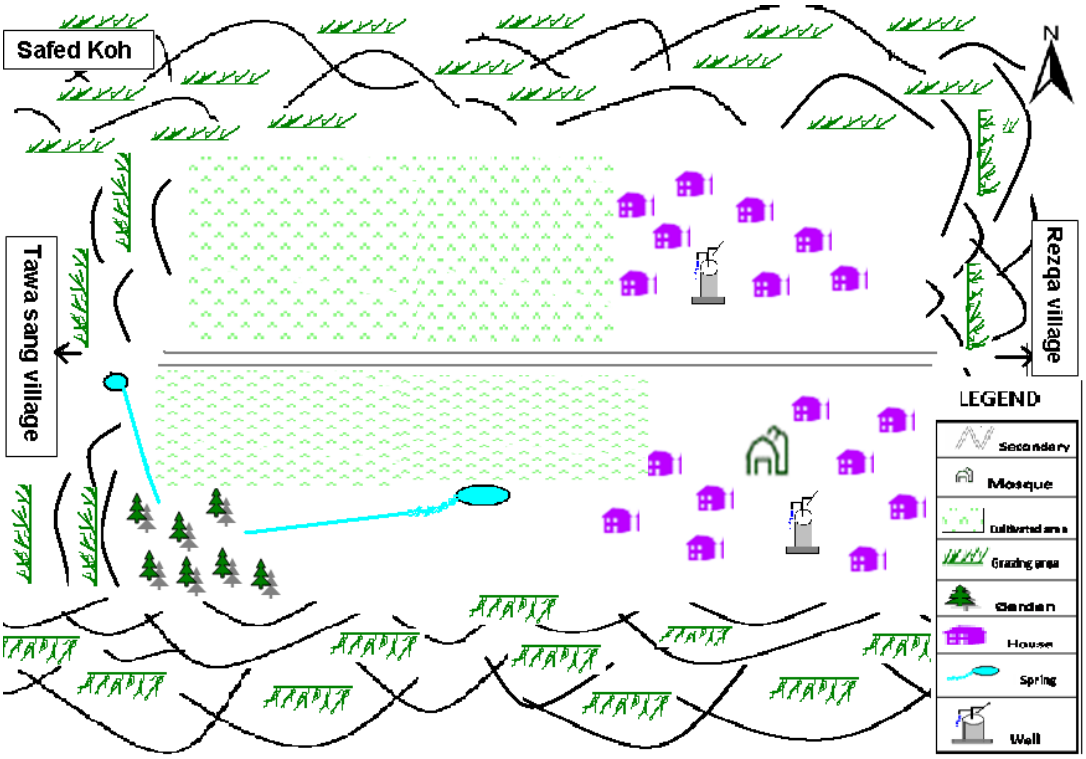

Figure 37. Dahan Tunik village translated map.

5. DISCUSSION

Extensive and large scale grazing systems represent one of the best adaptive land uses in marginal rural areas of the country as well as in Western Region. Caballero (2012) described, "Man and nature laws interacted for years to reach the current appearance and characteristics of LSGS".
The results showed that the *Kuchi* is a traditional system mostly managed by *Kuchi* communities camped or settled in the Western Region since last century, and they came from the Southern Region of the country. Tapper (1973) found "early in 1886 orders were issued to the governors of Qandahar, Farah, and Herat to collect Pashtuns and invite them to migrate to the frontier areas of Herat"; however, it was the Kingship of Amir Abdul-Rahman Khan (1880-1901)

The *Kuchi* system is one of the oldest migratory sheep and goat husbandry techniques in which the whole families move with their flocks in constant search of grazing and water between low land (Farah, Herat provinces) and highland (Ghor province) as vertical transhumance.

The seasonal commuting from winter to summer area and vice versa as a kind of model for adaptation to climate and exploitation of natural resources is the main driver that generated nomadic life, which has a history of several thousand years (Moini 2008).

An empirical index of this is the nature of physical structures for shelter, which are among nomads either portable, such as the tent, or temporary such as the lean-to or hut made with local materials. Weijer (2007) wrote, "*Kuchi* refers to a mode of living (migratory), a production system (livestock dependent) and a cultural identity". All literature showed that the *Kuchi* is an important system at national level. This study found that *Nimeh Kuchi* played an important role in the Western region as a sub typology of the *Kuchi* system. This typology can be found in the Herat province, where they identify themselves as *dukhanaghi* (see appendix 1). These communities mostly move as short distance transhumance within the province and occasionally they can move to another province as long distance migration.

Kuchi communities are more numerous in the south, the southwest and the west of country. Migration routes remain much the same for those nomads who still have livestock. In recent years, others were prohibited from using some of the summer pastures because of the continuing conflict.

Throughout the winter (in low land), *Kuchi* flocks are penned at night in special constructed mud and bush shelters (*Gash*), but under very severe weather, flock will remain into the tents.

This research found that in WR there exists other kind of *Kuchi* communities such as *Obury* and *Badieh nashin* that each one has different lifestyle and use different location for their winter settlement. In terms of movement, *Obury* is long-range migration and *Badieh nashin* mostly is short-range and in some case could be long range-migration.

Based on MRRD (2007), it is estimated that Western Region has typically some 46% Long-range migration communities, 48% Short-range migration communities and 6%

Settled). This means that short-range migratory communities (Herat and Badghis provinces) are more numerous than long range migratory.

Analyzing the number of *Kuchi* people in summer and winter seasons, it is shown that of the four provinces of Western Region, two (Herat and Badghis) rangeland are used in both seasons by different typology of grazing system and the Ghor province is home for summer grazing for *Kuchi*. In addition, sedentary to semi sedentary groups of this province use the rangeland along the year, and Farah province is winter settlement for *Kuchi* except some parts of this province (e.g., *Purchaman* and *Gulistan* districts) that is used as short-range migratory in summer season.

Sedentary is a highly opportunistic system dependent on what resource is available and in each season, and there are many factors over which the villagers have little control. As far as possible, they maintain a balance between the use of inexpensive grazing and the by-products of the cropping systems to support their flocks.

Sedentary people access to different vital facility and their literacy is higher (>20% of literacy in the community) than *Kuchi* communities (<10% literacy). The result of this study is similar to what reported by MRRD (2007) that reported an average of literacy of *Kuchi* people lower than sedentary and urban. For example, the literacy for the age group 15-24 years old is highest in the urban areas (64%), followed by the rural areas (26%) and only 6% among the *Kuchi*. By comparing the characteristic of *Kuchi* and sedentary in terms of grazing management and socio-economy, I found that *Kuchi* people have higher experience and skill on extensive systems of livestock husbandry - sheep and goat management - and sedentary have higher skill on agriculture and mixed farming systems.

Most of the scientific literature (Glatzer 1996, Omid 2004, Allen et al. 2011) explained the sedentary system in Afghanistan without any discussion on semi sedentary systems. Fitzherbert (2007) defined that sedentary raise livestock as an adjunct to their cropping systems but also rely to some extent on common grazing on the open land surrounding the villages.This study found that another sub category of sedentary communities, namely semi sedentary, that originally were sedentary, have permanent house and the village is their homeland. Agriculture irrigated and rainfed land and women are occupied permanently in the village. In this system during the summer members of family camp far from the village or in some case near the village, but most of their villages are without inhabitants during the summer season.

In the highlands, sedentary/semi sedentary people in the late of summer or in the beginning of autumn, collect the rangeland forage and some bushes from mountain and around their rainfed cropland. Livestock owners let these forages for few days to dry and then transfer to village and stocked for their animal consummation in winter season. It is a good opportunity that this typology has and under normal climate condition, they do not need to buy supplementary food for their animal for winter season.

The greatest management issue with regard to domestic animals in Western Region is nutrition. The primary food resources are rangeland in summer (highland rangeland) and winter grazing area (in lowland). Animals that move to mountain pastures in summer recover body condition better than those left in the villages, because of the abundance and better quality of these rangeland.

Wide varieties of basal and supplementary foods are used in winter by sedentary, some produced on the farm and some is purchased from the market. In general, winter-food that produced on the farms is wheat straw, followed by barley grain, alfalfa hay, maize stover and grain, and clover hay.

Sedentary flocks feeding are more dependent on supplementary food; farm residue and village pasture in contrast *Kuchi* flocks are mostly dependent to rangeland in both seasons. This means that sedentary flocks have greater accessibility to supplementary food during the shortage of rangeland forage than *Kuchi* flocks and on the other hand, that *Kuchi* flocks are at risk, particularly under non-equilibrium of accessibility to rangeland. When natural events such as drought occur, the *Kuchi* communities are more vulnerable than sedentary communities because they do not have any other possibility to feed their animals. The last drought experience showed that *Kuchi* people had to sell their animals to provide food for the remaining animals and in this way, some *Kuchi* lost big numbers of their animals and become settled. Most of the interviewed stakeholders explained that recently migration patterns changed from long distance migration to short distance migration and short distance migration to settle, if this process continues in future, the number of settled *Kuchi* will significantly increase.

In conclusion, rangeland improvements in WR rural communities are crucial for their socio-economic development and for the mitigation of poverty, uncertainty and vulnerability. Such improvements could be strategic in increasing the overall security in the country. Efforts are also needed to improve the quality of the winter feeds. An increased supply of high quality fodder from arable land is therefore an important priority.

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CHAPTER (III)

Western Region Rangeland issues, challenges and options

1. ABSTRACT

Rangeland supplies forage for the livestock industry, habitat for wildlife, and water for people and animals, beauty and pleasure for everyone and an economic base for rural communities, as well as it occupies 45% of the total study area in the Western Region of Afghanistan.

The issues and challenges around sustainable rangeland management are intertwined with social, environmental and economic dynamics of the pastoral communities. The paths of change towards the sustainable development of these communities may be strongly supported through strategies aiming to improving the grazing systems.

Quantitative and qualitative questionnaires, expert and stakeholder survey through structured and semi structured interviews and participatory techniques for field survey were used to engage some representative components of the pastoral communities in the Western Region of Afghanistan.

The results from the survey evidenced that the main weakness of the grazing system are associated to a lack of clear institution and land administration information. This caused conflicts on rights in land accessibility and increased insecurity of rangeland tenure. Therefore, the land tenure issue has become a political problem at national level in this country.

A number of issues of fundamental important are currently constraining sustainable development in the Western Region of Afghanistan. Lack of alternative energy resources to replace fire fuel collection, increasing conversion of rangeland into cropland, excess of grazing pressure, recurrent droughts and inaccessibility of grazer animals to water are also issues of fundamental importance in the Western Region of Afghanistan. Some 60-70% of the rangelands in the north side of the Herat province were converted into rainfed cropland.

Poverty of rural population, inequitable access to rangeland especially *Kuchi* people and limited capacity of the government to mitigate the impact of natural disasters are also major challenges.

Participatory approaches based on closed collaboration between local communities and improvement of their traditional institutions is vital for the sustainable management of rangeland resources and the development of pastoralist production systems.

A more comprehensive approach to planning is needed to integrated rural development and natural resources management to be able tackle the complex, diverse and deeply rooted issues around large scale grazing systems in the Western Region of Afghanistan.

2. INTRODUCTION

Rangelands are the main food resource for traditional livestock rearing systems in many parts of the developing countries in the world and this is of great economic and social importance, because it offers a livelihood for millions of people (Mannetje 2002).

In the Western Region of Afghanistan, traditional animal production systems provides people with food (milk, meat), manure (for fuel and fertilizer), wool, hides, transportation, added security and the possibility to accumulate capital. Livestock is also important in association with arable agriculture, because livestock provides the power for cultivation and manure for increased soil fertility, whilst livestock consumes crop residues, which often has no or little other value, except that straw can be used as roofing material or to make baskets. Improvement of the rangeland management and disease control method could have serious implication on long-term stability of the grazing system (McArthur et al. 1979) and in turn on food security of the country.

In terms of rangeland ecology, the quality and quantity of rangeland production depends on climate and a range of other environmental factors that influence seasonal fluctuations in growth rates, dormancy periods and seasonal variations in quality (Kirkman and Carvalho 2003). The grazing ecosystems are among Earth's most endangered terrestrial habitats (Frank et al.1998). The capacity of rangelands to provide feed for livestock and securing sustainable livelihoods of pastoral communities has been drastically reduced due to a combination factors such as degradation due to overgrazing, expansion of cultivation and desertification of large tracks of arid and semi arid lands (Zaroug and Mirreb 2010).

Grazing has a heavy disturbing effect on herbage species of arid rangelands, compared to fire, cultivation, deforestation, mining and urban development. It has far less devastating effects on the vegetation and habitats (Behnke and Scoones 1993; Bayer 1995). In addition, livestock grazing has reached a point where the sustainability of the rangeland is at risk due to disruption of traditional systems and livelihoods (Aleem1980; Mohammad 1989; Umrani et al.1995; Umrani et al.1996).

Pittrof (2011) through a problem analysis indentified that water, livestock and fire fuel are of fundamental importance of the intertwined roles of agriculture and natural resources in Afghanistan. Diminishing access to water is one of the significant risks for *Kuchi* pastoral communities (Jacobs and Schloeder 2012).

In Western Region, rangelands are specified as land where the predominant vegetation consists of grasses, herbs, shrubs, and may include areas with low-growing trees. The terms rangeland resources' refers to biological resources within a specific rangeland and associated ecosystems, including vegetation, wildlife, and open forests (canopy coverage less than 30%). Today, rangelands comprise 45% of the total Western Region territory. Rangelands are crucial in supplying this region with livestock products, fuel, building materials, medicinal plants, and providing habitat for wildlife. The grazing of small ruminants, mainly closely herded flocks of sheep and goat, over the last 5,000 years has been an important factor in shaping the development of Afghanistan's plant biodiversity. Biodiversity provides goods and services that underpin sustainable development in many ways, so biodiversity is at the

heart of many cultural values (NEPA 2008). Western Region people's livelihoods depend entirely or partially on agriculture and animal husbandry, whether they are from *Kuchi* or sedentary communities, which are the main typologies of grazing systems (see chapter 2).

Western Region with a fragile, arid environment, years of conflict, social disruption and drought have resulted in almost total (in lowland) denudation of vegetation cover through uncontrolled grazing and intense pressure for fuel supplies.

In such contexts, scientific knowledge has limitations in identifying appropriate solutions for rangeland conservation, therefore the combination of local and scientific knowledge could identify adaptive managing strategies to address sustainable rangeland management and conservation (Reed et al 2006; Ison and Russell 2000). According to Hassinger (1959) for a technology to be adoptable, it must be compatible with the environmental and socio-cultural context in which it is introduced, addition to farmer needs and objectives (cited by Reed and Dougill 2010).

Indigenous knowledge is a measure of local community capability (McCall and Minang 2005): without awareness of what institutions are and how they can mediate practices, natural resource managers can become the victims of theories and practices that have been institutionalized but which are no longer valid to the circumstances (SLIM 2004).

According to Whyte (2013) "traditional and ecological knowledge and science should be seen as twins, or two knowledge-bearing perspectives on the world that complement each other", so he added that indigenous knowledge, while it may produce important knowledge, does not do so in the ways that scientific disciplines do.

Local knowledge on disaster preparedness is based on people's observations of natural hazards from daily experience of their surroundings (Dekens and Siddiqi 2009). As conditions and knowledge change, so must farmers and communities be encouraged and allowed to change and adapt too. This implies that any definitions of sustainability are time - and place specific (Pretty 1995). Steyaert and Jiggins (2007) defined that desirable changes in practices towards concerted actions are related of changes in understanding from social learning processes among multiple stakeholders, addressing complex and uncertain natural resources management situations.

The Ministry of Agriculture Irrigation and Livestock (MAIL) of Afghanistan introduced a significant new policy /strategy in 2006 when advocated "the transfer of effective management responsibility for forest and rangeland resources to communities within defined community geographical areas".

The government of Afghanistan is facing a significant challenge to meet the Millennium Development Goals (MDGs) that address equitable and sustained pro-poor growth. It is the national priorities to tackle the poverty that is deeply embedded in rural areas. On the other hand, degraded natural resources need to be protected from overexploitation by rural inhabitants. Rural life is nowadays deeply dependent on natural resources, in Western Region 90.2 % of population are living in rural areas.

Glatzer (1996), Weijer (2007), Stanfield et al. (2008) and Pittroff (2011) discussed on land tenure context, at national level, as a key issue for development in Afghanistan. Toulmin (2006) found that secure rights to land and property depend on a

combination of two key elements: (i) legitimate by the local population and (ii) legality by the state.

Bruce (1998) showed that land tenure security is as landholders' confidence that neither the State nor other people will interfere with the landholder's possession or use of the land for an extended period.

Analysis of rangeland policy issues and trend of rangelands should become a national priority for the Afghanistan country (Pittroff 2011).

Hypothesis and objective:

To address options and challenges for sustainable grazing systems in the Western Region of Afghanistan it is necessary to integrate the available scientificc knowledge about biophysical constraints, contextualized in the social economy background with the local knowledge of stakeholders around relevant issues. In other words, the options for sustainable grazing systems can emerge from the integration of existing knowledge on the biophysical constraint and the local knowledge and perceptions of the stakeholders about issues and challenges.

The improvement of the grazing system in this region has relevant implications on the overall social and economic development of the pastoral society.

The objectives of this chapter are to identify the most relevant Western Region rangeland issues and challenges emerging from the involvement of local stakeholders and experts in a learning process facilitated by a various participatory methods.

3. MATERIAL AND METHODS

The study was conducted in the context of the large scale grazing systems of the Western Region of Afghanistan, using secondary and primary sources. Several tools/method were used sequentially or jointly in relation to the specific situation on the field and by adapting the method/tool/technique to facilitate the achievement of the objectives (Ghoryar 2006).

The methods and tools included expert and stakeholder survey, participatory-community mapping, and field surveys described in chapter 2.

The framework developed by Caballeto et al (2009) in the context of the LACOPE project (www.lacope.net) was adapted to the specific study area. An expert's survey was made in the Western Region and it was integrated by semi-structured interviews to livestock owners and shepherds of different typology of grazing systems.

The questionnaire is described in chapter 2 and Appendix-2. For livestock owners, a simplified separate questionnaire was designed and used for structure and semi structured interviews in Dari language, to facilitate the discussion and the data collection at local level.

The collected data were integrated with a literature review.

The analysis was implemented in summer 2011 and 2012 through interviews were made with six stakeholders groups and three experts from university, UN organization and NGOs. A total of four experts and twelve groups of farmers belonging to different

typology of grazing system were involved in the survey. Each group was composed by 3-5 persons.

Participatory techniques (Cavestro 2003) were used during the interviews especially when interviewers were villagers. Villagers were involved in a participatory mapping exercise (Duvail et al. 2006) at village level to illustrate the village resources and the location of the managed rangelands and *Quruq* (a traditional practice for resting of rangeland). The village mapping tool involves the community members in drawing a map of their community to tell their story together.

To gain access to this information by the villagers, we had to contact local leaders and officials that enabled us to make the field survey in the agreed dates. Details about the survey were already described in chapter 2.

The expert survey and stakeholder interviews allowed to obtain information at different levels such as experts and local people. The collected data were summarized to derive relevant informations on issues challenges and options of ach typology of grazing system.

4. RESULTS

4.1. Rangeland issues

4.1.1. Drought

In the last 30 years, recurrent drought contributed to reduce the rangeland area in Western Region. Communal grazing lands have been eliminated in many parts of the country, especially in the western and southern parts due to drought and the movement of sand dunes. Even when the communal grazing land persisted, its productivity and carrying capacity have been greatly reduced. When asked about the current levels of productivity of pasturelands as compared to normal and average rainfall years, the farmers in Ghor and Badghis indicated that the level was below 50%. Also in Ghor, Badghis and Herat provinces the animal population has decreased significantly because of five years drought from 2000 to 2004 (except 2003), therefore in that period the number of sheep and goats decreased by 40–65%. The degradation of the pasturelands has resulted in a significant decrease in the available forage for the livestock of the *Kuchi* and the selling price of animals has gone down by 15–30% as compared to the number of animal in non-drought years.

Increase in number of desert mice in some areas (e.g., around Chaghcharan–Ghor province) which cause damages to many different plants' roots with significant negative effects on natural vegetation of rangeland.

Droughts negatively influenced the carrying capacity of rangelands, so degradation of vegetation increased runoff and sedimentation and decreased infiltration, which negatively influenced the quantity and quality of available irrigation water. Population suffered from shortage of drinkable water and falling groundwater levels. Most of interviewers were explained that the water level of their well, which is excavated by some national and international NGOs, now has been decreased or some of these wells are dried and not usable. They mentioned that drought has a return period of about 20-30 years.

Farmers often increase their reliance on livestock as an adapting strategy (if they have possibility for movement); because animals are a valuable asset, they can be moved when people are forced to migrate, and they can be eaten or sold. Farmers traditionally keep herds, which they can use as a cushion against shocks.

4.1.2. Fire fuel

The rise of population of this region as well as in other part of country, increased the pressure on fire fuel collected from rangelands and woodlands practically by all of the rural and important sectors of activity of the urban population in the areas where people does not have regular access as regular to electricity or other energy resources for cooking and heating.

Fire fuel collection is the responsibility of men and children. Any burnable vegetation is collected: sticks, woody herbs, thorny plants (*khar*) and uprooted saplings. Villagers often lend donkeys to other families, in rotation, for fuel collection expeditions. For example a man and two or three children with three donkeys make more than 10 hours round trip in Herat province (but in Highland such as Ghor and Badghis provinces this round trip is estimated less than 10 hours) to the remote hills to collect up to 150 kg of firewood. This is adequate for one average household compound for a month. The demand for fuel material is estimated at about 0.60 kg per person per day.

Figure 38. Shrubs and wooded plants uprooting in different provinces of WR.

There is little formal recognition of the seriousness of the fodder and fuel shortages or of the severe denudation of the rangelands. When asked about the past situation of rangeland in context of fire fuel collection, older people agreed that uprooting of bushes is their principal problem and recall that vegetation cover was better in their childhood. In addition, collection of medical plants by people without any technical information or technical knowledge helped to accelerate the decreasing of rangeland vegetation cover and the increasing of soil erosion.

The other negative effect of the fire fuel collection that interviewers emphasized is the increasing wind erosion. The 120-day wind "called *Boadhai sadubistroz*" is a northerly wind that blows across the western and southern regions along the summer months of June to September. This wind is usually accompanied by intense heat,

drought, and sand storms. In addition, dust and whirlwinds frequently occur during the summer months on the flats, rising at midday or in the early afternoon, highest speed of this wind as average reach up to 16 m s^{-1}, and raising high clouds of dust.

4.1.3. Rangeland conversion to cropland

The conflict between different groups and parties resulted into many rangelands treated as a free for all. In the past decades, each person that had power and access to rainfed cultivation tried to plow the rangeland to cultivate food or fodder crops. In the Herat and Badghis provinces, in relation to the topography and climate, cropland is cultivated with wheat, barley, caraway (*Carum carvi*), chickpea, melon and watermelon. In the Ghor province farmers cultivate mainly wheat and barley under rainfed condition.

President of *Kuchi shura* (council) in Western Region, clarified that rangeland conversion in Western Region is one of the main problem. He identified some areas that recently were converted to rainfed cropland such as; *Dorudi, Chehartakhta*, *Chah Muradak* and *Chah Kohsani* that are located north of *Gulran* district, some 70-80 km away from the district center, where now 60-70% of the rangeland has be converted into cropland.

Also in the *Kushk Robatsangi* district, in places such as *Chah Gulby*, *yekah chah*, *Gala cha*, *Shah Ghulam* and *Barginak* located to north part of the district and *Shur Arabe* area located between *Rubatsangi* and *Kushk Kohna* districts, rangelands were converted into cultivated rainfed crops. During the Taliban regime, most parts of *dashte Ghoryan* were plowed by tractor to cultivate Caraway.

Most people are regretful about this action but others continue because they get some economic benefits from the cultivation of these areas. They have a particular regulation for the rotation of different type of plants: they cultivate wheat before *C.carvi* and when they cannot get enough benefit from these plants because of decrease in soil fertility and soil structure they cultivate melon and watermelon under rainfed condition.

Figure 39. Melon cultivation under rainfed condition in Badghis province

Traditionally rainfed cultivation (*Lalmi*) is used in slope and hilly topographical condition, which expose soil to water erosion, particularly when soils are tilled with tractors.

4.1.4. Grazing pressure

The livestock sector is one of the key drivers of rangeland-use change; more than 70% of the whole country is vulnerable to desertification. Pasture degradation is generally a consequence of a mismatch between livestock density and the capacity of the pasture to recover from grazing and trampling. Ideally, the land to livestock ratio should be continuously adjusted to the conditions of the pasture, especially in dry climates. However, because of the weakening of the traditional grazing institutions, the increased pressures on rangeland resources and the increased barriers to livestock movements, such adjustments are often not possible. This is particularly the case of the arid and semi arid communal grazing areas. Increasing human population and encroachment of arable farming on grazing lands have severely restricted the mobility of the herds and limited options for their management.

Where widespread grazing has reduced vegetation cover and exposed soils to erosion many communities have had to significantly reduce livestock stocking because of the reduced quality of the rangeland.

Overgrazing seems to be more problematic in lowlands than in highlands in Western Region, where rangeland is use all year round in all seasons. During the latest decades the problem is intensified, as long distance mobility of pastoralist is decreased and short distance migration increased because of security problems for nomadic and semi nomadic people. Therefore, the areas that are most suffering major overgrazing damage are closest to the larger settlements. Uprooting of shrubs is also a problem is also an issue in many areas, causing further decline of rangeland productivity.

Vegetation restoration, usage of *Quruq*, rest rotation combined with grazing management are recommended to combat overgrazing pressure, desertification and flood risks.

4.1.5. Land tenure

Different typologies of grazing systems use rangeland with different objectives, but the lack of clear institution and land administration information constrained land accessibility rights. Due to these factors, insecurity of rangeland tenure increased and finally helped to generate the conflict between villagers and *Kuchi* people in many different areas.

The Afghan community traditionally observed the local grazing institutions, a set of practices implemented by the pastoral communities that were recognized to be more effective and usable for the everyday lives than the laws and other regulations emanated by the current governmental institutions.

However, the land tenure problem in Western Region is less relevant than in other regions of the country but it is a fact that security problems have specific impacts on this issue. Some *Kuchi* explained that particularly for summer grazing area they faced with this issue or they must pay for some grazing units (see case study for *Kuchi* and *Nimeh Kuchi*). When asked to sedentary communities about the *Kuchi* flocks, nobody was interested that they come near their village or around croplands: it is not only because *Kuchi* flock would grazed herbs/forage in the grazing areas, but also because grazing flocks are perceived as a risk for their agriculture production and other village sources.

From a legal point of view, rangeland is public land and can't be privately owned. However, this study showed clearly that in practice the rangelands of the Western Region, especially those located in the highlands, are classified by the communities in two groups:

- Rangeland opened to all users (e.g., *Kuchi*, other communities or other pastoralists).
- Rangelands which belong to a village or a particular community, identified as "community rangelands".

There are two main uses of the second type of rangeland: the area of the rangeland nearest to the village (<10 km) is managed as winter grazing area; the area distant more than 10 km around the village is that mostly located in closed mountain and valley areas and are managed as summer grazing area, where people move from their village to spend the summer months.

All nomadic and semi nomadic communities indicated that there is a strong need to restore and ensure access to key resources or multiple ecological zones, including different seasonal rangelands and different vegetation communities.

4.1.6. Animal drinking water

In extensive grazing systems, the effort expended by animals in search of feed and water, considerably increases the need for water when compared with intensive or

industrialized systems. Intensive production has additional service water requirements for cooling and cleaning facilities, generally resulting in much higher overall water consumption than extensive systems.

In the Western Region of Afghanistan, water is a major issue for the grazing animals. Traditional *kariz* - underground tunnels that tap aquifers in the foothills and lead to villages - are a vital source of water for domestic livestock and irrigation supplies. Traditionally, the community used wells (*Chah*) in lowlands (e.g., Herat province) and Kariz and springs in the grazing area. During the drought years, a number of these Kariz and wells were dried and therefore unusable. Shortage of animal drinking water has become a big problem for *Kuchi* communities and people who use rangelands to feed their animals. Interviewees clearly emphasized on shortage of animal drinking water in *Dashte Hamdam Ab* and *Dashte Ghoryan* during the summer season in Herat province. In early spring season, grazing animals use rainfall water in these areas. Most communities that used these areas have complained from the limitation of water for their animals and from water salinity.

Water is becoming an extremely scarce resource in WR, as demand has increased and users have multiplied while supply has become erratic. Water has become a source of conflict between many communities.

4.2. Rangeland challenges

After three decades of conflicts, military activities, refugee movements, lack of management and institutional capacity and overexploitation have heavily damaged natural resources. The Western Region, as other parts of the country, is facing a high level of poverty and natural resource degradation.

The conflicts and induced by the poor management system that has been implemented at different levels in the society during the last decades, which resulted in inequitable access to and misuse of rangeland resources. To combat this issue, mobilize natural resources to enhance employment opportunities, domestic products, and services, policy-makers are confronting serious challenges.

The land tenure/pasture dispute is one of the most important and growing issues at national level. It has caused many local security issues in recent years, it is linked with tribal identity, and government reduced capacity and ability.

To introduce an alternative fuel/energy resource for cooking and heating in Western Region, particularly for those inhabitants from the rural community, the government or international community interventions have the objective to decrease fire fuel collection pressure from rangeland resources and improvement of livelihood.

The needs that emerged from the interviews, for *Kuchi* system is livestock and rangeland improvement and for sedentary system is water for agriculture and agriculture inputs as well as the literacy level showed that education is the priority need for both systems.

A more comprehensive approach to planning is needed to integrate rural development and natural resource management to be able to combat the complex, diverse, and deeply rooted issues.

4.3. Rangeland options

Improvement of rangeland resources

The Western Region rangelands are home to many culturally diverse *Kuchi* people. Large numbers of animals and people depend fully or partially on rangelands. They support a sizeable livestock population (Table 9) and wildlife, which supply different products, also they provide critical watershed services, climatic functions, and preserve diverse biological and cultural resources. These resources are under heavy stress because of degradation caused by overgrazing, poorly designed management characterized by unsystematic and unscientific sound practices, and overexploitation of natural resources such as soil, water, vegetation. Large areas of rangelands lost their vegetation cover and some areas have been converted into croplands and other agricultural uses also in areas that were not suitable for intensive use. Rangeland degradation has accelerated loss of biological resources including flora and fauna, which has affected the lives of people dependent on livestock rearing.

Improved rangeland management requires a non-threatening environment in which rangeland users, through their representatives, can make their voices heard. Local decision-making bodies are required (e.g. *Shura*) to open new learning spaces to address agreements for managing rangelands at the community and territorial level. According to the evidence provided by sedentary and semi sedentary of *Taiwara* district, since 10 year rangelands in most villages of *Taiwara*, Ghor province, (e.g., *Waras*, *Dahan jal*, *kham zard*, *Khaleshkak*, *Zarbeed*, *Jawz*, *Pushtmaqa*, *Sarda*, *Khairbed*, *Mulahgharah*, *Jarghoja*, *Zaghand*, *Gharplang*, *Esfowr*, *Gariwa*, *Qalam Chashmah*, *Now sheer*, *Kali*) have been preserved through *Quruq* (A traditional practice for resting of rangeland) by the community, which is supported by the local authorities and heads of clans. In addition, for each area, including a number of villages, one person was hired to keep or protect the *Quruq* areas from fire fuel collection and bush uprooting. This person received 4 kg of wheat by each family per year. If other districts and communities would implement this practice, this would result into big changes on rangeland vegetation and productivity in a few years over the whole Ghor province.

On the other hand, it is essential to recognize that communities are not homogenous groups but made up of different sub-communities and clans, sometimes with conflicting interests. Therefore, in the short-term make-up of these local co-management committees, representatives from different groups must be involved in order to ensure representativeness of different communities' ethnicity and age. In the longer term, the enhancement of social cohesion could be addressed through new learning spaces for the community education including children, young, women and families. The acknowledgements of the role of all social components and levels, which are at the basis of the pastoral society, could be a first significant step.

Sustainable development options include non-destructive strategies. In this region, there is a good opportunity to design a learning process around rangeland management and grazing system typologies, which are perceived from all communities as endangered from human induced degradation processes. The heavy dependence of these communities from rangelands and natural resources is key to consider rangeland development as a "socio-technical object" (Toderi et al., 2007)

that is a central topic that could be used as a facilitation tool for the dialogue among the different clans and communities.

A number of options for development emerged from the expert survey, interviews and participatory processes implemented in this study:

Restoration of rangelands through traditional ways such as *Quruq*: in some parts of this region such as Ghor and Badghis province there is a clear potential for restoration through the traditional *Quruq* practices. Most interviewees claimed that a concrete decision from the central and state government is required, providing that this happens in close collaboration with the local communities.
The selection of adaptive drought-tolerant native species can be a strategic objective in the longer term to implement a rangeland restoration process aimed at increasing the carrying capacity of rangelands, providing that this step is well embedded in a more systemic action of rural development including alphabetization and education about the relationships between grazing systems and the resilience capacity of natural resources.
There are a number of topics around rangeland management that emerged from the interviewees as potential triggers for rural development. What follows is an analysis emerging from the elaboration of the semi-structured interviews, that includes particularly those subjects around which there is a great potential for achieving wide consensus from the different communities.

Rangelands and energy options
To introduce alternative energy sources, with the objective to decrease the pressure of fire fuel collection from rangelands. Western Region has a great potential of hydropower electricity production trough *Hari Rud*, *Farah Rud* and *Murghab* rivers (Table 5). An electricity dam is currently under construction in the east of Herat province (*Bande Salma*, estimated 70-80 % is completed). In this context, efforts are required to establish community-managed forest lands close to the villages, socially protected and managed and equitably available for use by all households. However, nowadays not all villages have this facility or they face lack of water, hence it is impossible for them to establish such forests without a startup process that could be triggered from the community appreciating the potential of welfare associated to well designed forest management systems.
On the other hand, availability of high speed of wind for 120 days (called *Boadhai sadubistroz*) during summer is a good opportunity to utilize as sustainable source of energy in WR provinces (e.g., wind pump, electricity) and installation of solar energy will be another option for multiple purpose.

Rangelands and water resource management options
Rainwater harvesting managed by local communities based on traditional systems is another promising option that emerged from the interviews. This would contribute to providing drinking water for animals and irrigation water for crops. A sound programme of improvement of water resources management implies the inventory of available and potential water recourses (well, springs, *Kariz*, rainfall, snow) considering quantity and quality and the seasonal availability in each rangeland management unit and along the transhumance paths. The maximum sustainable number of animals in each sub-unit should be quantified accordingly.

The collection of quantitative hydrologic and hydrogeologic data to assess the variability of water availability between seasons and years is essential to take decisions about the sustainable livestock stocking rates and in relation to community needs.
The construction of new water reservoirs is a priority in many areas. However this process must be designed in close collaboration with the pastoral communities with the aim to save the rain and snow water to be used during the periods of water shortage in rangelands. Meanwhile, a sound design of a community learning process around the current *Shura* and *Mosque* is needed to enhance community awareness on rangeland resources restoration and sustainable usage. This could happen through the support and reliable independent assessment processes from the central government and international organizations.
The improvement of the existing traditional small and medium irrigation systems and a rehabilitation programme of existing infrastructures is also important for the community development.

Rangeland community education and training options
The wild medicinal plants in the region are an important potential economic resource for the country. An education programme is needed to train people on how to collect or cultivate medicinal plants, in order to preserve them from extinction and enhance the production of natural pharmaceutics.
A special education service is required for *Kuchi* communities that should take into account of their mobility needs. Among the many subjects, the following appeared as strategic in the short and medium term: natural resources management, human health, animal health, rangeland conservation. Many *Kuchi* suggested this option as a viable and good solution. Although the rangelands are under the government's ownership, local communities and *Kuchi* people are the daily users of rangeland resources and should be regarded as its custodians other than just users.

Finally, most interviewees emphasized that government should be active in building a new sense of trust around rangeland management at central, province and district level by interacting with respect and fairness with local communities.

5. DISCUSSION

Livelihoods of communities living in the Western Region, with the exception of Badghis and Ghor provinces, are relatively more diverse than in other regions of the country. Livestock ownership plays an important role in people's livelihoods. Cattle, donkeys, and camels are owned, and large herds of sheep and goats are used for dairy, meet and wool production, sale, trade and transport. Wool and hides from the Badghis and Ghor province are sold within the country. Work opportunities are based on agricultural activities with seasonal migration to Iran for work.

Despite the important role rangelands play in sustaining the livelihoods and overall economy of country, many problems still exist in relation to the use and management of rangeland resources (Ismail et al. 2009).

Table 16. Decline in agricultural parameters in surveyed village of Ghor, Badghis and Herat provinces (decline recorded in 2004, a drought year vs. 2003, normal year).

Provinces	Crop diversity (%)	Area cultivated (%)	Yield (%)	Area irrigated (%)	Water table (m)	Number of animals (%)	Social effects
Herat	25-70	21-67	17-88	51-86	2-4	20-50	M, IC
Ghor	40-65	20-60	25-75	50-75	2-4	25-55	M, CL, IC
Badghis	30-60	15-70	20-78	50-75	3-4	20-60	M, CL, IC

Source :(Bhattacharyya et al. 2004)
Note: M = Migration, CL = Children labor, IC = Illegal crops.

Currently, the main sources of income for many people in the Western Region are seasonal agricultural labor, sale of livestock, sale of agricultural production, remittances from family members, mostly young members, are migrating to Iran. It has been estimated that some 20% to 30% of the population works within the districts during the cultivation and harvesting seasons, or as sharecroppers. Bhattacharyya et al. (2004) estimated that 30% to 40% of male laborers seasonally were migrating to the urban centers of Herat and Farah, while up to 40 to 50% crossed the border to Iran in the hope of finding work and sending back remittances to their families.

Poverty of rural community resulted in increased pressure on rangeland resources not only for animal food, but also for the exploitation of firewood and bushes that represent the two main sources that they get from rangeland. An average estimate indicates that in the households in Western Region some 59% of the energy consumption for cooking comes from firewood and bushes in summer and 65% in winter. MRRD and SCO (2007) through an assessment based on household consumption (NRVA 2005) showed that the percentage of total energy resources for cooking and heating deriving from bushes and firewood. In summer, the highest consumption of bushes was in the highland Ghor province (76%) and lowest in the lowland Farah province (33%), while the highest consumption of firewood was in Farah (34%) and lowest in Badghis (1%) which has intermediate altitude between Ghor and Farah. In winter, the highest consumption of bushes was found in Ghor (70% of total energy consumption) and the lowest in Farah (24%); firewood highest consumption was found in Farah (49%) and lowest in Badghis (3%). The different percentages depend on the availability and accessibility to alternative resources in the different provinces and on climatic constraints in relation to the altitude gradients. Such high dependence on firewood or bushes is a clear indicator of the multiple role of rangelands in providing primary resources for the rural livelihood.

McArthuret al. (1979) described that the bush plant *Artemesia herba alba* is extensively used for fire fuel and cutting practice is known to kill this plant. The same plant is also a basic source of fodder for the grazing animals, hence the availability of alternative energy resources would improve the availability of fodder resources for the grazing animals. On the other hands, in case of shortage of fire fuel, conflicts arise between different pastoral communities.

Some villagers are blaming government because of its responsibility to control and preserve these resources. Others perceive their direct responsibility, and show a spontaneous pro-active behavior in preserving and keeping these resources for their own utilization, beauty and environment conservation.

The conflicts and induced poor management system during the last decades have also resulted in inequitable access to and misuse of rangeland resources.

Because of the conflicts, many pastures are treated as a free-for all, everyone getting what can, and this is driving destruction of the vegetation cover (Pittroff 2011). Our study found that in the north part of Herat province 60-70% of rangeland were converted to cropland.

Long term sustainable use of rangelands depends on the balance between rangeland productivity and animal stocking rates. This has implications on the cultivation of the areas receiving adequate rainfall. Where widespread grazing has reduced vegetation cover and exposed soils to erosion many communities have had to significantly reduce livestock numbers because of the reduced quality of rangeland (Bedunah 2006).

This study found that, to enhance rangeland productivity, the first step could be to improve grazing management through the combination of rangeland resting as traditionally such as *Quruq*. It is proved that this kind of resting system could be effective where the rangeland vegetation is able to self-restore through natural ecological succession. An alternative option is to seed the area with introduced plants. For example, in the Herat province (west and south) and Farah province (except *Purchaman* district), the *Quruq* practice proved not to be effective.

The local experts recommended that sustainable rangeland management require agreement between communities where to graze livestock at different times of the year. In such a way self-regeneration of the rangeland vegetation could be allowed through self-reseeding and regrowth. To preserve the local germplasm of forage plants, villagers and herders can collect seeds from local rangelands to be used for pasture improvement. However such programs require encouragement and external support from the government or other organizations through national programs. Perennial forage plants in good vigor can withstand short-term drought, retain soil and moisture, and contribute to good animal health.

The selection of adaptive and drought-tolerant local species is an option to be implemented in the long term, meanwhile the introduction of imported good quality fodder and forage species from foreign countries with similar ecological conditions can be a suitable option through national or international development plans if technical assistance and proper implementation is provided. However it is important to consider that newly introduced forage plants should not replace the well adapted local germplasm. Hence the cultivation of imported forage crops should be restricted to arable lands.

Climatic variability in WR requires an adaptive management mechanism for rangelands. Many people in lowlands and highlands tend to regard mobile livestock grazing as an ancient form of land use, as ‘backward’ and often propose and impose ways to ‘modernize’ rangeland use. They fail in recognizing that traditional mobile livestock grazing is well adapted to the uncertain environment of rangelands at large

scale. Seasonal grazing in which flocks move in relation to the availability of forage and water is a good practice that is supported by scientific evidence, and well suited to dealing with extremes in weather conditions and unpredictable climate, as Toulmin (2006) found: "maintaining mobility for livestock is key to managing semi-arid grazing lands".

Limited capacity of government, poverty of rural communities and the lack of alternative energy resources other than bush and firewood are the main challenges to trigger the development of these pastoral communities. In the recent lasts years land tenure issues became a national political problem and its background came back to hundreds year ago. In addition, corruption (Emadi 2007), continuous war, droughts and other natural disasters (Bhattacharyya et al. 2004) are undermining the social confidence in the willingness and capacity of public institutions to fulfill their obligations to the people.

Alden-Wily (2004) in October/November 2003, found that the 53% of the controversies around property in Faryab province, at the boundary of the Northern Region, were directly related to pasture and rangeland use, 26 % to arable farms and only 10 % to buildings. This is a clear evidence of the relevance of pasture and rangelands issues in rural areas, with respect to those related to property of houses or other buildings (e.g., shops, mills).

Groninger et al.(2012) found that overgrazing and plant collection for fuel and animal feed are the primary causes of plant loss in grazing land, so he add the resulting of plant loss lead to increased run-off and environmental damage (e.g., soil erosion). The result of our study showed, that plant loss had significantly increased wind erosion in WR. In fact, most interviewees complained from wind erosion, particularly during the dry period between June and September, as other authors found.

Pittroff et al. (2009) found that "Sustainable land management is the most important environmental problem in Afghanistan; solutions can only be found and implemented at the community level". He proposed the COSEM (Community Selection and Mobilization for Sustainable Land Management) approach to address such issues. The results obtained from our study recommended to invest in the selection and improvement of traditional knowledge to build resilient and adaptive rangeland management, and suggest that activities would be more successful when addressed to social benefits and environmental protection. Increasing the rangeland capacity through soil and water conservation along with identifying appropriate breeds and their improvement would be a logical and sound strategy for reducing the negative impacts of droughts.

A strategy to improve the resilience and mitigate the recurrent drought for pastoral households is urgently needed. An intervention at the Governmental level is required but the capacity of the government particularly in this context is very limited, "because Afghan government anti-drought policies and practices were at embryonic stage (Bhattacharryya et al., 2004)"

Ismail et al. (2009) found that mobile livestock grazing systems are biologically friendly and more resistant and adaptable to ecological and economic changes than sedentary grazing. Lesson learned from our study showed that the *Kuchi* system is resistant and adaptive providing that the accessibility of rangeland is guaranteed and

that *Kuchi* can trust about this guarantee. However, the *Kuchi* pastoral communities are constrained by the availability and the reduced accessibility of rangelands and in this respect they are more vulnerable than sedentary communities in case of severe adverse natural events.

Participatory Rangeland Management (PRM) approach is widely recognized to be effective in addressing sustainable rangeland management (Flintan and Cullis 2009). However, our study found that under particular situations such as in the Western Region of Afghanistan, participatory approaches are not sufficient *per se* if the local knowledge of the various roles and members of the pastoral community is not considered. Our study showed that these communities were able to manage their pastures in a sustainable way for many centuries, but they are threatened by the war dynamics and social conflicts that weakened their resilience to adverse climatic and natural events. Rangeland degradation is an early warning for undesirable social dynamics such as migration, concentration of the rural population in urban areas and loss of the traditional knowledge that allowed these communities to live in equilibrium with their land. However the weakness of the pastoral communities in addressing issues driven by the global social and economic dynamics is clear. The consequences of further rangeland degradation can lead to irreversible damage to the primary resources that sustained rural livelihood for centuries.

Participatory rangeland management requires a design of new social learning processes in which local communities are supported to take their own of responsibility in the guarantee of the rangeland conservation. The government or international organization aid should be designed in close collaboration with the pastoral communities starting from the identification of the challenges and options as emerging from social learning processes as the one designed for our study. While the design and the assessment of the process can be under the responsibility of scientific experts, the implementation requires the design of new learning spaces for local experts and members of the pastoral communities that will take these responsibilities. The process should be addressed to enhance and use the local knowledge that has historically informed the rangeland management practices that proved to be effective for centuries, by triggering people's active collaboration.

For instance, the restoration of rangeland through the traditional ways such as *Quruq*, integrated with a strategic plantation of local adaptive, multipurpose shrubs and trees can be a starting point to improve the primary rangeland resources. Hassanyar et al. (1983), Virgo et al. (2006), Groninger et al. (2012) and Bell (2012) recommended different multipurpose species of trees and shrubs to provide home fuel and possibly feed needs (Appendix 3-A, 3-B, and 3-C).

In conclusion, participatory approach based on closed collaboration of local communities and an external support aimed at the improvement of their traditional institutions is vital for the sustainable management of rangeland resources and development of large scale grazing systems in the Western Region of Afghanistan.

The national Government must play a fundamental role in providing support, also through international aid programs, providing that government representatives are sufficiently sensitive to the rangeland issues and to the value of the local knowledge in identifying effective options.

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GENERAL CONCLUSION

Afghanistan is a landlocked country with 12.1% total cultivated land area (5.1% irrigated agricultural land and 7% rainfed cropland), forestland 2.1%, rangeland 45.2 % and barren land 37.3%. About 50% of territorial has an altitude more than 2000 m and 10% has less than 500 m. There are six types of climates, 1) Desert climate, 2) Monsoon climate, 3) Mediterranean climate, 4) Steppe climate, 5) Alpine climate and 6) Mountain climate. In term of vulnerability to desertification estimated: 0.5% low, 6.0% moderate, 6.8% high and 67.4% is very high.

Western Region of the country includes four provinces: Herat to west, Ghor to east, Badghis to north and Farah to south of this region, and covers an area of 169,617 km^2. More than 61% of the region is mountainous or semi mountainous while near to 38% of the area is made up of flat to semi flat land.

Large scale grazing system in WR played important role on socio-economy of *Kuchi* and sedentary households. LSGS are heavily based on rangelands that occupy 45% of the total study area, they supply forage for the livestock industry, habitat for wildlife, and water for people and animals, beauty and pleasure for everyone and an economic base for rural communities. The productivity of the rangeland varies significantly between areas and from year to year, so the target yield of rangeland of Ghor province is estimated 656 kg ha^{-1} $year^{-1}$ DM. Furthermore, rangeland resources play important roles as energy source for cooking and heating.

The prevalent way of rangeland utilization in WR is through sheep and goat-grazing systems, which have a strong seasonal pattern. Four typologies of large scale grazing systems were identified; *Kuchi* (nomad), *Nimeh Kuchi* (semi-nomad), *Deh nashin* (sedentary) and semi-sedentary. Each type affects rangeland development in a particular way.

Traditionally, nomadic groups were able to exploit natural resources at dispersed location. Distances in the order of several hundred kilometers separated economically valuable mountain pasture from winter campsites with areas of less economic interest lying in between.

Estimated that 4.5M different type of animal exists in WR and the main sources of their food is rangeland. Sedentary flocks feeding are more dependent on supplementary food, farm residues and village pasture. *Kuchi* flocks are more dependent on rangelands. Based on animal energy requirements, February and March are the most critical periods for flocks. In addition, sedentary flocks have more accessibility to supplementary food during the shortage of rangeland forage production than *Kuchi* flocks. On the other hand, *Kuchi* flocks are under risk, particularly because of restricted accessibility to rangeland due to security issues and conflicts with other pastoral communities for ethnic reasons.

Mixed mountain farming systems (livestock + cropland) has the advantage of providing fodder production to the permanent homesteads and also for nomadic herds grazing in the high-lying pasture during the summer.

The main issues that emerged from the LSGS study are related to drought, fire fuel consumption, rangeland conversion to cropland, land tenure, grazing pressure

and animal drinking water availability. Weaknesses and strengths are basically shared by different typologies of grazing systems in different locations and these are part of their identity. However, specific issues emerged for the different grazing system typologies: the *Kuchi* systems are constrained mainly by rangeland accessibility, while the sedentary systems are constrained by the local resource availability that result into overgrazing in the land around the villages or high dependence from external resources. Drought and natural events have different impacts on the diverse grazing system typologies. *Kuchi* are more vulnerable than sedentary to extensive drought because *Kuchi* are heavily dependent on natural resources, while sedentary can rely on other resources.

The main challenges that emerged from the survey are related to poverty of rural population and limited capacity of the government to mitigate natural disasters and to the shortage of an alternative source for fire fuel collection. The outcome of our study clearly indicates that to address such challenges it is very important to take into account of the structure of the different typology of pastoral communities.

The common thinking in Western Region is that the issues related to security and even by ethnic conflicts are constraining particularly the access to rangelands of nomadic grazing systems, which result into the overexploitation of rangeland resources in some areas. In the past, the grazing system sustainability was relying on the collaboration between sedentary and nomadic pastoral communities and this new situation is endangering the future perspective of the traditional nomadic systems

Participatory Rangeland Management (PRM) based on closed collaboration of the different pastoral communities and the sharing of responsibility between each community regarding rangeland conservation. The support of governmental or international organization is required, but to guarantee the durability of interventions, it is essential that a social learning process be designed to enhance skills and education capacities within the pastoral communities, taking into account of their peculiarities (e.g., nomads).

This was the first time that such kind of study was done in WR. I hope it may open the way for future systems and inter-systems research and further refinement of rangeland management options. WR experts and other stakeholders agreed that LSGS can provide environmental services and side-economics activities providing that a new government policy on rangeland systems is designed and implemented and that local community institutions are involved.

Rangeland improvements in WR rural communities are crucial for their socio-economic development and for the reduction of poverty, uncertainty, vulnerability, and such improvement could be strategic in increasing the overall security in the Western Region.

APPENDIX

1. Glossary of some Dari terms and words in English: relevant to Agriculture/Rangeland

Abi: Irrigated land

Arbab: Village or community leader

Aesh: Cultivation as fallow rotation one a 2 or 3 years

Afghani (or Af): The official Afghan currency (US$1=45 Afs)

Ailaq: Summer camp for pastoralist

Amlak: Property

Arhad: Persian wheel (ground water is lifted from shallow wells with the help of Persian wheel).

*Badieh nashin***:** In this term, *Kuchi* people during winter season lives specific area such as near to Turkmenistan and Iran border, in spring season moving to *Dasht-e Hamdam Ab* or other summer grazing are.

Bazgar: Sharecropper, usually a settled community member

Band: Dam

Chakka: The surplus liquid after draining yoghurt through a cloth bag

Chah: well, shaft

Chupan: Shepherd, or a person who tends, herds, feeds, or guards flocks of sheep

Dah nashin: Villager

Dasht: Plain, Desert or semi-arid plain

Darya/Rud: River

Ejare: Ownership to leasing

Gash: It is a specially shelter that constructed or established by bushes (bush shelter)

Gerawi: A type of mortgage that works as a pawn agreement

Graw-dar: The person to whom land is pawned

Gharibkar/Karigar: Very poor sharecroppers, usually accommodated by landowner

Gumary: assistant of shepherd

Hasher: Irrigation maintenance labor obligation

Hawz: Traditional accumulation and storage pool

Jerib: Unit of land measurement: (1 *Jerib*=2000m^2 or 5 *Jeribs*=1 ha.)

Jirga: Convened meeting of elders or traditional leaders

Juftgaw: A unit of irrigated land determined by the area a pair of oxen plowing a day

Kambaghal: Destitute/beggar

Kargar: Laborer/worker

Khan: Notable, landowner, property owner

khar: Literally thorns or spikes, thorn bushes collected from mountains or plain area for fuel.

Kishtmand: Tenant sharecropper/"middle peasants" who have farm inputs.

Karez: Traditional underground canal system tapping subterranean water sources or underground tunnels with gentle slopes carry water from the source to the settled areas. *Karez* are also called *qanats* in Iran, Afghanistan, Pakistan and central Asia. In addition in other countries are called in different names for instance: *khettara* (Morocco), *galeria* (Spain), *falaj* (United Arab Emirates and Oman), *Kahn* (Baloch) and *foggara/fughara* (North Africa).

Karand: Mattock/Hoe. It is a versatile hand tool, used for digging and uprooting the bushes and woody plants.

Khel: A Pashtun tribal division/ Tribal groups

Kuchi: Afghan nomadic pastoralist: The term is Persian for one who migrates. *Kuch* is meaning migration; the plural of *Kuchi* is *Kuchiha,* translated as nomads.

Lalmi: Rainfed land

Mirab: Water bailiff

Mirabbashi: Senior water master

Maldar: Herd owner

Malik: Landlord, owner

Mantiqa: Area, ward, territory, cluster of villages with a linked identity

Obury: The type of *Kuchi*, which they are pass from one province to another province in terms of seasonal movement (used in Western Region).

Orfi: Customary documents

Qariya/ Qeshlaq/Deh: Village

Qurut: Dried buttermilk: It is spread out on trays or boards in the sun and dried. Whilst still moist it is rolled into small balls. Some salt may be added. When completely dry it is stored for the winter or it may be taken to the market and sold. *Qurut* is small balls of dried *chakka*. In additions, *Qurut* dissolved in water is a primary ingredient of *Qurutob,* a traditional Persian dish in Tajikistan, Afghanistan and Iran.

Quruq: A traditional practice for resting of rangeland/rest-rotation

Rashqa/Sabest: A species of Lucerne

Rud/ Darya: River

Sarhad: Literally “cold land,” meaning land fed by springs or highland ponds

Seer: Hundred grams in Herat province and seven kilograms in Kabul

Shabana-roz: Literally “night and day” the traditional unit for irrigation system

Shaftal/Shabdar: It is a type of clover.

Shura: Local council or traditional assembly of elders

Waqfi: Land endowed for religious purposes

Watan: Home area/ Original territorial

Wuluswali: District

Yurt: Referring to around dwelling place constructed of portable materials. It is not only a specific geographical area, but also an essential element in a system for right to rangeland.

Zamindar/Mulkdar: Landlord, landowner

Afghanistan Solar calendar (Hejri shamsi)

The Hejri shamsi calendar starts from the year of the emigration (hejrat) of the Islamic Prophet Mohammad (s.a.w.s) from Makkah to Medina in 622 A.D. It has 12 months, consisting of 29 to 31 days. Hejri shamsi year begin (first *Hammal*) corresponds to 21 March (20 March in leap years) in the Gregorian calendar. The year has 365 days and in leap years 366 days. The leap years in the Hejri shamsi calendar can be computed by an arithmetic formula.

Names of months:

Hamal: begins March 21st (20th March in leap years) - April

Sawr: April -May

Jawza: May - June

Saratan: June - July

Asad : July - August

Sunbula: August - September

Mizan: September - October

Aqrab: October - November

Qaus: November - December

Jadi: December - January

Dalw: January - February

Hut: February – March

2. Expert survey questionnaire

Typology of Large scale Grazing System in Western Region of Afghanistan

Contacts

Name: Mohammad Alam Ghoryar
E-mail: ghoryar@yahoo.com

Honourable Expert/Researcher, Salaam.

We kindly ask you to give as far as possible descriptive answers on a particular Large Scale Grazing systems (LSGS). We are in particular interested in systems, which you know that they are contributing to biodiversity. Please do not refer to a particular farm or management unit. Describe the system as type of existing livestock management typical for a particular territory or landscape, connected with certain ecological conditions. Your information should be based on your expert knowledge, experiences, results from other research projects, literature and/or own observations. You may contact other experts and ask them for amendments if necessary.

Name of the expert and contact details:

_____

_____

_____

I – LOCATION OF THE SYSTEM

1.1 In what country (or countries) can the grazing system be found?

1.2 Specific name* of the grazing system:

** If local or traditional names like „transhumance or nomadic" are known please mention!*

_____

1.3 Size* of the territory where the grazing system is currently in practice and is considered to be a typical form of husbandry:

_____

** You may give us an approx. size in km^2, ha. Or political borders like counties or a geographical region*

1.4 Which vegetation types are included in the grazed area?

_____

Please indicate all vegetation units which are influenced during the grazing period and alongside with grazing paths of the herd or flock, even though it does not provide main parts of fodder resources. In Question 2.3 refers more to the fodder resources of vegetation types.

1.5 Which vegetation types provide a considerable part of the fodder resources?

_____

1.6 Is the grazing system situated in a Less Favoured* or Mountain Area (at least with a major part of the grazed area)

❒ Less Favoured ❒ protected area

❒ Protected are according to national environmental schemes ❒ Not at all

Notes and comments:

II - DESCRIPTION OF THE SYSTEM

2.1 Grazing Animals*

❒ Dairy cows ❒ Suckler Cows ❒ Oxen ❒ Young bulls ❒ Heifers ❒ Sheep ❒ Goats ❒ Reindeer

❒ Others: *Please specify*

_____

** If there is more than one group, please classify according to the order of importance*

(3= high, 2= medium, 1= low)

2.2 a) Size of the herd/flock (most important animals)

What is the herd/flock size? _____ heads of _____

You may give an approximate typical number or a range. If variable please refer to the largest flock size during the grazing period.

2.2 b) Size of the herd/flock (second most important animals)

What is the herd/flock size? _____ heads of _____

You may give an approximate typical number or a range. If variable, please refer to the largest flock size during the grazing period.

Co-operation among farmers/herdsmen

a) Who is directly or indirectly involved in the operation of the system?

❒ Farmers ❒ Herdsman ❒ Landowner ❒ Animalowner

❒ Municipality ❒ others: .....

b) What kind of co-operation exists?

❒ co-operation ❒ clan ❒ informal organisation

❒ company ❒ others: .....

c) What is shared?

❒ property of grazed land ❒ grazing rights ❒ live stock ❒ infrastructure ❒ work

❒ others ❒ nothing

Please give a short description if possible:_____

2.3 a) Which habitat/vegetation types contribute to the fodder resources during the annual cycle?

Winter:

.....

Spring:

.....

Summer:

.....

Autumn:

.....

2.3 b) Do you use complementary feeding which is not produced on the farm?

Normal practise during

❒ Winter ❒ Spring ❒ Summer ❒ Autumn

Exceptional practise in periods of fodder restrictions during

❒ Winter ❒ Spring ❒ Summer ❒ Autumn

2.4 Movement of the livestock

Estimated average movement distance between pastoral areas according to the season:

maximum distance between grazing areas _____ km

from winter to spring grazing grounds: from summer to autumn grazing grounds:

_____ _____

from spring to summer grazing grounds: from autumn to winter grazing grounds:

_____ _____

Animals move ❒ with ❒ without help of machinery

2.5 How many operation units are approximately involved in one management unit* in total?

_____

**"Management unit" – Definition: the areas which are grazed by a flock or herd during the annual cycle and where – if relevant – fodder is produced for additional feeding.*

2.6 How many herdsmen are approximately involved in one management unit* in total?

_____

** see previous question*

Notes and comments:

III – EFFECTS ON BIODIVERSITY IN THE GRAZED AREA

3.1 How you describe the effect of the grazing system on biodiversity?

If your experiences allow to describe the relationship between the grazing system and the effectecs on biodiversity - what is most important: the grazing pattern, the management of the flock or herd or the annual cycle? How would you describe this relationship?

_____

_____

_____

_____

_____

3.2 Target species

Target species can be plants or animals. At the best they can be used as indicators for the existance/persitance of other rare species, *i.e.* indicators of biodiversity. If possible indicate such species:

_____

_____

_____

3.3 Metapopulations in target species

To estimate the chance of persistence for a target species population it is essential to know if the population related to the grazing system functions as a metapopulation.

a) Are the individuals of the target species more or less even distributed or do they occur in patches? (*i.e.* are there local populations?)

_____
_____

b) What are the distances between suitable habitat patches for these local populations?approx. min. dist._____ max. dist. _____ average dist. _____

c) How do individuals of a target species spread from one habitat patch to the other? (*e.g.* by livestock animals or by wind, water, birds, etc.)

_____

d) Over what distances can individuals of the target species spread?

_____

e) How long (on average) live individuals of the target species? (*e.g.* are they annual plants or long living trees)

_____
_____

f) Are there catastrophic factors (like droughts, floodings or fires) that are likely to wipe out a local population (see 3.3 a)?

_____
If so, how often do these catastrophic events occur?_____

Can you estimate the % of the whole (meta-)population that is destroyed by these events? _____

g) Does any of the factors mentioned above depend on the grazing system? Can you describe the dependence?

_____

_____
_____

3.4 Is there a local rare habitat depending on the grazing system? If so, can you describe the dependence? _____

_____

3.5 Is there a whole landscape that is depending on the grazing system and of what kind is this dependence

IV – DESCRIBE THE ANNUAL CYCLE OF THE SYSTEM

4.1 Please indicate the seasons for the activities of a typical management unit

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Grazing period												
Stable period (night and day)												
Additional feeding												
Calving, lamming,												
Slaughtering												
Herd separation												
Herd junction for migration												
Medical care (injections, investigations)												
Others:												

4.2 Please indicate the seasonal migration and grazing patterns

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Free browsing												
Herding												
Grazing in fenced units												
Migration/spatial flock movement:												
Short distance migration												
Long distant migration												
Daily return to the stable												

4.3 Please indicate the average stocking densities during the annual cycle of a typical MU and estimate the grazing pressure according to the feeding potential of the grazed area and effect of grazing on biodiversity

Spring: ..... heads of.....

.....heads of.....

Feeding potential	Biodiversity
❒ above carrying capacity	❒ above carrying capacity
❒ below carrying capacity	❒ below carrying capacity
❒ balanced	❒ balanced

Summer: .....heads of.....

.....heads of.....

Feeding potential	Biodiversity
❒ above carrying capacity	❒ above carrying capacity
❒ below carrying capacity	❒ below carrying capacity
❒ balanced	❒ balanced

Autumn: ..... heads of.....

.....heads of.....

Feeding potential	Biodiversity
❒ above carrying capacity	❒ above carrying capacity
❒ below carrying capacity	❒ below carrying capacity
❒ balanced	❒ balanced

Winter: .....heads of.....

.....heads of.....

Feeding potential	Biodiversity
❒ above carrying capacity	❒ above carrying capacity
❒ below carrying capacity	❒ below carrying capacity
❒ balanced	❒ balanced

4.4 What would be the optimal stocking density from an economical point of view? (Including a combination of animals)

_____

_____

V–SOCIAL, ECONOMICAL AND POLITICAL DESCRIPTION OF THE GRAZING SYSTEM

5.1 Factors influencing the biodiversity and the economy of the MU and/or the involved operation units

	Positive effect		Negative effect		No effect	Not relevant
	On biodiversity	On the economy of the operation unit	On biodiversity	On the economy of the operation unit		
National **agricultural** policies and subsidies	❒	❒	❒	❒	❒	❒
National **environmental** policies and subsidies	❒	❒	❒	❒	❒	❒
Market prices	❒	❒	❒	❒	❒	❒
Access to markets	❒	❒	❒	❒	❒	❒
Tourism activities in the region	❒	❒	❒	❒	❒	❒
Off-farm income	❒	❒	❒	❒	❒	❒
Infrastructure	❒	❒	❒	❒	❒	❒
Co-operation between stakeholders	❒	❒	❒	❒	❒	❒
Property rights on the land	❒	❒	❒	❒	❒	❒
Access rights to grazing resources	❒	❒	❒	❒	❒	❒
Access to complementary feeding	❒	❒	❒	❒	❒	❒
Traditional values	❒	❒	❒	❒	❒	❒
Tradition	❒	❒	❒	❒	❒	❒
Internal social network	❒	❒	❒	❒	❒	❒
Succession (is the next generation willing to continue)	❒	❒	❒	❒	❒	❒

5.2 Factors influencing future changes

Do you anticipate future regulations and market effects which will have an important influence on the described grazing system?

_____
_____
_____

5.3 Are the activities involved in the grazing system linked to a special social identity (way of living, strong traditional values)?

❒ Yes ❒ No ❒ don't know

Please briefly describe the traditional links and state if they have a positive or negative influence if possible:

_____
_____
_____
_____

5.4 Are there stakeholders and organisations influencing the grazing system in the local society?

Supporting:

_____

Against:

_____

5.5 Who is involved in decision making concerning the development of the grazing system?

Do support agencies and/or instruments give assistance to the MUs? (*e.g.* extension services, governmental institutions, nature conservation bodies, regional development programmes/associations *etc.*)

_____
_____
_____

Is this influence positive or negative?

_____
_____
_____

3. List of different plants species recommended by different authors for rangeland improvement

A. Hassanyar et al. (1983) recommended list of different plants species for rangeland plantation and restoration

Family Poaceae:

Agropyron desertorum

Agropyron elengatum

Agropyron intermedium

Agropyron trichophorum

Arrhenatherum elatius

Bromus cappadocicas

Bromus inermis

Bromus persicus

Bromus tementellus

Elymus junceus

Festoca arundinadcea

Hordeum fragile

Poa bullesa

Secale cereale

Secale mentanum

Stipa basbata

Family Fabaceae:

Astragalus siliquesus

Melilotus officinalis

Medicago sativa

Trifolium alexandrina

Onobrychis gaubae

Shrubs:

Artemisia herba alba

Atriplex spp

B. Promising fodder tree options froom UC Davis

Table of promising fodder tree options for different provinces in Western Region.

Species	Common name	Primary uses	Farah	Herat	Badghis
Robinia pseudoacacia	Black Locust	Fodder, Fuel & Soil Conservation	Y	Y	Y
Morus spp.	Mulberry	Fruit, Fodder, Fuel, Timber & Shade	Y	Y	Y
Salix spp.	Willow	Fodder & Fuel	Y	Y	Y
Populus spp.	Poplar	Fodder, Fuel & Timber	Y	Y	Y
Elaeagnus latifolia	Russian olive	Fodder & Fuel	Y	Y	Y
Fraxinus floribunda	Ash	Fodder & Fuel	Y	Y	Y
Dalbergia sissoo	Sissoo	Fodder, Fuel & Timber	Y		
Melia azedarach	Persian Lilac	Fodder, Timber, Fuel & Shade	Y		
Pistacia vera	Pistachio	Fodder, Dry fruit, fuel			Y
Juniperus excelsa	Juniper	Soil conservation, fuel and timber			Y

Source: Mark Bell (UCDavis) 2012, taken from Khaurin. 2003. Trees and bushes of Afghanistan. FAO, Rome.

C. Recommended list by Virgo et al. (2006): Some trees species for multi-purpose use (fuel, fodder and income) across the some villages in *Pashtun Zarghon* district

Ash (*Fraxinus floribunda*), Walnut (*Juglans spp*), Willow (*Salix spp*), Jujube (*Ziziphus mauritiana*), Mulberry (*Morus alba*), *Robinia pseudoacacia*, *Salix wallichiana*, *Populus ciliata*, *Morus spp* and *Elaeanus latifolia*. Furthermore where water is available, could cultivate these trees: Poplar (*Populus nigra, P. balsamifera* and *P.alba*), *Acacia tortilis* (adapted to dry conditions, yielding fodder and timber) and *Prosopis cineraria* (provide fuel wood and fodder from foliage and pods).

4. Village maps

A- Taghi Naghi village

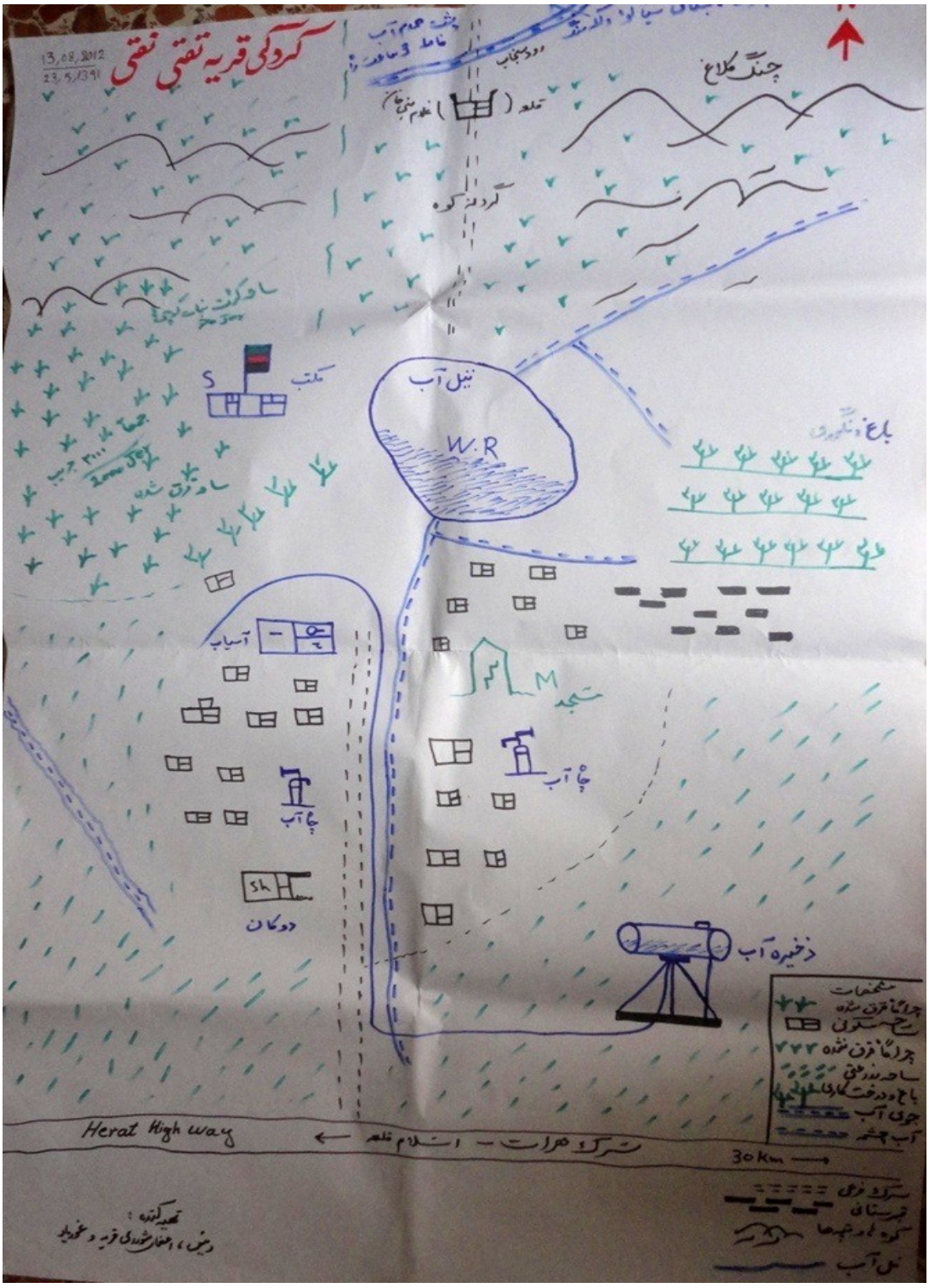

Figure 40. Taghi Naghi village original map

Mohammad Alam Ghoryar
Large Scale Grazing Systems (LSGS) in the Western Region of Afghanistan: Typologies, issues and options for sustainable rangeland management.
PhD. thesis in: Produttività delle piante coltivate, XXVI ciclo - Università degli Studi di Sassari, Italy.

B- Ruch Village

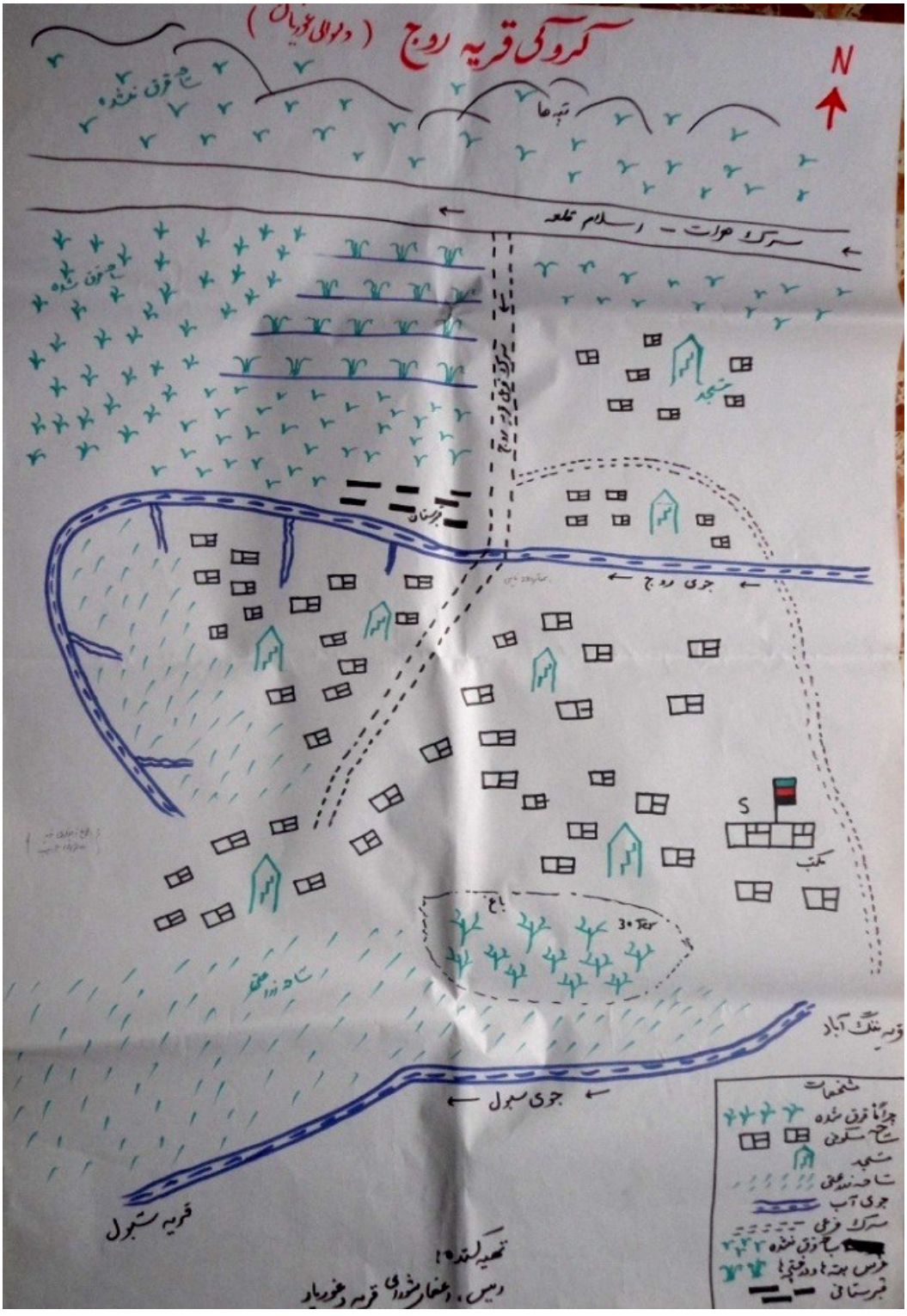

Figure 41. Ruch village original map

Mohammad Alam Ghoryar
Large Scale Grazing Systems (LSGS) in the Western Region of Afghanistan: Typologies, issues and options for sustainable rangeland management.
PhD. thesis in: Produttività delle piante coltivate, XXVI ciclo - Università degli Studi di Sassari, Italy.

C- Dahan Tunik village

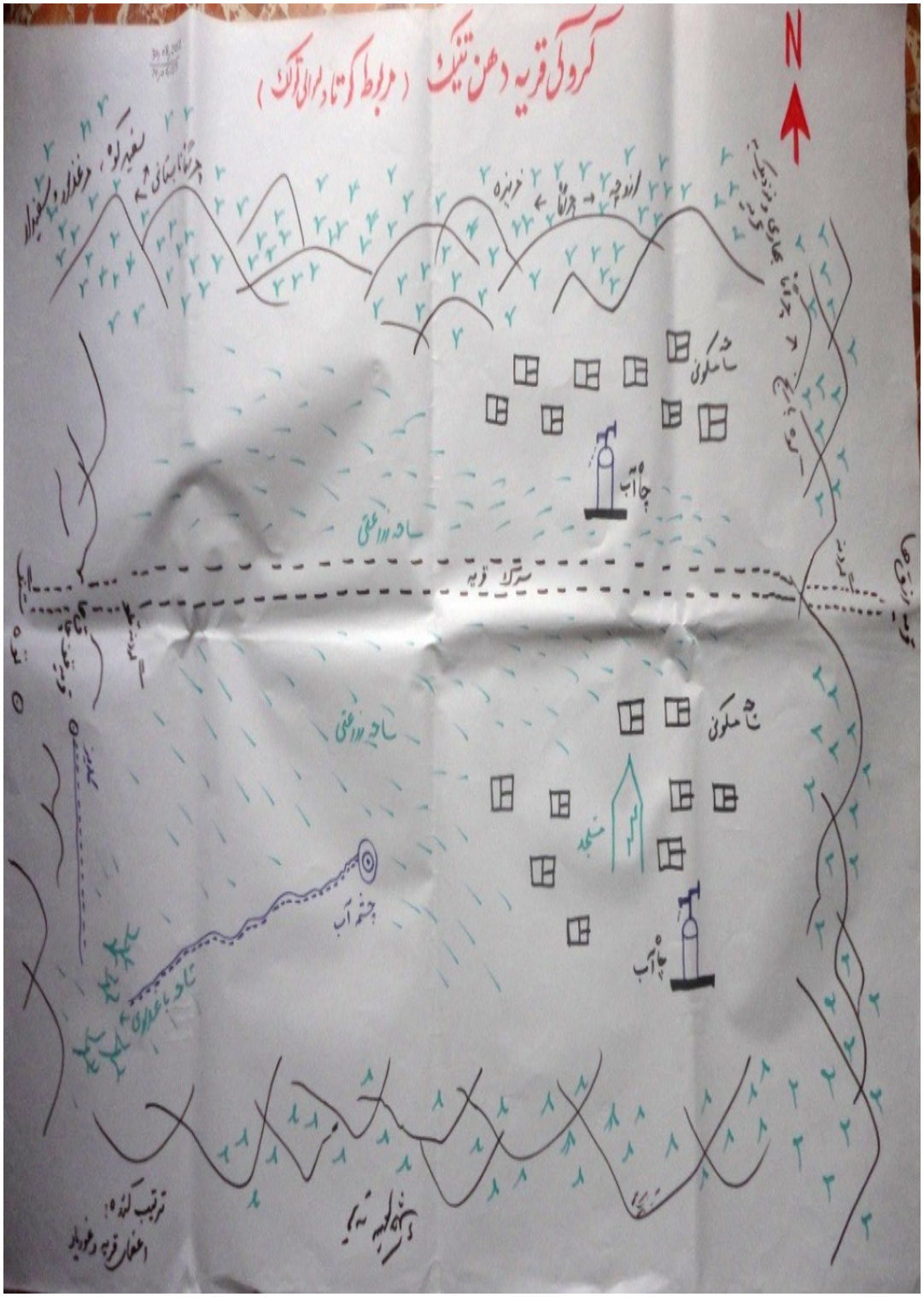

Figure 42. Dahan Tunik village original map.

5. Fact sheet of Large Scale Grazing Systems in the Western Region of Afghanistan

Basic information (1)

Contact/ source
Name: Mohammad Alam Ghoryar, Mobile: , E-mal: Ghoryar@yahoo.com

Name of the system	*Kuchi*, *Nimeh Kuchi*, *Deh nashin* (sedentary) and Semi sedentary	
Geographic description	**Map units/ Coordinates**	**Size of grazing areas**
Western Region of Afghanistan	Attached the Western Region map	77,425 km^2

LSG Flock (2)

Grazing animals	**Number of grazing animals**	**Production system**
Sheep, goat, cattle, donkey, camel, horse. Mixed flocks (main system)	4,545,038 (head)	Wool, hire, hide, meat, dairy and mixed (main system)

Participating agents - Co-operative aspect (3)

Flock management
Farmers, shepherd and cattle herders

Ownership of the flock
Flock in private property (several owners)

Ownership of the grazed area
Land in common use (in public property)

Support system
Based on rangeland and forest law, government should be support, but practically seems there is no any supporter

Co-operative aspects
Villagers (based on number of animals and tribe) and *Kuchi* (based on their clan, number of animal, relationship with villagers, accessibility to grazing area and security issues)

Large scale aspect (4)

Use of different grazing blocks in different landscapes?	And / or	**Heterogeneity within one grazed block – pattern of grazed habitats?**
Pastoralists use different grazing management unit during the year on the basis of season (e.g., lowland in winter and highland in summer season)		- LSG include a pattern of open landscape and woody land - Hill rainfed farming system

Management during LSG period (5)
Herded/not herded flock Herded stationary flock: A herder is present and manages the grazing of the flock on a series of rangeland round
Annual cycle -Year round stationary grazing on several large blocks and seasonal long/short distance migration form lowland to highland -Remote summer grazing in large flocks composed of animal from owners (5-10) in *Kuchi* systems.
LSG areas - Biodiversity aspects (6)
Grazing creating typical steppic landscape structure with low productivity
Protection status of the grazed area Regional and provincial development priority
Grazing and landscape development Grazing to maintain a particular habitat pattern in a landscape
Habitats Subtropical dessert (<1000 m a.s.l.), subtropical steppe and temperate steppe (1000 - 1500 m a.s.l.) and subtropical mountain (>1500 m a.s.l.), rangeland in neighborhood to the villages
Species (somme important genuses) *Artemisia, Agropyron, Aristida, Bromus, Carex, Festuca, Poa bulbosa, Kochia, Saccharum, Stipa, Artiplex, Ferula, Acantholimon, Acanthophyllum, Cousinia*, *Astragalus, Peganum, Prangos, Trigonella.*

Need for new/changed measures (7)		
Stability assessment / Weakness of system (7.1)	**Stabilizing/ destabilizing factors (7.2)**	**Problems to be solved (7.3)**
- Grazed area decreased - Inequality of accessibility to all LSGS area - Lack of government control and support the LSGS	- Drought - Fire fuel collection - Grazing pressure - Rangeland conversion to cropland - Several decades of war - Land tenure issue	- Rangeland degradation - Lack of alternative energy resources - Drought effects on vegetation - Pressure of woody vegetation and bushes - Unequal accessibility to all LSGS areas

6. Afghanistan land cover map

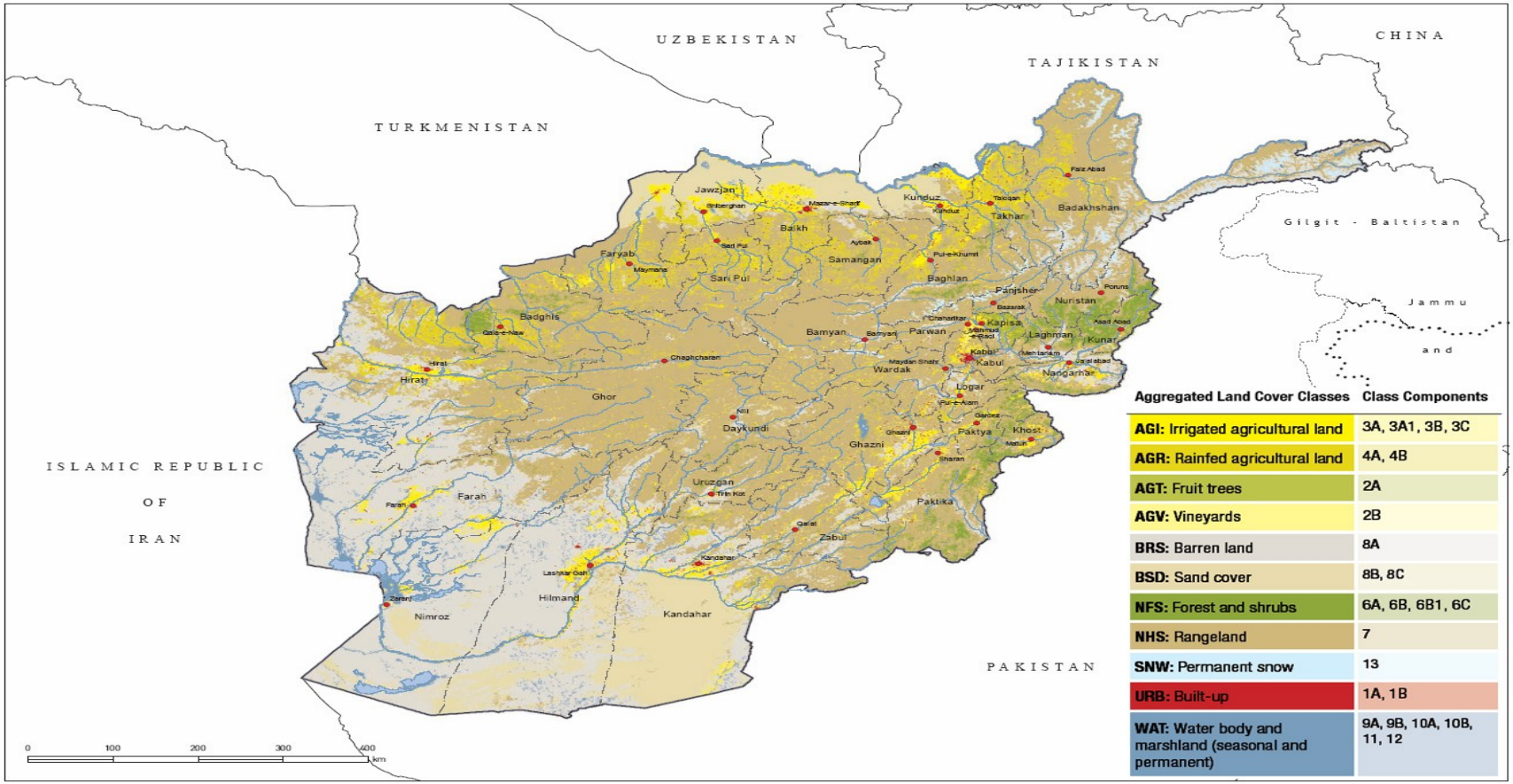

Figure 43. Afghanistan land cover map
Source: http://www.glcn.org/activities/img/afg_lc_2010_map.jpg. Accessed 29.10.2013