



# Updated Rangeland Strategy for Jordan



Ministry of Agriculture  
Directorate of Rangelands and Badia Development

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## Introduction

Natural rangelands have a vital role in Jordan through meeting part of the feeding requirements for livestock despite the deterioration that affected range resources over the past decades. Rangelands continued constituting a main source for livestock fodder and a major component of ecosystems in the country.

Rising to the challenge of enhancing such role, rangeland reserves were established in the different ecoregions and have been managed in accordance with sound range policies and sustainable grazing systems. For instance, the participatory approach has been followed in managing range resources as to sustain natural rangelands and thus secure livelihoods for generations to come against a backdrop of challenges imposed by climate change including successive droughts that have aggravated the deterioration of natural resources and wildlife and expedited desertification.

Upon that, the Ministry of Agriculture updated the National Rangeland Strategy in cooperation with the International Union for Conservation of Nature and consultation and cooperation with relevant stakeholders. This Strategy revolves around what needs to be done to curb rangelands deterioration through addressing the underlying causes, enhancing rangelands sustainable management and improving the plant cover quantitatively and qualitatively. This is to be further consolidated by local communities' effective involvement in natural resources management, enhancing their awareness of their roles and responsibilities and empowering and regulating their institutions.

This orientation made the Strategy in harmony with the three Rio Conventions (on climate change, desertification and biodiversity) and gave it an institutional and practical character evident in the comprehensive set of specific projects and activities proposed therein that are directed to achieve certain goals and implement the Hima approach in managing range resources sustainably.

Finally, I would like to thank all those who contributed in preparing and producing this Strategy, particularly the International Union for Conservation of Nature and its Regional Office for West Asia.

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Minister of Agriculture

## Foreword

This updated National Rangeland Strategy for Jordan was prepared by the National Rangeland Strategy Committee in the Ministry of Agriculture. The Head of the Committee was Dr. Radi Al Tarawneh, Secretary-General of the Ministry of Agriculture and the members of the committee are:

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This draft is the work of the committee over several months. Dr. Jonathan Davies, the IUCN Global Drylands Initiative Coordinator, Eng. Fida Haddad, IUCN ROWA Dryland, Livelihoods and Gender Program Manager and Dr. Sa'eb A. Khresat- Strategy Consultant all worked to consolidate and update this strategy.

The draft strategy was reviewed by different stakeholders. The reviewers endorsed the main directions of the strategy and made recommendations about additional elements that should be addressed in the strategy. These additional elements have been incorporated in this document, and discussed in a national workshop held in Amman in June 2013 to reach the final version of the strategy.

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# 1. Overview of the Agricultural Sector

Jordan is a semi-arid and drought-prone country largely dominated by range of mountains in the west. Those highlands have a Mediterranean climate characterized by a hot, dry summer and a cool, wet winter separated by two short transitional periods. The southern and eastern parts of the country are arid with hot dry summers and cold dry winters. Temperature increases towards the south, with exceptions in some southern highlands.

Precipitation is extremely variable and is confined largely to the winter and early spring seasons and ranges from over 500mm in the highlands to less than 50mm in the east. The long-term average annual precipitation is 8,317 million cubic meters (Ministry of Water and Irrigation, 2014) of which about 92.5% is lost to evaporation (Freiwan, M. et al., 2007). The Eastern Desert (also known as the Badia<sup>1</sup>) that lies east of the mountainous region and covers about 80% of the land area of Jordan has a low precipitation. (The Hashemite Fund for Development of Jordan Badia, 2014)

## Agricultural Sector's Contribution in the National Economy

Agriculture's contribution to GDP declined from 20% in 1974 to 2.9% in 2011 (Bahdousheh, et al, 2010), while in absolute terms it has increased (e.g. from JD 57 million in 1974 to JD 598.3 million in 2011 as shown in Table 1).

**Table 1: Agriculture's Contribution to GDP**

YEAR	1954	1964	1974	1984	1994	2010	2011
Agriculture's contribution in absolute terms (million JD)	15	32	57	98	193	560	598.3
Agriculture's contribution in relative terms (%)	40	30	20	6	4.5	2.9	2.9
Total national GDP (million JD)	15	200	281	1.764	4.300	18.762	20.476

Source: The Central Bank of Jordan (periodic reports between 1996 and 2012), and MOA 2013.

However, this sector maintained an increase in monetary value (market price) as reflected in the incremental contribution of agriculture to actual GDP as indicated by the value of the total agricultural gross output (from JD 267.3m in 1986 to JD1,555.3m in 2010), plant and animal intermediate consumptions (JD153.8m to JD976.4m in 2010) and the added value (A.GDP) from both crop and livestock products (from JD113.5m to JD 576.9m in 2010).

It is estimated that the indirect contribution of agriculture through auxiliary (supporting) industries of agriculture such as agribusiness, food processing, fertilizer industry, accounts for 27% of GDP.

However, the importance of the agricultural sector stems from the fact that it is not only the major source of food products (especially red meat, poultry, dairies, fruits and vegetables), but also from being one of the sources of hard currencies earned from exports. About 20% of the total poor in Jordan live in rural areas depending mostly on agriculture, being livestock keepers, smallholders of farm households and landless former agriculturalists. Despite lack of motivation for rural youth, agriculture is still an important source of employment in rural communities (IFAD 2010).

1. The name Badia is an Arabic word describing the land where Bedouins live and practice seasonal browsing.

## Agro-Ecological Zones of Jordan

Jordan has five agro-ecological zones (AEZs) based on the annual rain levels (Table 2). A common element in all AEZs is the rainfall factor that determines the land use and farming systems in each zone. Drier zones are areas of small ruminant grazing and rainfed barley cultivation. Wheat is also rainfed but in higher rain areas, whereas irrigated farming, including intensive dairy, fruits and vegetables are in the settled permanently irrigated areas.

**Table 2: Jordan's Agro-Ecological Zones, Annual Rain Levels, Area and Land-use**

Agro-ecological Zone	Annual rain (mm)	Km <sup>2</sup>	Area (%)	Land use
Arid	<200	79,412	89	Range, small ruminants, irrigated cereal & forage
Marginal zone	200-300	5,620	6.3	Wheat & barley, small ruminants
Semiarid	300-500	1,338	1.5	Wheat, barley & food legumes, small ruminants
Subhumid	500-800	892	1.0	Fruit trees, dairy farming
Jordan Valley	200-350	1,070	1.2	Vegetables, fruit trees, irrigated cereals, dairy farming
Water bodies		986	1.0	
<b>Total</b>		<b>89,318</b>	<b>100</b>	

Vegetables (mostly tomato, cucumber, aubergine, cauliflower, cabbage); fruits (mostly citrus fruit and banana, melon and grape); Livestock (mostly small ruminants (sheep and goats), except dairy cows in the intensive small dairy.

MOA 2011 Compiled by Sidahmed for IFAD Evaluation Mission April 2011; DOS 2011, Statistical Annual Report.

## The Physiographic Regions of Jordan

The physiographic land regions of Jordan are classified according to climatic, land, terrain, elevation, and soil and water characteristics. Agriculture (crop and livestock systems) is practiced at varied levels in the following four main physiographic regions. The land surface ranges from the fertile and agriculturally productive Jordan Valley and highlands in the north and west to the vast Badia desert/semi-desert stretches of the east and southeast fringes.

### *The Jordan Rift Valley and Wadi Araba (Area 5000km<sup>2</sup>)*

The Jordan Rift Valley extends from Lake Tiberias in the north to the Gulf of Aqaba in the south and includes the Jordan River, Jordan Valley (Ghor), Lake Tiberias and the Dead Sea. This zone can be divided into three areas. First, the Jordan Valley that lies between 200 and 400m below sea level, extending from Lake Tiberias in the north to the Dead Sea, with a length of 104km and a width of 4-16km; it is surrounded in the east and west by high mountains. Rainfall decreases from approximately 300 mm in the north to 102mm in the south. Second, Southern Ghor, also lying below sea level to the south of the Dead Sea and with annual rainfall of less than 100mm. Third, Wadi Araba, that extends between the Southern Ghor and Aqaba on the Red Sea. It is extremely dry, with limited cultivated areas using groundwater. The Jordan Valley and the Southern Ghor are among the most important agricultural areas, as there is a permanent source of water from the Yarmouk River and side dams for the former and surface water for the latter. Due to their position below sea level and high temperatures (microclimate), these two are the most important winter vegetable producing areas. Cultivable lands in Ghors total approximately 34000ha, all irrigated. The majority of holdings are 3-4ha. Farmers use modern agricultural techniques in irrigation, production and marketing.

### ***The Highlands (Area 5000km<sup>2</sup>)***

The highlands extend over the entire length of the western part of the country where most of Jordan urban and peri-urban people live (e.g. Amman, Zarqa, Irbid and Karak). Many creeks and wadis drain from the east to the Jordan River, Dead Sea, and Wadi Araba. Altitude ranges between 600m in the north, 1000m in the middle and 1500m in the south. The highlands are a succession of catchments and sub-catchments, falling within the semi-arid zone (350-500mm annual rainfall) and a small sub-humid zone (over 500mm annual rainfall).

### ***Steppe (arid zone or plains) region (Area 10000 km<sup>2</sup>)***

The steppe is plains located between the highlands and the eastern desert (Badia). The area, which extends from Irbid through Mafraq and Madaba all the way south to Karak was formerly covered with steppe vegetation. Much of this has been lost to desertification. Rainfall ranges between 200mm in the East and 350mm in the West. More than 50% of the arable land is in this zone. The rainfed crops are mainly barley (areas of 200-300mm of rainfall) wheat and fruit trees (where rainfall ranges between 300 and 350mm). In the south, the Sharah highlands extend from Shobak to Ras an-Naqab. This high altitude plain receives little annual rainfall and is therefore lightly vegetated.

### ***The Badia (Desert and steppe grazing region)***

The Badia region covers about 80% of the country, receives less than 200mm rainfall per year and extends from northern basalt and Rweishid deserts in the northeast to the central desert south of Amman. Wadi Sarhan on Jordan's eastern border drains north into Azraq. Al-Jafr Basin, south of the Central Desert, is crossed by a number of broad, sparsely-vegetated wadis. South of al-Jafr and east of the Rum Desert, al-Mudawwara Desert is characterized by isolated hills and low rocky mountains separated by broad, sandy wadis. The Badia is characterized by sparse vegetation that is reduced southward. More recently, underground water is being extracted to grow vegetables, fruit trees and wheat in limited areas.

### **Forests and Range Resources**

Jordan has limited forest resources, with only about 1 per cent of the country classified as forests. The forests in Jordan are generally neither productive nor capable of producing good quality wood for commercial or industrial purposes (i.e., they have low commercial value). However, they provide other kinds of important services, including contribution to soil conservation, watershed management, aesthetic and recreational value, biodiversity conservation and carbon fixing. Forests in Jordan consist of natural and man-made forests including windbreaks and shelterbelts. Natural forests constitute only 0.44% of Jordan's total land area (50800ha).

The grazing resources used to sustain the flocks of grazing animals most of the year, and supplemental feeding was practiced only in drastic situations such as severe-prolonged drought or very cold conditions. At present, different studies reported that the natural grazing resources are highly degraded and their contribution to the feeding calendar of grazing animals is less than 20% (Juniedi and Abu-Zanat 1993, Abu-Zanat and Tabba'a 2001, Abu-Zanat 2001, Abu-Zanat 2002). The original productivity of the steppe and Badia before 1990 was estimated at 20kg and 8kg per dunum of dry matter, respectively. While after 1990 and due to the unsustainable policies and practices that prevailed during that era, the



productivity of the rangeland represented by the steppe and Badia was estimated at 10kg and 4kg per dunum of dry matter, respectively. This means that the traditional pastoral systems are at risk and about 250,000 of inhabitants (5% of Jordan's population) engaging directly or indirectly in pastoral activities will be severely affected.

## **Livestock**

Livestock contributes about 55% of the agricultural production. Sheep and goats are the predominant livestock species in Jordan. The animals are generally raised on a crop-residue, planted fodder and barley grain based system with the rangeland contributing about one month of livestock feeding in normal years. This contribution is severely reduced in overgrazed areas and during extended drought years. The maximum potential contribution of improved rangeland is not expected to exceed 30% of the daily feed requirements of one adult sheep or goat (Sidahmed 2011).

Supplementary feed has been encouraged by the government barley subsidies and reducing forage availability and has as a result led to decreasing profit margins of producers and low competitiveness of their products at national and international markets.

Twenty years of subsidies and ease of transportation around the desert have encouraged the livestock industry to become dependent on barley, which accounted for 63% of feed costs for producers.

The government policy for subsidizing prices of imported inputs especially during the dry seasons has also encouraged livestock herders to keep large number of animals exceeding the carrying capacity of the rangeland.

## 2. The Rangeland Patterns in Jordan

Rangelands comprise the low rainfall and variable climate arid and semi-arid areas of Jordan. The main ecosystem types are native grasslands, shrub lands and woodlands. There is no clearly defined boundary to the rangelands. Boundaries move according to climatic conditions. The rangelands are a strong element in the Jordanian culture, historical course, social imagery, and social history, and have a significant cultural and heritage value.

The land area of Jordan's rangelands depends largely on the definition adopted. An inclusive definition joins together much of the desert, the steppe region and the highlands, thus making some 97% of the land area of Jordan as 'rangelands'. "The wide-open, non-fenced lands where fodder grow naturally, that are not suitable for traditional farming due to lack of rain, low fertility, rough terrain and high rockiness or because of a combination of these factors, which makes the lands optimum use restricted to production of fodder for animals" (Abu Zanat, 1999; Sinkri, 1977).

However, only the regions unsuitable for rain-fed cropping, with rainfall below 200mm annually, are defined as range which gives a figure near to 80% of the total land area. The Agriculture Law No. 20 for the year 1973 defined the ranges as "all lands registered as such and any other state-owned lands where annual rainfall is below 200mm and that do not have sustainable irrigation, or the lands confined for public use". Since 1985 there has been an acceleration of all types of agriculture, gradually eating into the area of the rangeland..

### Land Use in the Rangelands

#### *Pastoralism*

The most significant economic use of the rangelands is pastoralism. The most common animal herded is sheep, although goats are more numerous in the south. This represents a major change from camel production, which was predominant until the 1940s. Camels are still kept in certain areas, but their numbers are much reduced. This change has almost certainly affected the vegetation patterns as the large thorny bushes that camels graze cannot be eaten by sheep or goats. Controlled systems of land use in the rangelands, such as the Hima system,(a traditional conservation system used by Bedouins to organize grazing and keep lands protected and conserved) persisted until the early twentieth century.

#### *Agriculture*

One of the most tangible uses of the rangelands is agriculture. Given the extremely low rainfall, this area is not usually regarded as suitable for agriculture; however, cropping is common all along the western edge of the rangelands. The most common agricultural pattern is rainfed winter barley. Yields are so poor that it is difficult to consider this production of economic value.

#### *Rangelands Management*

For a long period in the past, Jordan's grazing lands were characterized by effective traditional land tenure systems and grazing rights which were associated with tribal institutions. This protected the resources in these lands and organized their use in a way that assisted in their conservation and continued productivity

under the prevailing environmental and social conditions. With the elimination of these systems and rights and declaration of grazing lands as state-owned land, open for everybody, new land uses encroached such as overgrazing and early grazing of range plants, ploughing of rangelands to establish ownership rights, property rights, urbanization, uprooting of bushes for use as fuel wood, arbitrary movement of vehicles, quarries and mining activities. Many of these areas were over-used without consideration to their resource requirements or their productivity. The change in land tenure also led to a lack of the incentives that encourage pastoralists and Bedouins to maintain and conserve their resources and lands and control their grazing. Therefore, the identification and definition of the ownership of these lands would greatly assist in setting plans for their development and improvement.

The rangeland management includes:

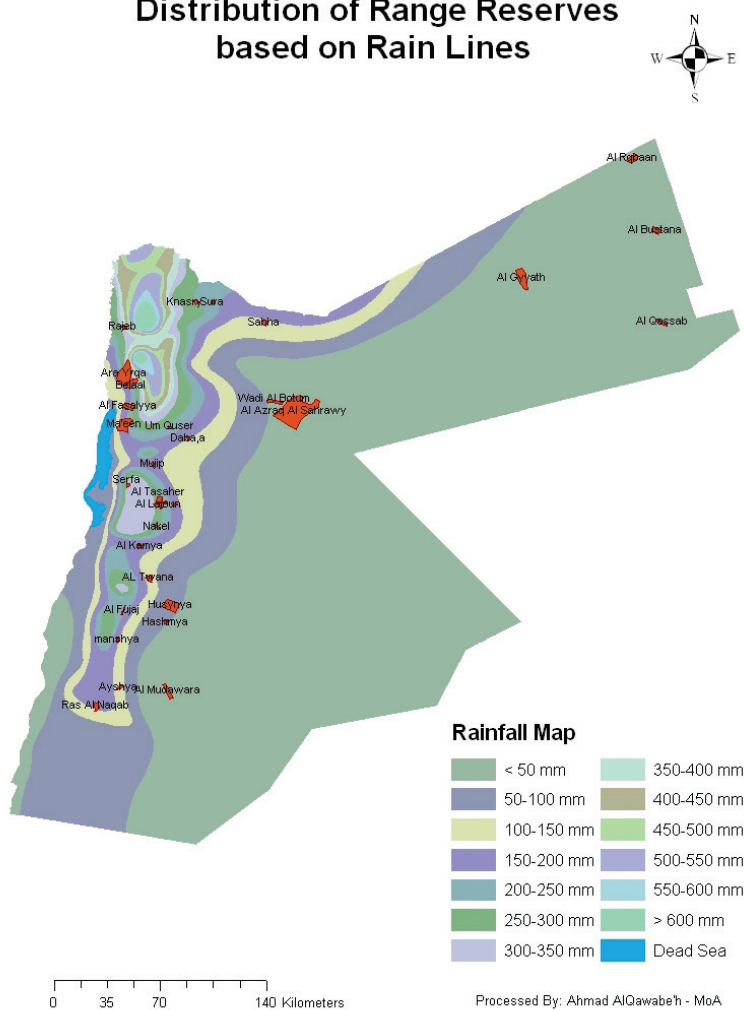
1. Protection: Protecting the natural resources of rangelands by reversing improper grazing practices and detrimental actions such as logging.
2. Improvement and development of rangelands through water harvesting, planting rangelands seedlings, reseeding rangelands species and regulating the exploitation of pastures. The Ministry of Agriculture has established 34 reserves to protect and manage the rangelands plant species and conserve the ecosystem.
3. Production Systems in Jordan.

### Production Systems of Small Ruminants and their Effects on Rangelands

The production systems of small ruminants (sheep and goat) includes the following:

- Nomadic System: This system is adopted by people who mainly rely on livestock as their source of living which makes them move most of the year searching for food and water for their animals.
- Transhumance System: This is practiced by people who are essentially cultivators and also practice livestock keeping and make use of climate differences by moving animals to graze at different altitudes and latitudes.
- Sedentary System: Sheep depend for food on the balance of food and direct health care provided to them. This system reaches to be a commercial system.

Distribution of Range Reserves based on Rain Lines



Distribution of range reserves along rain lines (Source: Ministry of Agriculture / Directorate of Rangelands and Badia Development 2012).

### 3. Land Tenure and Land Property Rights in the Rangelands

Land can be owned individually or by groups in Jordan (USAID 2007). The state claims ownership over all uncultivated or un-built-upon land, including pastoral areas. The subdivisions of land ownership within the the Badia of Jordan includes:

1. Privately owned land
2. State owned land /Treasury of the Hashemite Kingdom of Jordan
3. Lands registered in the name of some government institutions and Jordan Armed Forces

Although pastoral land is also claimed as government property, traditionally the land is considered tribal domain with full rights of use by the tribe. This creates land use conflicts and also leads to mismanagement of the natural resources leading to overgrazing and desertification.

Since ancient times, Bedouin tribes have practiced a traditional land management system expressed by the term “dirah,” the area throughout which a group migrated, including pasture and some cultivated zones. They used a grazing system known as “Hima” in which good forage within a tribe’s territories was sought out while heavily grazed land was allowed to lie fallow to recover. Within the dirah, certain good grazing areas, such as wadis and marabs (wadi fluvial outwash zones that are typically well vegetated), traditionally “belong to” individual families and clans whose property rights are recognised and respected by others.

Fifty years ago, nomadic Beduins raised their livestock with no regard to political borders, venturing into Jordan, Syria, and Saudi Arabia, as well as locations around the Iraqi borders. They migrated with their livestock to nearby lands in order to let the forage and resources in their original local areas regenerate without the interference of their sheep, using a ‘Hima-like’ system. In those days, around 74% of livestock owners used to travel to the east of Jordan (Al Hammad region) for grazing purposes, and 55% were also entering into Syria and 30% into Saudi Arabia due to droughts in Jordan. According to Participants in a study, living a nomadic life and raising livestock across what has become international borders was also very beneficial to the land, which was able to naturally replenish itself while the livestock grazed in other locations. (Abu Jaber et al. 1987; Al-Oun 2008)

With all the Beduins now residing permanently in Jordan, 71% raise their livestock in the northern Badia region, with 56% in the northeastern Badia and 15% in the northwestern Badia. Modern-day political borders no longer allow them to cross over into other countries and, as a result, Jordan’s limited rangeland resources now have rare opportunities to regenerate. The change to a non-migratory grazing regime has put stress on the land as the Beduins now keep their livestock year-round.(Al-Tabini et al. Pastoralism: Research, Policy and Practice 2012, 2:4 Page 3. <http://www.pastoralismjournal.com/content/2/1/4>)

#### Property Rights in Rangelands

Livestock production in the Jordanian rangelands is based on feed resources obtained from individual crop fields, tribal pastures, state lands (forests, open rangelands and range reserves), and from land and feed markets. Secured tenure rights are related to registered use rights granted by the state (miri) and private property rights (molk). Holders of these freehold property rights have full control over their land resources whether that was through traditional tenure (the dirah), state land or private ownership. A common problem in the region is weak control over areas of rangeland by the people who are the

primary users of those lands. Some form of pastoral cooperatives is the contemporary substitute for the traditional tribal authority that could prevent flocks from outside the community from trespassing onto prime grazing land, but these cooperatives are often ineffective. Central governments are reluctant to assign sufficient responsibility to pastoral communities to allow them exercise full land tenure privileges. Without effective local control over range resources, there is little incentive for pastoral communities to accept management recommendations or technological interventions that increase resource productivity.

On rangelands such as Jordan's Badia, state management of tenure is the only viable option. Four alternatives are suggested to stimulate better resource management: (1) development of pastoral cooperatives, (2) the redefinition of pastoral rights, (3) re-introduction of the Hima concept and (4) the development and improvement of the rangelands through capacity development.

### **Hima Revival and Biodiversity Conservation**

The Bani Hashem community in Zarqa area presents a successful example of the re-introduction of the Hima system. The reviving of the Hima system at Bani Hashem villages is an attempt for showcasing how strengthening local community capacities (of both women and men) enables them to protect and manage their land resources in proper communal efforts that will be reflected positively on their natural resources as well as socio-economic growth. The community (supported by the Ministry of Agriculture) has identified 1500 hectares of public forest land that they refer to as "the last green area" in the rapidly industrialising Zarqa river basin area. Negotiations between the Bani Hashem community and the Directorate of Rangelands and Badia Development, involving the prime minister's office were carried out to grant the community the right to manage the lands as rangelands. Approval was given to the community to start management on 100 Ha, to be scaled up to 1500 Ha if this management attempt proves to be successful.

Through "Securing Rights and Restoring Lands for Improved Livelihoods" project, led by IUCN ROWA, the community at Bani Hashem has developed a local tribal law, called "Meathak Sharaf", to help enforce the new land management system by restricting grazing. Meathak Sharaf has been endorsed by the Zarqa governor who represents the local government and can help enforce the law. The Ministry of Agriculture has established a community based group (Hima Bani Hashem CBO) to follow up and sustain the process.

After one year of activities and protecting their Hima area from the herders but without using any fencing, biodiversity benefits have already become observed through the increase of biomass and restoration of indigenous floral species such as artemisia herba-alba. Protecting the pilot area allowed shrubs and grasses to regenerate, restoring the land's vegetation. A total of 36 native plant species were recorded in the site, mainly in the area that receives the highest rainfall.

### **Shraif Reserve**

This reserve is located in Karak Governorate - south of Jordan, where shraif community owns sixty thousand dunums. It became to be managed by the local community which has established a cooperative society to institutionalize collaborative work. They have succeeded in applying the participatory approach in protecting and planting the area and having income generation projects as sheep breeding.

Governmental efforts to conserve and protect biodiversity have started several years ago. The Jordan National Biodiversity Strategy provides a framework for actions at all levels to enhance the ability to

ensure the productivity, diversity and integrity of natural systems and, as a result, the ability to develop sustainably. It promotes the conservation of biodiversity and the sustainable use of biological resources in order to alleviate poverty in rural areas and improve the health conditions and quality of life of the population. Within this framework, governmental efforts have been aiming to:

1. Conserve biodiversity and use biological resources in a sustainable manner by protecting the various species of animals, plants and micro-organisms in their different agricultural environments; and productivity of environmental systems, especially forests, grazing land and agricultural land within a balanced environmental order.
2. Improve the understanding of ecosystems, increase resource management capability; and promote an understanding of the need to conserve biodiversity by using biological resources in a sustainable manner;
3. Manage natural resources and distribute roles among institutions in a way that conserves the basic natural resources which are necessary for human growth and survival, such as soil, water, plant cover and climate, developing these elements and using them appropriately in a sustainable manner;
4. Maintain or develop incentives and legislation that support the conservation of biodiversity and the sustainable use of biological resources;
5. Work with other countries to conserve biodiversity, use biological resources in a sustainable manner and share the benefits equitably.

### **Community-Based Rangeland Rehabilitation (CBRR)**

When the Royal Botanic Garden (RBG) of Jordan was founded in 2005, it identified food security as a major challenge facing Jordan. Climate change, overgrazing, desertification and a rapidly expanding population in Jordan have all combined to create huge imbalances between food security and natural resources management. To address habitat loss and food security problems at a fundamental level, the RBG launched the Community-Based Rangeland Rehabilitation Project (CBRR) in 2007, starting with five families living near the RBG site. Participation then developed to include 38 families by 2013.

The local herding community initially opposed the creation of the RBG, as an area of land traditionally used for grazing was fenced off for the Garden. Like most unregulated rangeland areas in Jordan, the condition of the land at that time was poor, due to constant overgrazing, illegal wood cutting and picnicking. The vegetation was sparse, erosion rampant, and the soil dry and unhealthy.

The CBRR's first step was to hold meetings with community members. Local livestock owners were offered forage replacement (barley) in exchange for not grazing on the site while the RBG conducted vegetation surveys, estimated the biomass and developed sustainable stocking rates. Based on the collected data, the CBRR team established stocking rates and developed managed grazing plans that have led to a significant rise in biomass and plant diversity, and better soil conditions. The formerly overgrazed land can now bank more rainfall and retain moisture in the dry summer months, while allowing herders to graze their flocks inside the RBG site on a supervised basis.

The CBRR's grazing management plans resulted in a return of profuse vegetation to RBG land, along with more wildlife. The site's biomass increased by over 30% in a three-year period, as measured by biomass surveys. The number of native plant species growing wild on the site increased from 436 in 2006 to 580 in 2012, some of which have not been recorded in the area since the late 1800s.

As part of the project, local families are also learning how to earn income from sources other than herding. A dozen families have been trained to produce bee products, sun-dried yoghurt (jameed) and mushrooms. Furthermore, local women have been taught sewing and handicraft skills. The CBRR is successfully improving the livelihood of sheep and goat herders and improving family hygiene, which has greatly decreased illness among the community. The multi-faceted activities of the CBRR have brought higher and diversified incomes for local livestock owners, community mobilization, and greater understanding of sustainable land management practices, all of which are key to achieving enhanced food security locally and throughout the country.

### **Quarries in Jordanian Badia**

In the Agriculture Law No 44 for year 2002, article 36 addresses land with annual rainfall below 200mm as a rangeland, which means that the majority of Jordanian lands are rangelands. However, the Ministry of Agriculture is not the entity mandated of such rangelands as these are owned by Treasury of Hashemite Kingdom of Jordan. Therefore, it is the Treasury Lands Directorate in the Department of Land and Survey that is in charge of such lands and mandated to handle any violations to them.

The Natural Resources Authority is responsible for the ores and minerals of Jordan specifically those in the Badia lands that contain stone material (quarries) which became subject to rapidly increasing demand since early 1990s. This makes it easier for NRA to follow up on licenses of quarries while the majority of licenses are issued by the Ministry of Agriculture except quarries licenses that are issued by the Treasury Lands Directorate in the Department of Land and Survey. This resulted in the spread of quarries within eastern Badia region (Rwaished and Azraq region /Tal Hassan), and southern Badia (Ma'an).

The dispersed authorities in following up on quarries led to the deterioration of rangelands which already belong to the Treasury. It therefore became necessary to reconsider the text of article 36 of the Agriculture Law, which identify rangeland as that with annual rainfall below 200mm. Productivity and ownership of land should be taken into account when establishing and developing pastures especially that there are large areas in Jordan with low productivity but rich in rocks and natural minerals which makes it possible to establish quarries. On the other hand, the majority of rangelands are registered as Treasury lands where there is no authority the Ministry of Agriculture. Also there are lands considered as tribal lands which hinders the establishment of range reserves by the Ministry of Agriculture.



## 4. National Agricultural Policies, Strategies, Laws, and Programmes

### Policies, Strategies and Laws Related to the Agricultural Sector

Policies, strategies, laws, and temporary laws for agriculture, land use, livestock, rangeland use, water resources, environmental protection and biodiversity were developed and are coordinated by various public ministries as relevant, with varied degrees of performance and effectiveness). Brief descriptions of each one are summarized in Table 3.

**Table 3: Policies, Strategies and Laws Related to Agricultural Sector**

Document	Year	Type	Description
Agricultural Policy Charter (ACP).	1995	Policy	The Charter aims at achieving consistency of agricultural development with local, regional and international requirements and changes, and an integrated socio-economic development characterized by efficiency, sustainability and equity. Clear policy objectives and priority sub-sectors were defined.
National Strategy for Agricultural Development:2002-2010	2002	Strategy	The strategy discusses the role of the agricultural sector in social and economic development to achieve a sustainable agricultural and rural development, taking into consideration the socio- economic and environmental aspects e.g. protection and conservation of ago-biodiversity during such development. The strategy presents profiles of proposed projects in the five agricultural sub sectors of rain fed agriculture, irrigated agriculture in the Jordan Valley, irrigated agriculture in the highlands, livestock and rangelands and marketing of agricultural produce.
National Rangeland Strategy	2001	Strategy	This strategy was developed in 2001 with the main objectives of controlling deterioration of the rangelands and reversing the desertification process; increasing sustainable livestock production by restoring the productivity of rangelands and increasing sustainable range fodder production; supporting fodder production in order to encourage intensive breeding; and encouraging local communities and sheep breeders to adopt intensive breeding techniques to regulate stocking rates.
National Environmental Strategy (NES)	1992	Strategy	The NES catalogues all environmental pressures and problems and includes over 400 specific recommendations and suggested actions in the field of environmental protection and conservation.
National Strategy and Action Plan to Combat Desertification	2006	Strategy	The National Strategy and Action Plan (NAP) to combat desertification was launched in 2006. It includes six major programmes that are mainly "project-based". The programmes include several projects related to desertification monitoring and control, capacity building, natural resources rehabilitation and development.
The National Agenda 2006	2006	National Strategy	The National Agenda was launched in 2006 comprising a comprehensive political and socio-economic reform plan for the country until 2017. The main goal of the National Agenda is to achieve consistent policies and ensure that they will not be subject to government change while taking into considerations the need to regularly develop and update these policies.



Document	Year	Type	Description
Agriculture Provisional Law No. (44) of 2002	2002	Law	Organize and develop the agricultural sector to attain developed, growing, diversified, and integrated agricultural production that conserves the environment and natural resources; enhance self-dependency, and meeting the international, regional and domestic requirements.
Environmental Protection Law No. (52) of 1999	1995	Law	The Jordanian environmental law was enacted as a temporary legislation in 2003 and was ratified by the Parliament in 2006. This law provided the appropriate legislative umbrella for issuing the various detailed regulations and instructions regarding the protection of the environment.

## Analysis of Policies Impacting Rangelands

### Agriculture Strategy

The National Strategy for Agricultural Development (NSAD) 2002-2010 addresses the role of the agricultural sector in social and economic development, the present situation of the sector and future scenarios under a “status quo” scenario and a “development” scenario to achieve a sustainable agricultural and rural development, taking into consideration the socio-economic and environmental aspects of such development. The strategy presents profiles of proposed projects in the five agricultural sub sectors of rain fed agriculture, irrigated agriculture in the Jordan Valley, irrigated agriculture in the highlands, livestock and rangelands and marketing of agricultural produce. Under the different subsectors specific projects were proposed but due to budget limitations many of those projects were not implemented.

### Key Actions for the Livestock and Rangeland Sub-sector (NSAD, 2002)

1. Protect natural rangelands, organize grazing, and increase the productive capacity of rangeland resources.
2. Define land uses according to productive capacity, giving priority to the development of areas that have high potential of incorporating water conservation and management measures as an integral component of rangeland development.
3. Develop rangeland on the basis of integrated management approach and local community participation.
4. Conserve agro-biodiversity and use it for rangeland development and expand the establishment of natural and rangeland reserves.
5. Develop agricultural farming systems that integrate water-harvesting techniques in the development of rangeland.
6. Monitor environmental changes and combat desertification.
7. Increase animal feed production, improve its quality and introduce new feed resources.
8. Promote households’ small livestock projects.
9. Support livestock breeders organizations and encourage the establishment of councils or specialized associations for animal production and marketing and providing necessary support services.
10. Support integration between plant and livestock production.

## **National Rangeland Strategy for Jordan 2001**

This strategy along with the agricultural strategy (2002-2010) and the Water Strategy (2009) are regulatory measures developed to address the various uses and abuse problems of the Jordanian Badia such as:

- Deterioration of the rangelands as a result of over grazing, uprooting and recurrent droughts;
- Demand-driven increase in number of livestock beyond the carrying capacity of the natural vegetation;
- Mobility of livestock becomes easier using trucks or bringing water resources to the sites.
- Deterioration of the traditional ecosystem conservation and grazing regulation mechanism.
- Encroachment of crop cultivation and mining investments in the rangelands;
- The need for the adoption of breeding and flock improvement techniques to regulate stocking rates (to increase productivity per animal).
- Common use of the rangelands causes a problem for sustainability of rangeland resources.
- Inadequate and/or lack of effective regulations and application of sustainable use of rangeland.

The short and long term objectives of updated National Rangeland Strategy were defined as follows:

1. Control deterioration of the rangelands and reverse the desertification process.
2. Increase sustainable livestock production by restoring the productivity of rangelands and increasing sustainable range fodder production.
3. Improve and conserve the rangeland environment.
4. Improve the socio-economic conditions of the rangeland inhabitants.
5. Support and develop range institutions with financial and human resources, particularly the Rangeland Directorate of Rangelands and Badia Development.
6. Amend and develop legislations pertinent to the rangelands.
7. Encourage local communities and inhabitants to adopt animal production improvement programs, pay more attention to quality of animals and participate in rangeland development and management.
8. Promote gender equality and the empowerment of women as effective ways to combat desertification and for transformative development.
9. Work with concerned agencies to solve problems related to rangelands such as tribal lands, identify suitable solutions for the common use of rangelands and relate use to fixed rights.
10. Support fodder production in order to encourage intensive breeding.
11. Encourage local communities and sheep breeders to adopt intensive breeding techniques to regulate stocking rates.

### **Gap Analysis**

The following are the areas that have been most lacking in the 2001 strategy:

- The strategy of 2001 included some goals that contribute to reversing the process of desertification; however, it did not include any information or reference to the United Nations Convention to Combat Desertification which was ratified by Jordan in 1994.
- The important role and unique local community's knowledge and skills especially women in the management and protection of rangeland have been given far too little attention in development programmes and priority setting for policies and funding. For example, the Hima approach and its effective role in combating desertification and biodiversity conservation through community participation were overlooked.

- The strategy did not emphasize the role of cooperatives in rangelands management and conservation and role of beneficiary organizations in a cooperative framework.
- The anticipated outcomes of suggested projects in the strategy were not linked to the themes of the three Rio Conventions (desertification, biodiversity, climate change), which made funding mechanism and resource mobilization more complex.

There is a need to review the land use policies, laws, regulations and bylaws for effective management of resources as to be managed communally. Such management should take into account providing the farmers and herders with incentives to improve land use practices, to ensure sustainability and reduce land fragmentation. Also, there is a need for programmes that support breed improvement, flock management and range management in addition to curbing the expansion of crop cultivation (especially low yield field crops) at the expense of fragile rangeland ecosystem. Furthermore, it is necessary to assess the threats of urbanization and encroachment of human settlements on arable areas, and poor support to green belts around the cities.

In conclusion, the ability of the strategy and policy developers to identify problems is commendable; however, it seems that none of these policies and strategies was linked to relevant tools and settings. Currently the Ministry of Agriculture is conducting a review of the existing agriculture strategy and preparing for a medium and long term agricultural development strategy with the assistance of FAO. It is recommended the Ministry of Agriculture take into consideration issues raised in the above analysis and incorporate the necessary amendments.

## 5. Updated National Rangeland Strategy for Jordan

The National Rangeland Strategy was developed in 2001. The Strategy and the related legislations have not been effective mainly because of the absence of national consensus and the lack of integrated plans. The status of poor management and use of the rangeland resources has not changed, which led to destruction of plant cover and weakening of productive capacities of rangelands. At present the rangelands of Jordan cannot provide animal feed for more than 3 month during the good rainy seasons and less than one month or none during the drought years. In addition vast rangeland areas (about 10 million du) known as claimed tribal lands have been allocated to private owners without proper plans for their restoration, development and management. This facilitated promotion of real-estate business in the rangeland areas and use of large areas for non-agricultural purposes.

**Vision:** Conservation and Sustainable Management of Rangelands

**Mission:** Support and develop the rangelands sector as to attain a sustainable development and increased productivity and preserve achievements, and enhance the integrative role of concerned parties and participation of local communities in natural resources management as to have improved standards of living in light of climate changes and recurrent droughts which have significantly aggravated the deterioration of natural resources and wild life.

### **Strategy Main Goals**

1. Rangelands sustainable development and management.
2. Improvement of social and economic conditions for livestock breeders and pastoral communities taking into consideration gender issues
3. Enhancement of capacity building (training and awareness)
4. Monitoring and evaluation of rangeland status
5. Engagement of Local communities in sustainable rangeland development and management.

## Programmes and proposed projects to achieve the strategy goals:

### Goal 1: Rangelands sustainable development and management

#### Programme 1: Reverse rangeland deterioration through law enforcement and modification

##### Proposed projects:

Project name	Update legislations related to rangelands ownership and land use
Rationale	The continued deterioration of grazing lands as a result of ineffective legislations for the management of grazing lands and organization of beneficiaries
Goals	<ul style="list-style-type: none"> <li>• Identify gaps and weaknesses in legal and technical legislations currently in force</li> <li>• Modify current legislations to be inclusive of good governance of rangelands</li> </ul>
Target area/ group	Rangeland and its users
Implementing partners	<ul style="list-style-type: none"> <li>• Prime Ministry</li> <li>• Parliament</li> <li>• Ministry of Agriculture</li> <li>• Department of Land and Survey</li> <li>• Royal Jordanian Geographic Centre</li> <li>• Higher Council for Science and Technology</li> <li>• Royal Botanic Garden of Jordan</li> </ul>
Implementation period	Three years
Implementation requirements	<ul style="list-style-type: none"> <li>• New law for rangelands management.</li> <li>• Financial resources</li> <li>• Activation of the Land Use Law</li> </ul>
Achievement indicators	<ul style="list-style-type: none"> <li>• Formulation of legislations for rangeland management</li> <li>• Ratification of legislation by relevant parties</li> </ul>
Cost estimate	500,000 JD

#### Programme 2: Improvement of vegetation cover quantitatively and qualitatively

##### Proposed projects:

Project name	Rehabilitation of grazing reserves
Rationale	Need for reserves with good biodiversity.
Goals	<ul style="list-style-type: none"> <li>• Sustainable management</li> <li>• Participatory approach</li> </ul>
Target area/ group	Eira, Yarqa, Fannoush and Bilal areas (1000 dunum in each area)
Implementing partners	The Ministry of Agriculture / Relevant Directorates in the Ministry, Royal Botanic Garden, NCARE
Implementation period	Five years
Implementation requirements	<ul style="list-style-type: none"> <li>• Studies and surveys of the areas</li> <li>• Providing financial resources</li> <li>• Community training/awareness</li> <li>• Community Engagment</li> <li>• Implement managed grazing concept especially in the pastoral community</li> <li>• Using water harvesting technique in rangeland development.</li> </ul>
Achievement indicators	<ul style="list-style-type: none"> <li>• Reserves' productivity increased by 10%</li> <li>• Regeneration of 5-10 species of extinct grazing plants in the target reserves</li> <li>• Enhancement of cultivating plants prone to extinction by 5% at least.</li> <li>• Reduction of soil erosion</li> </ul>
Cost estimate	500,000 JD

## Programme 3: Empowerment of pastoral communities including women for self-sustainable management of pastoral resources

### Proposed projects

Project name	Pastoral/grazing Resources Development
Rationale	<ul style="list-style-type: none"> <li>Deteriorated rangelands while there is a possibility to increase their productivity through proper management and modern techniques</li> <li>Women -through their unique local knowledge- make crucial contributions in agriculture and rural enterprises in rangelands, as farmers, caretakers of animal husbandry, workers and entrepreneurs.</li> </ul>
Goals	<ul style="list-style-type: none"> <li>Sustainable management</li> <li>Improve efficiency of rangelands' technical staff</li> <li>Increase the potential productivity of rangelands</li> <li>Improve economic status of the pastoral community through the rangeland development</li> </ul>
Target area/ category	Potential areas of grazing
Implementing partners	<ul style="list-style-type: none"> <li>Ministry of Agriculture</li> <li>Badia Research and Development Programme</li> <li>Department of Land and Survey</li> <li>Royal Jordanian Geographic centre</li> <li>Royal Botanic Garden</li> <li>NCARE</li> </ul>
Implementation period	Five years
Implementation requirements	Professional staff and providing supporting services needed for project success
Achievement indicators	<ul style="list-style-type: none"> <li>Rangeland productivity increased by 10%</li> <li>10 study tours conducted</li> <li>5 training courses given (abroad)</li> <li>10 local training courses given</li> </ul>
Cost estimate	750,000 JD

### **Goal 2: Improvement of social and economic conditions for livestock breeders and pastoral communities, taking into consideration gender issues and climate change.**

#### Programme 1: Improving rural beneficiaries' income from rangeland reserves

### Proposed projects

Project name	Use medicinal and aromatic plants to increase household income
Rationale	<ul style="list-style-type: none"> <li>Weak interest in medicinal plants and aromatic plants</li> <li>Rural communities' low income</li> <li>Weak participation of rural women in income generation</li> </ul>
Goals	<ul style="list-style-type: none"> <li>Increase interest in medicinal and aromatic plants</li> <li>Improve rural communities' income</li> <li>Activate women role</li> <li>Implement the managed grazing concept</li> </ul>
Target area/ group	Selected sites
Implementing partners	<ul style="list-style-type: none"> <li>Ministry of Agriculture</li> <li>Jordan Cooperative Association</li> <li>Local community organizations</li> </ul>
Implementation period	Five years

<b>Project name</b>	<b>Use medicinal and aromatic plants to increase household income</b>
Implementation requirements	<ul style="list-style-type: none"> <li>• Enact legislation(s) to prevent encroachment on rangeland reserves</li> <li>• Provide administrative staff to implement project activities</li> <li>• Provide marketing channels</li> <li>• Conduct awareness programs</li> </ul>
Achievement indicators	<ul style="list-style-type: none"> <li>• Twenty training courses given on planting medicinal and aromatic plants</li> <li>• Evaluation of training courses impact on the beneficiaries conducted</li> <li>• Local exhibitions held (one exhibition yearly)</li> </ul>
Cost estimate	150,000 JD

<b>Project name</b>	<b>Develop pastoral/grazing communities</b>
Rationale	<ul style="list-style-type: none"> <li>• Weak cooperation between governmental and non-governmental institutions in planning and implementing projects related to local community development</li> <li>• Low pastoral community awareness about rangeland importance</li> </ul>
Goals	<ul style="list-style-type: none"> <li>• Involve all institutions working with the local community in developing the community development plan, which aims to create a political framework for the implementation of appropriate rural development strategies in target areas.</li> <li>• Increase pastoral/grazing resources productivity</li> <li>• Coordinate between animal production and plant production</li> <li>• Consolidate efforts of various institutions working in the development of local communities</li> <li>• Raise awareness of pastoral community (incentives)</li> </ul>
Target area/ category	Pastoral communities across the country
Implementing partners	<ul style="list-style-type: none"> <li>• Ministry of Agriculture</li> <li>• National Center for Agricultural Research and Extension</li> <li>• Jordan Cooperative Association</li> <li>• Non-governmental organizations</li> </ul>
Implementation period	Five years
Implementation requirements	<ul style="list-style-type: none"> <li>• Conduct demographic, social and economic studies on target areas</li> <li>• Identify actors/parties to be working on the project and select local leaders for the project</li> </ul>
Achievement indicators	<ul style="list-style-type: none"> <li>• 6 training courses in natural resources strategic planning conducted</li> <li>• 10 semi-automatic units for dairy processing established</li> <li>• 3 coordination meetings with institutions working in local community development conducted</li> </ul>
Cost estimate	200,000 JD

### ***Goal 3: Enhancement of capacity building (training and awareness)***

#### **Programme 1: Participation of local community including women in pastoral resources management**

##### **Proposed projects**

<b>Project name</b>	<b>Upscaling Hima system in Southern Jordan</b>
Rationale	<ul style="list-style-type: none"> <li>• Continuing deterioration of vegetation as a result of indiscriminate overgrazing and the weakening of the productive capacity of rangelands, which leads to declining biodiversity and severe environmental degradation</li> <li>• Weak economic level of local communities</li> <li>• Weak extension/awareness programmes for rangelands users</li> </ul>

Project name	Upscaling Hima system in Southern Jordan
Goals	<ul style="list-style-type: none"> <li>• Management of Hima by the local community to ensure sustainable management of grazing in the region's drylands taking into consideration gender issues</li> <li>• Restoration of indigenous plants in the region</li> <li>• Making use of unique local knowledge related to land grazing management</li> <li>• Rehabilitation of rangelands through community management to reverse degradation and reduce desertification</li> <li>• Implementation of water harvesting techniques</li> </ul>
Target area/ group	<ul style="list-style-type: none"> <li>• Rangeland users</li> <li>• Livestock breeders</li> <li>• Extension services providers</li> <li>• Karak Governorate</li> </ul>
Implementing partners	<ul style="list-style-type: none"> <li>• Ministry of Agriculture</li> <li>• Badia Research and Development Programme</li> <li>• Department of Land and Survey</li> <li>• Royal Jordanian Geographic Centre</li> <li>• Royal Botanic Garden</li> </ul>
Implementation period	Three years
Implementation requirements	<ul style="list-style-type: none"> <li>• Availability of financial resources</li> <li>• Awareness programmes for Hima management using participatory approach</li> </ul>
Achievement indicators	<ul style="list-style-type: none"> <li>• Establishment of two cooperatives for Hima management established</li> <li>• Rangelands productivity increased by 10%</li> </ul>
Cost estimate	250,000 JD

Project name	Strengthening the beneficiary communities of the rangeland reserves)
Rationale	<ul style="list-style-type: none"> <li>• Need to disseminate successful stories about rangelands management</li> <li>• Lack of rangelands' utilization by local communities</li> </ul>
Goals	Institutionalization of participatory / consultative approach among pastoral communities and related parties
Target area/ group	<ul style="list-style-type: none"> <li>• Rangeland reserves users</li> <li>• Rangeland users and beneficiaries</li> </ul>
Implementing partners	<ul style="list-style-type: none"> <li>• Jordan Cooperative Association</li> <li>• Ministry of Agriculture</li> <li>• The Hashemite Fund for Development of Jordan Badia</li> <li>• Royal Society for Conservation of Nature (RSCN)</li> <li>• Local media</li> <li>• Jordan Badia Research and Development Program</li> <li>• Ministry of Municipal Affairs</li> <li>• Ministry of Tourism and Antiquities</li> </ul>
Implementation period	Five years
Implementation requirements	<ul style="list-style-type: none"> <li>• Establishment of cooperatives</li> <li>• Environmental awareness programmes</li> <li>• Enhancement of participatory approach concept</li> </ul>
Achievement indicators	<ul style="list-style-type: none"> <li>• Three pastoral cooperatives established</li> <li>• Nine training courses conducted</li> </ul>
Cost estimate	300,000 JD



## **Goal 4: Monitoring and evaluation of rangeland status**

### **Programme 1: Monitoring and assessment of rangeland condition and trends**

#### **Proposed projects**

Project name	Management of the State's rangeland
Rationale	<ul style="list-style-type: none"><li>• Lack of a clear authority for rangeland management</li><li>• Low productivity of rangelands</li><li>• Weak and unsustainable management of rangelands</li></ul>
Goals	<ul style="list-style-type: none"><li>• Protection of natural resources by curbing overgrazing, and improving fodder production</li><li>• Contribute to the achievement of social and economic development of livestock breeders with special attention to women</li><li>• Develop rangeland indicators necessarily using a standard methodology across the country (vegetation, soil, wildlife, etc)</li></ul>
Target area/ group	<ul style="list-style-type: none"><li>• Rangeland users</li><li>• Ministry of Agriculture /Directorate of Rangeland and Badia Development</li><li>• Royal Botanic Garden</li><li>• NCARE</li></ul>
Implementing partners	<ul style="list-style-type: none"><li>• Ministry of Agriculture in cooperation with governmental and non-governmental organizations adopting participatory approach with local communities</li><li>• Mapping agency (survey)</li><li>• Law enforcement agency</li></ul>
Implementation period	Should be part of a national programme (long term)
Implementation requirements	<ul style="list-style-type: none"><li>• Enact a legislation to prevent encroachment on rangeland reserves</li><li>• Provide administrative staff to implement project activities</li><li>• Conduct awareness programmes</li></ul>
Achievement indicators	<ul style="list-style-type: none"><li>• Encroachment reduced by 50%</li><li>• Better assessment of rangeland status leading to improved decision making</li></ul>
Cost estimate	250,000 JD

### **The Updated Rangeland Strategy's Harmony with the Rio Conventions**

The updated strategy complies with the recommendations of Rio conventions. It highlights the importance of local community's knowledge and skills including women in the management and protection of rangeland. The role of cooperatives in rangelands management and conservation and role of beneficiary organizations in a cooperative framework is also emphasized.

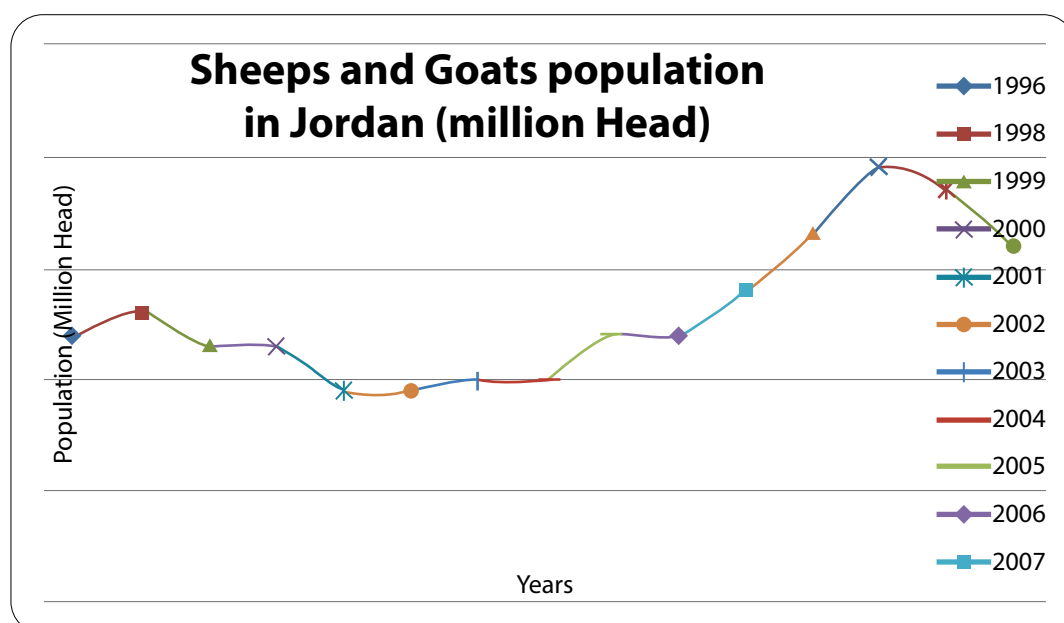
On the other hand, the updated strategy includes the necessity of reviewing relevant legislations for effective management of resources as to be managed communally. The objectives of the strategy also take into account providing the farmers and herders with incentives to improve land use practices, to ensure sustainability and reduced land fragmentation. The strategy also addresses flock management and range management in addition to curbing the expansion of crop cultivation at the expense of fragile rangeland ecosystem.

## Appendix I Contribution of Agriculture to Actual GDP (in millions JD)

Indicators	1986	1990	1995	2000	2005	2008	2009	2010
Plant Gross Output	98.8	173	221.1	201.1	307.2	450.5	445.6	601.7
Livestock Gross Output	168.5	266	351.4	339	458.3	876.2	777.47	951.6
<b>Total Agricultural Gross Output</b>	<b>267.3</b>	<b>439</b>	<b>572.5</b>	<b>540.1</b>	<b>765.5</b>	<b>1326.7</b>	<b>1223.1</b>	<b>1553.3</b>
Plant Intermediate Consumption	39.9	49.1	121.4	139.2	188.1	197.9	155.3	183.7
livestock Intermediate Consumption	113.9	198.9	274.8	280.8	331.3	755.3	608.6	792.7
<b>Total Intermediate Consumption</b>	<b>153.8</b>	<b>248</b>	<b>396.2</b>	<b>420</b>	<b>519.3</b>	<b>953.2</b>	<b>763.9</b>	<b>976.4</b>
Plant Value Added,	58.9	123.8	99.7	61.9	119.1	252.7	290.3	418
Livestock Value Added	54.6	67.1	76.7	58.3	127.1	120.9	168.9	158.9
<b>Total Value Added (A. GDP)</b>	<b>113.5</b>	<b>190.9</b>	<b>176.3</b>	<b>120.2</b>	<b>246.2</b>	<b>373.6</b>	<b>459.2</b>	<b>576.9</b>

Source: DOS 2012

## Appendix II Distribution of Sheep and Goats Population (1996-2007)



### Appendix III

#### Trends in Imported and Local Production of Barley, and Feed Subsidy

Year	Quantities of imported barley (000 ton)	Value of imported barley (million US\$)	FOB Price JD/ton	Local barley production (000 ton)	Livestock feed subsidy (million US\$)
1994	471.9	43.1	64.8	27.4	41.1
1995	487.9	53.3	77.4	31.7	3.1
1996	732.9	153.7	148.7	29.2	42
1997	507.9	1.3	113.6	29.4	--
1998	505.7	66.8	93.7	27.4	--
1999	744.5	79.2	75.5	4.9	--
2000	426.1	54.3	90.4	12.1	28.5
2001	374.1	44.4	84.1	17.3	16.8
2002	315.6	31.5	70.7	56.8	14.1
2003	567.4	54.2	67.8	25.8	7.9
2004	764.8	103.3	95.8	21.0	31.6
2005	627.1	100.4	113.6	31.8	50.8
2006	876.8	141.1	114.2	18.4	62
2007	850.9	250.6	208.9	13.5	134
2008	661.5	240.5	257.9	10.3	?
2009	613.9	104.2	120.4	17.1	?
2010	541.0	136.1	178.4	10.7	?

Source: DOS (2012); Ministry of Industry and Trade (2008)