2020

POLICIES AND INTERVENTIONS RELATED TO SUSTAINABLE RANGELAND MANAGEMENT & LAND DEGRADATION NEUTRALITY IN EGYPT

Arab Organization for Agricultural Development
(AOAD)

Healthy Ecosystems for Rangeland Development (HERD)

POLICIES AND INTERVENTIONS RELATED TO SUSTAINABLE RANGELAND MANAGEMENT (SRM) & LAND DEGRADATION NEUTRALITY (LDN) IN EGYPT

Editors

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Arab Organization for Agricultural Development

(AOAD)

2020

Required citation:
Rizk, R and Saifelnasr, E. (2020). Policies and interventions related to sustainable rangeland management & land degradation neutrality in Egypt. Egypt. Arab Organization for Agriculture Development.

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Foreword of AOAD

The Arab countries are distinguished by vast pastoral and agro-pastoral lands distributed across different regions characterized by great diversity in their ecosystems, animals, plants and different types of microorganisms. The rangelands are considered some of the most important renewable natural resources in the Arab countries. So, the Arab region is considered eligible for the advancement of the animal production sector raised in the rangelands as well as the provision of animal products aiming to enhance self-sufficiency, food security and income from selling the products locally or export abroad.

The rangelands cover an area of about 397.05 million hectares representing about 29.5% of the total land area of the Arab region. The rangelands contribute to the feed of livestock at least by 25% in most Arab pastoral/agropastoral environments and provide job opportunities for local communities, whom practice grazing and agriculture. It is also a source of livelihood for a great number of herders depend entirely or partially on rangelands for feeding their livestock and lifestyle. It plays an important role in the conservation of the dry and semi-dry lands that characterize the Arab world. Rangelands play political, economic, social and environmental roles in most Arab countries.

The pastoral and agro-pastoral area is considered a huge storehouse for the biological diversity and natural habitats of many farm and wild animals, as well as for wild plants that are the genetic origins of many food and feed crops. However, these natural resources are generally stressful and subjected to large levels of

degradation and genetic resources erosion, which negatively affected their biological diversity and decreased their agricultural production (quantity and quality).

The pastoral/agro-pastoral areas currently face great challenges that threaten their genetic resources by extinction due to water scarcity and climatic changes in addition to long droughts and frequently floods. These areas are subjected to degradation, desertification and sand encroachment in many cases. Therefore, there is an urgent and fast need to protect and conserve them by all available means/interventions as soon as possible.

It should be noted that the Arab Strategy for Sustainable Management of Rangeland prepared by AOAD was approved and issued by the organization's Executive Board at its fiftieth meeting held in the Sudanese capital - Khartoum - at December 5, 2019 (Decision No. 15/50 / CE / 2019).

In accordance with the partnership agreement between The Arab Organization for Agricultural Development (AOAD) and The Centre for Environment and Development for the Arab Region and Europe (CEDARE), AOAD achieved a rangeland policies and interventions related to SRM and LDN “Sustainable Rangeland Management Strategies and Practices”. This study is part of implementing the activities of the UNEP-GEF funded project “Healthy Ecosystems for Rangeland Development (HERD. It has been executed by the International Union for the Conservation of Nature (IUCN), through its Regional Office in West Asia (ROWA). HERD is a multi-country initiative to promote the restoration of degraded rangeland ecosystems and the revival of sustainable herding practices. With the main goal of protecting the rangelands through sustainable

pastoral management, in order to promote rangeland ecosystem services, the initiative contributes towards the goal of restoring and sustainably managing rangelands through stronger local governance and increased benefit-capture of the multiple environmental benefits of pastoralism safeguard. The project partners are the Hashemite Fund for Development of Jordan Badia (HFDJB), the Royal Botanic Garden (RBG) in Jordan, the Desert Research Centre (DRC) and the Centre for Environment and Development for the Arab Region and Europe (CEDARE) in Egypt.

While introducing this study, I would like to extend my thanks and gratitude to the CEDARE for providing AOAD with the opportunity to carry out the study. I would also like to extend my sincere thanks and appreciation to the Middle Regional Office of AOAD as well as the experts' team who contributed to the preparation of the study, hoping that it will contribute to the conservation and sustainable management of the rangeland in the Arab countries.

Prof. Dr. Ibrahim Adam Ahmed El-Dukheri

Director General

Acknowledgment

The authors would like to express their special thanks of gratitude to Prof. Dr. Ibrahim Adam Ahmed El-Doukheri, AOAD Director General as well as Dr. Kamel Mostafa Elsayed (head of the Middle Region Office, AOAD) who gave us the great opportunity to do this study.

We are very grateful for the participation of Prof. Dr. Essam Shehata, Agricultural Research Centre, Egypt, for his valuable comments, guidance and revising of the study final report.

We also thank Prof. Dr. Mohammed El-Shafie, Prof. Dr. Tarek Abel Khalek, Dr. M.M. Madboly, Dr. Maysoon M.M. Makhlouf, (Animal Production Research Institute, Agricultural Research Centre, Ministry of Agriculture, Egypt) for providing valuable information during the focus group meeting.

We are grateful for the head and staff members of the Ecology & Range Management Department, Desert Research Centre, for the valuable advices and knowledge sharing.

Thanks also extend to the local Authority of Matrouh, Sustainable Development Centre for Matrouh Resources, Barki Sheep Association, Association of Ramsah, All Bedouins, Herders, traders and community leaders as well as parliament representatives cooperate with the authors during carrying out the study.

The authors would like to thank Eng. Ahmed Yousef, head of the Agricultural Directorate, Matrouh Governorate and all the employees for providing the data and information needed for the study.

Declaration:

The views expressed in this study are those of the authors and do not necessarily represent the views or policies of the AOAD. The AOAD and CEDARE are jointly supported through a cooperative agreement.

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Executive summary

The present work is a desk study. It is a part of implementing the activities of the UNEP-GEF funded project "Healthy Ecosystems for Rangeland Development (HERD): sustainable rangeland management strategies and practices". The project is executed by the International Union for the Conservation of Nature (IUCN), through its Regional Office in West Asia (ROWA) with partners in Egypt the Desert Research Centre (DRC) and the Centre for Environment and Development for the Arab Region and Europe (CEDARE).

The project's main purpose is to promote the restoration of degraded rangeland ecosystems and the revival of sustainable herding practices. With the main goal of developing and protecting the rangelands through sustainable pastoral management. The project activities in Egypt are carried out at two sites located in Matrouh governorate, Site 1 (Abou Mazhoud) locate at two districts; Barrani and El-Negila. While, site 2 (Al-Gaaween) locate at Marsa Matrouh district.

This study will contribute to the outcome of good practices and effective policies in sustainable rangeland management and rangeland rehabilitation identified and prioritized for implementation.

The purpose of the study is to provide an in-depth review and analysis of the policy of agriculture, water, wildlife, land, and governance. They will also include over-arching government strategies, including National Action Programs to Combat

desertification, National Adaptation Plans of Action, National Biodiversity Action Plans, and sector-specific plans.

The study depends on the information represented in the governmental agencies, economic statistical and social studies related to the field of the present study and in line with its objectives. Furthermore, it depended mainly on the information gathered, with the help of stakeholders' questionnaire, which was in harmony with the study objective, (related to biological diversity and intervention with conservation and sustainable utilization of genetic resources), from studied samples and communities. It depended also on personal meetings with various stakeholders. Several meetings with the research staff and traders were of quite gain in drawing the outlines of the study and planning the final policy options.

To achieve the main target of the study, the regional and international agreements, treaties and protocols related to SRM and LDN have been studied to easily establish this development strategic plan for rangeland restoration , management and development in line and compatible with them. Studied materials such as International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA), Convention on Biological Diversity (CBD), Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization to the Convention on Biological Diversity, United Nations Convention to combat desertification (UNCCD), United Nations Framework Convention on Climate Change (UNFCC), Sustainable Development Goals (SDGs) and The Aichi Biodiversity Targets.

In parallel with studying the regional and international agreements, treaties, and protocols related to SRM and LDN, the national policy,

legislation, and regulation related to SRM and LDN have been addressed. Which will help to specify the current situation and baseline accurately at the national level. The Egyptian Constitution (2014) contains some articles concerning the conservation of biological diversity and natural resources in Egypt (articles, 29, 32, 44, and 46).Relevant national Laws, agencies, and authorities also related to management and conservation of biodiversity and natural resources of Egypt.

Based on the study of baseline (Rizk et al., 2020) and the current situation hereinabove, unfortunately, there are no specific legislation, strategy and action plans concern specifically to the sustainable management of the rangeland in the national, governorate or locations levels, but there are different articles of national legislations and regulations that deal directly with livestock, animals, feed, veterinary animal health and welfare, land ownership as well as agriculture. Most of the rangeland-use practices are subjected to the customary law (URFعرف). It is a set of articles prepared by the tribes. The URF law regulates the individual behaviours within and among groups, these rules governing those behaviours. Also, it concerns with the provisions that are taken against individuals in the event of behaviour that violates the group's security.

The main economic activity in the study area community is livestock production under the agro-pastoral production system. The free forage from the rangeland plays a paramount factor in the feeding cost of the animals. The vegetation cover of the study area in

summer is very poor, while in winter and spring seasons the wild plant cover is moderately dense. The density of vegetation in the study areas response to rainfall quantity and magnitude. The vegetation cover fluctuates from year to year. The density, frequency, and plant cover of annual species are highly affected by the rate of precipitation. The annual species are started to appear in the winter season and flowerish in the spring season (March-May). The livestock sector face many problems such as, inbreeding, un directional cross breeding programs, poor health and veterinary services, lack of a proper breeding program, shortage of available feed resources.

The grazing ecosystem exposed to different types of stresses such as overgrazing, uprooting, woodcutting, aridity, different types of human activities, and erosion of the soil surface. Moreover, aggressive grazing caused ecosystem degradation by various kinds of mismanagement of the rangeland. This includes the extensive grazing of livestock and multiple-use of the land to develop tourism especially the land near to the sea line. Agro-pastoral considers one of the main economic activities and sources of income in the study area. Crop production fluctuates according to the region and from year to year along the north-western coast as it based mainly on rainfall rate and the availability of other sources of water, mainly underground and yearly conserved water.

Rain-fed agriculture in the study area is generally risky due to the high spatial and temporal variability of the rainfall level. The productivity of cultivated rain-fed crops is affected mainly by the

amount and fluctuation of precipitation. It is expected that rainfall in Marsa Matrouh governorate will be highly reduced in 2029/2030, this will reflect negatively on livestock production, the main income source in the study area due to the shortage of free-range forage.

The extensive agro-pastoral livestock farming system is the mainstay and backbone of agriculture production in the study area. The average livestock population during the period 2007-2018 was 104767 heads represents 21.5% of the total livestock in Matrouh governorate. The livestock population shows fluctuation with a decreasing trend during the period from 2007 to 2018. The private sector (pastoralists) plays the main role in livestock production as most livestock owned by them while the governmental/public sector owns very minor numbers in limited and specific locations. Small ruminants is dominated in livestock production (more than 90%) in the study area. Sheep (68%) followed by goats (23%) are the most common species and the ratio between them varies according to the rainfall rate, size of human families and the market.

Rangeland fodder is the main feed source for the livestock in the rainfall season, grazing season usually extends from November to March. But, nowadays rangeland has been deteriorated rapidly as a result of drought, poor management, soil degradation, water scarcity, and, overgrazing. In the dry grazing period, the additional feed such as feed concentrates, wheat, barley, bran, straw, and agricultural by-products are supplied to the animals, and supplementary drinking water becomes more necessary. The livestock population raised in the study area is over the pasture

carrying capacity during the last decade. Consequently, the stocking rate has drastically increased which resulted in more grazing pressure on the rangelands.

Overgrazing is a widespread problem where the meager winter rainfall supports a scant plant cover. Overgrazing is widespread in the study area. The problem is that the pasture area is degraded and their production of forage becomes unable to cover the forage quantity needed for feeding the livestock raised on it, although the livestock number is stable or slightly decreasing. The pasture carrying capacity is decreased, which means, the amount of forage available for grazing animals is less than required feeding for grazing animals for a specific time period. The livestock population raised in the study area is over the pasture carrying capacity to produce forage during the last decade.

In order to achieve the goal of the study which aim to provide activities and proper policies and interventions for restoration of the degraded rangeland ecosystems and revival of sustainable herding practices the study start by proposing some basic developmental solutions as follow: (1) Rural reform and implement the preferential pastoralism policies., (2) Strengthen infrastructure construction and improve production capacity, (3) Strengthen scientific and technological innovation and support the development of rangeland science and technology, (4) Strengthen the training of herders and improve the scientific and cultural education of herders, (5) Encourage the development of supplementary industries and enhance the competitive advantage, (6) Resource Inventory on

Sustainable Rangeland Management, (7) A Multi-stakeholder Decision Support Tool for Optimizing Sustainable Land Management Technologies, (8) Enhancing Resilience to Climate Change in Agro-pastoral Production Systems, (9) Establishing an annual livestock-stocking parameters, (10) Efficient utilization of freshwater resources, (11) Controlling overgrazing (Grazing pressure management), and (12) Overcome feed shortage for livestock especially in the summer. The proposed solution categories for sustainable range management (SRM) includes Integration Approach, Participatory Approach, Investment Approach and Strengthen capacity.

There is an urgent need to establish an efficient development strategic plan related to SRM and LDN at the national, governorate and locations levels. First of all, it is paramount important to define a clear idea for what could supposed to achieve the target objectives, then we have to set the vision, goals and objectives of this plan. Designing a grazing action plan is the first step in the SRM. The grazing plan should include all the components of the grazing and range system and serve as a road map for making management improvements.

Besides the establishment of the development strategic plan, a proposed legislative of sustainable rangeland management is required in order to the brevity and focus on the problems and solves and the consequences of not acting on it (Adherence to the principle of rights and duties). The proposed legislation must integrate and line with other national legislations as well as the religious value, custom law, and traditional values & heritages practices of the local

community as well as taking into account the regional and international obligations in the context. The legislation shall promote the sustainable utilization and development of rangeland. The new proposed legislation of sustainable rangeland management must address the following:

- Sustainable management of rangeland.
- Integrating rangeland resources into protected areas legislation.
- Establish customary law council to protect the rights of communities and pastoral community's indigenous knowledge.
- Protect Intellectual property rights over wild and cultivated material of rangeland.
- Regulate access and benefit-sharing to Genetic resources.
- Provide incentives to herders to maintain biodiversity, environmental system and promote production.

In line of sustainability, herders, breeders and producers need to congregate into larger bodies for a better business organization. Also, public awareness is key gap that needs to be covered.

Proposed solutions

- Establish a local entity of all rangeland stakeholders (union or association) to protect the legal rights of the region/community over their rangeland resources.
- Grant full authority for local government councils and/communities to manage and conserve their rangeland.
- Setup a platform (NGO) to ensure full participation of all herders' stakeholders towards sustainability of rangelands.

- Establishment of a national registry for herders' resources.
- Support activities to document traditional knowledge.
- Needs to a public awareness campaign about rangeland topics.
- Establishment of pilot protected and controlled grazing areas in each of the main habitats and communities to determine the optimum livestock load.
- Initiation of a cooperative system for grazing management among the main social sectors (tribes), mainly to arrange the grazing activity and determine the optimum livestock load for each area all around the year.
- Formation of an extensive program for the propagation and seed production especially for the grazing species threatened by extinction.
- Initiate program for the propagation of multipurpose species in the study area and establishment of nurseries for propagation as well as demonstration of field experiments.

Rangelands produce a wide variety of desired goods and services. The geographic extent and important valuable renewable resources of rangelands make their proper use and efficient management vitally important to people everywhere, especially in the fragile ecosystems/communities, such as in the study area. It is very important to take all possible actions and interventions by all stakeholders in a participatory and Integration approach to be able to maintain healthy ecosystems for rangeland development in the target areas or at the national level.

Symbols, acronyms and abbreviations.

- ABS Access & Benefit Sharing
- AIS Alien Invasive Species
- ARC Agricultural Research Centre
- CBD Convention Biological Diversity
- DRC Desert Research Centre
- EEAA Egyptian Environmental Affairs Agency
- EP Egyptian Parliament
- FCRI Field Crop Research Institute.
- FRD Fodder Research Department.
- LDN Land Degradation Neutrality.
- MALR Ministry of Agriculture and Land Reclamation
- MoE Ministry of Environment
- NBSAP National Biodiversity Strategy and Action Plan
- NCS Nature Conservation Sector
- NSSD National Strategy for Sustainable Development
- PAA Protected Areas Authority.
- PAs Protected Areas
- PGR Plant Genetic Resources.
- SDGs Sustainable Development Goals
- SLM Sustainable land management
- SRM Sustainable Rangeland Management.
- UN United Nations

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Methodology

Data collection

The study depends on the information obtained from the governmental agencies, economic statistical and social studies related to the scope of the study and in line with its objectives. In addition, it depended mainly on the information gathered, with the help of stakeholders' questionnaire, which was in harmony with the study objective, (related to biological diversity and intervention with conservation and sustainable utilization of rangeland resources), from studied samples and communities. It depends on personal meetings with various stakeholders. Several meetings with researchers' staff, traders, herders are of quite gain in drawing the outlines of the study and planning the final policy options.

Intervention identification

It is interesting to note, during planning of the questionnaire that it is being possible to determine the intervention effect of grazing policies and developmental activities on sustainable rangeland management (SRM) at Matrouh governorate. The identification of the intervention nature of different influences and roles which could clarify the participation of each, government (policies & laws), research centers, extension, nongovernmental agencies and others on SRM. The target stakeholders that represent the community under study are divided into:

1. The governmental sector (Governor of Matrouh & vice Governor);
2. Local administration (Agriculture Administration);
3. Researchers (Desert Research Centre "DRC", Agricultural Research Centre "ARC", Animal Production Research Institute "APRI"), Ecology and Range Management Department, DRC);

4. Non-Governmental Organization (Barky Sheep Association, Association of Ramsa and etc.,);
5. Community leaders (Parliament representatives);
6. Traders (Sheep market), and
7. Herders of the two target areas.

PHOTO 1: MEETING WITH RESEARCHERS OF APRI TO DISCUSS AND GET THEIR FEEDBACK REGARDING THE PROPOSED INTERVENTIONS IN THE STUDY AREA, SINCE THEY HAVE WORKED IN THE STUDY AREA FOR MANY YEARS.

PHOTO 2: MEETING WITH FEED TRADERS AND LIVESTOCK KEEPERS AT THE LIVESTOCK MARKET TO GET THEIR OPINIONS REGARDING THE CURRENT SITUATION AND PROPOSED INTERVENTIONS.

PHOTO 3: LIVESTOCK MARKET AT MATROUH DISTRICT.

PHOTO 4: NGO (BARKY SHEEP ASSOCIATION)

PHOTO 5: MEETING WITH NGO (HEAD OF ASSOCIATION OF RAMSAH) AND COMMUNITY LEADER CONCERNING TO DISCUSS THE PROPOSED POLICIES AND INTERVENTION TO PROMOTE AND ENHANCE THE LOCAL COMMUNITY IN THE STUDY AREA.

Methodology module

The methodology used in this study has four phases:

1. The current baseline information;
2. Policy analysis;
3. Policy formulation and;
4. Policy iteration & legal drafting.

This used methodology module could apply on the generation of new policies or laws; alternatively, it could also be applied on the context of evaluating existing policies and legislation to identify possible gaps, administrative burdens and transaction costs, in general, could negatively affect implementation.

Introduction

Nearly all our needs; food, medicine, feeds, water, wood / wood fuel, shelter and other products come from the land and renewable resources . The question is: will these lands and resources be able to sustainably support the growing population in the world?

Human needs, development and environmental sustainability are highly interlinked and threatened by the major anthropogenic-driven environmental challenges of our time. Direct human interaction with the natural environment, especially in the domain of socio-ecological systems, are complex and happen at multiple scales. These scales range from the local landowners, and Local and national land-use planning, to the global demand, supply of services and trade patterns. It is important to enhance our understanding of the interlinkages between climate change, land degradation and biodiversity loss to improve the capacity to respond to these challenges.

Sustainable land management (SLM) defined at the Rio Earth Summit in 1992 as “the use of land resources, including soils, water, animals and plants, for the production of goods to meet changing human needs, while simultaneously ensuring the long-term productive potential of these resources and the maintenance of their environmental functions”. Sustainable Land Management (SLM) is the obvious solution that equips us with the tools to respond to the most pressing environmental issues. SLM helps to build resilient and productive ecosystems by integrating biophysical, socio-cultural and economic needs and values, and forms one of the main mechanisms to achieve Land Degradation Neutrality (LDN). SLM provides opportunities to recover tens of Gt of the lost carbon in the

world's agricultural and degraded soils, while enhancing land-based climate change adaptation (Sanz et al., 2017).

Range management is characterized as "the manipulation of rangeland components to obtain the optimum combination of goods and services for society on a sustained basis" (Holechek *et al.* 2011), which further notes that sustainable rangeland management must consider the integration of environmental, economic and social values.

The Sustainable Development Goals (SDGs) are rallying the global community around an ambitious goal to end/eradicate extreme poverty and hunger. The second of the 17 SDGs adopted by United Nations (UN) member states in 2016, is to "end hunger, achieve food security and improved nutrition, and promote sustainable agriculture," with specific targets to achieve this by 2030.

Significant and interrelated investments in climate change adaptation, health, education, infrastructure and other areas are all necessary for the global effort to end hunger. The rising global temperatures associated with climate change are expected to have negative impacts on both terrestrial and aquatic food production (IPCC, 2018), deepening the food security challenges of the most vulnerable populations and intensifying competition for land use across sectors of the economy.

Indeed, scientists, policymakers and other stakeholders are increasingly recognizing the need to identify and pursue synergies among national, regional and global change issues. Policymakers can play a crucial role in creating the necessary conditions for large-scale implementation of effective sustainable rangeland management (SRM). This could include making use of policy

instruments to incentivise SRM adoption and collaborating with land users and other relevant stakeholders to develop SRM initiatives that are adapted to the local context, bring tangible and long-term benefits, and align with national priorities.

The objective of this study addresses the potential for Sustainable Rangeland Management (SRM) practices through a review of existing policy/policies, laws and legislation including relevant national, regional, international agreements and identifying barriers and opportunities of the policy implementation process.

The work will focus on probing the extent to which the Governorate of Matrouh may be interested in technical assistance for the development of its first rangeland management strategy, piloting this kind of initiative along with the country. Other activities may focus on the review of the implementation of the Rangeland Strategy.

This activity will also contribute to the outcome of good practices and effective policies for sustainable rangeland management and rangeland rehabilitation identified and prioritized for implementation.

Policy domains will include agriculture, water, forest, wildlife, land, and governance. They will also include over-arching government strategies, including National Action Programs to Combat desertification, National Adaptation Plans of Action, National Biodiversity Action Plans, and sector-specific plans.

PART I: THE CURRENT BASELINE INFORMATION.

Overview

In order to refine the overall purpose and its component concerning SRM policy, the basic information about the current situation in the field of sustainable Rangeland Management should review. This information includes social, cultural, economic, scientific, political and legal data and information on the ground that provides the basis for making informed decisions in a particular community or region. It is the qualitative and quantitative information that should form the basis of the government's decision to venture into the SRM development process in the first place.

Regional and international policy and legislations related to SRM and LDN.

1. International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA).

The Contracting Parties acknowledge the enormous contribution that indigenous and local communities and farmers have made and still making for the maintenance and development of plant genetic resources that constitute the basis of food and agricultural production worldwide. The Contracting Parties recognized the protection of farmers' rights. Egypt ratified ITPGRFA in 31/3/2004.

1.1. Objectives

The objectives of this treaty are the conservation and sustainable use of plant genetic resources for food and agriculture and the fair and equitable sharing of the benefits arising out of their use, in harmony with the convention on biological diversity, aiming sustainable agriculture and food security.

1.2. Scope

This treaty relates to plant genetic resources for food and agriculture listed in the annex-1 of the treaty.

Egypt as well as the target study area contains number of PGRFA of anix-1.

1.3. General Obligations

Each Contracting Party shall ensure the conformity of its laws, regulations and procedures with their obligations provided in this Treaty.

1.4. Sustainable Use of Plant Genetic Resources

The Contracting Parties shall develop and maintain the appropriate policy and legal measures that promote the sustainable use of plant genetic resources for food and agriculture.

The sustainable use of plant genetic resources for food and agriculture may include a pursuing fair agricultural policies that promote, as appropriate, the development and maintenance of diverse farming systems that enhance the sustainable use of agricultural biological diversity and other natural resources.

1.5. National Commitments and International Cooperation

Each Contracting Party shall, as appropriate, integrate into their agriculture and rural development policies and programmes of conservation and sustainable use of plant genetic resources through cooperation with other Contracting Parties, directly or through FAO and other relevant international organizations.

2. Convention on Biological Diversity.

The Convention concerned with the conservation of biological diversity in a sustainable manner. The importance of maintaining and using biological diversity in a sustainable manner to meet

the needs of food, medicine, housing, clothing, and providing a healthy environment and other needs for the ever-increasing world population and its benefits to the present and future generations is evident. The access to genetic resources is essential to achieve CBD purposes. The maintenance and sustainable use of biological diversity would enhance local, national, regional and international cooperation among states, intergovernmental organizations and the non-governmental sector.

Egypt ratified CBD in 31/08/1994. The Ministry of Environment have produced national country reports under the CBD and Egyptian biodiversity strategy and action plan (2015 – 2030) – (NBSAP). NBSAPs adopted as Egyptian policy instrument for biodiversity and environment.

2.1. Objectives

The objectives of CBD are the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources, including appropriate access to genetic resources.

2.2. Principle

States have the sovereign rights to exploit their own resources pursuant to their own environmental policies, and the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or areas beyond the limits of national jurisdiction.

2.3. General obligation

The CBD has many obligations among which:

- Developing appropriate legislating regulations and harmonizing existing relevant legislation to be in line with the CBD.
- Develop national strategies, plans, or programmes for the conservation and sustainable use of biological diversity.
- Integrate, as far as possible and as appropriate, the conservation and sustainable use of biological diversity into relevant sectoral or cross-sectoral plans, programmes and policies.
- Introduce appropriate procedures requiring an environmental impact assessment of its proposed projects that are likely to have significant adverse effects on biological diversity with a view to avoiding or minimizing such effects.
- Introduce appropriate arrangements to ensure that the environmental consequences of their programmes and policies likely have significant adverse impacts on biological diversity are duly taken into account.

3. Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization to the Convention on Biological Diversity.

Egypt ratified Nagoya Protocol in 12/10/2014.

3.1. OBJECTIVE

The objective of this Protocol is the fair and equitable sharing of the benefits arising from the utilization of genetic resources, included by the appropriate access to genetic resources and appropriate transfer of relevant technologies, taking into account all rights over those resources and technologies, and by appropriate funding, thereby contributing to the conservation of biological diversity and the sustainable use of their components.

3.2. SCOPE

This Protocol shall apply on genetic resources within the scope of Article 15 of the Convention and to the benefits arising from the utilization of such resources. This Protocol shall also apply on traditional knowledge associated with genetic resources within the scope of the Convention and to the benefits arising from the utilization of such knowledge.

3.3. ACCESS TO GENETIC RESOURCES

In accordance with domestic law, each Party shall take measures, as appropriate, with the aim of ensuring that the prior informed consent or approval and involvement of indigenous and local communities are obtained for access to genetic resources where they have the established rights to grant access to such resources.

3.4. CONTRIBUTION TO CONSERVATION AND SUSTAINABLE USE

The Parties shall encourage users and providers to direct benefit from the utilization of genetic resources towards the conservation of biological diversity and the sustainable use of its components.

3.5. TRADITIONAL KNOWLEDGE ASSOCIATED WITH GENETIC RESOURCES

Parties shall, in accordance with domestic law, take into consideration the indigenous and local communities' customary laws, community protocols and procedures, as applicable, with respect to traditional knowledge associated with genetic resources.

3.6. ACCESS TO TRADITIONAL KNOWLEDGE ASSOCIATED WITH GENETIC RESOURCES

In accordance with domestic law, each Party shall apply measures, as appropriate, with the aim of ensuring that traditional knowledge, associated with genetic resources, and held by indigenous and local communities, are accessed with the prior and informed consent, approval and involvement of indigenous and local communities, besides mutual agree with terms have been established.

4. UNITED NATIONS CONVENTION TO COMBAT DESERTIFICATION

4.1. Objectives

The objective of this Convention is to combat desertification and mitigate the effects of drought on the framework of an integrated approach, with a view contribute to the achievement of sustainable development in affected areas.

Achieving this objective will involve long-term integrated strategies that focus simultaneously on improved productivity of land, rehabilitation, conservation and sustainable management of land and water resources.

4.2. Priority

The Convention shall give priority to the affected African Country Parties, in the light of the particular situation prevailing in that region, while not neglecting affected developing countries Parties in other regions.

4.3. Obligation

The most important obligation of the parties is to formulate, make public, utilizing and implement a national action programs as a central element of the strategy to combat desertification and mitigate the effects of drought. Such programmes will update through a continuing participatory process based on lessons from field action, as well as the results of research. The preparation of national action programs will closely interlink with other efforts to formulate national policies for sustainable development. National action programs will specify the respective roles of government, local communities and land users and the resources available and needed. They will incorporate long-term strategies to combat desertification and mitigate the effects of drought, emphasize implementation and integration with national policies for sustainable development. It must be sufficiently flexible at the local level to cope with different socio-economic, biological and geo-physical conditions.

To promote policies and strengthen institutional frameworks which develop cooperation and coordination, in a spirit of partnership, among the donor community, governments at all levels, local populations and community groups, and facilitate access by local populations to appropriate information and technology. It provides for effective participation at the local, national and regional levels of non-governmental organizations

and local populations, both women and men, particularly resource users, including farmers and pastoralists and their representative organizations, in policy planning, decision-making, and implementation and review of national action programmes.

5. United Nations Framework Convention on Climate Change

The United Nations Framework Convention on Climate Change (UNFCCC) is an international environmental treaty adopted at 9 May 1992 and opened for signature at the Earth Summit in Rio de Janeiro from 3 to 14 June 1992. It then entered into force at 21 March 1994. UNFCCC is a change of climate, which attributes directly or indirectly to human activities, that alters the composition of the global atmosphere, and which is an addition to natural climate variability over comparable periods.

5.1. Objectives

The UNFCCC objective is to "stabilize greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system". The framework sets non-binding limits on greenhouse gas emissions for individual countries and contains no enforcement mechanisms. Instead, the framework outlines how specific international treaties (called "protocols" or "Agreements") may be negotiated to specify further action towards the objective of the UNFCCC (Kyoto Protocol, Paris Agreement).

5.2. Obligations

Article 3(1) of the Convention states that Parties should act to protect the climate system based on "common but differentiated

responsibilities and respective capabilities", and that developed country Parties should "take the lead" in addressing climate change. Under Article 4, all Parties make general commitments to address climate change through, for example, climate change mitigation and adaptation to the eventual impacts of climate change.

6. Sustainable Development Goals.

The 2030 Agenda for Sustainable Development, adopted by all United Nations Member States in 2015, provides a shared blueprint for peace and prosperity for people and the planet, now and into the future. At its heart are the 17 Sustainable Development Goals (SDGs), which are an urgent call for action by all countries - developed and developing - in a global partnership. They recognize that eradicating extreme poverty and hunger and other deprivations must go hand-in-hand with strategies that improve health and education, reduce inequality, and spur economic growth – all while tackling climate change and working to preserve our oceans and forests.

- Goal 1. End poverty in all its forms everywhere.
- Goal 2. End hunger, achieve food security and improve nutrition and promote sustainable agriculture.
- Goal 3. Ensure healthy lives and promote well-being for all at all ages.
- Goal 4. Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.
- Goal 5. Achieve gender equality and empower all women and girls.

- Goal 6. Ensure availability and sustainable management of water and sanitation for all.
- Goal 7. Ensure access to affordable, reliable, sustainable and modern energy for all.
- Goal 8. Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.
- Goal 9. Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation.
- Goal 10. Reduce inequality within and among countries
- Goal 11. Make cities and human settlements inclusive, safe, resilient and sustainable
- Goal 12. Ensure sustainable consumption and production patterns
- Goal 13. Take urgent action to combat climate change and its impacts*
- Goal 14. Conserve and sustainably use the oceans, seas and marine resources for sustainable development
- Goal 15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss
- Goal 16. Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels
- Goal 17. Strengthen the means of implementation and revitalize the global partnership for sustainable development

7. The Aichi Biodiversity Targets

7.1. Vision

"By 2050, biodiversity is valued, conserved, restored and wisely used, maintaining ecosystem services, sustaining a healthy planet and delivering benefits essential for all people."

7.2. Mission

"Take effective and urgent action to halt the loss of biodiversity in order to ensure that by 2020 ecosystems are resilient and continue to provide essential services, thereby securing the planet's variety of life, and contributing to human well-being, and poverty eradication. What ensure this are, pressures on biodiversity reduced, ecosystems restored, biological resources sustainably used and benefits arising out of the utilization of genetic resources are shared in a fair and equitable manner; adequate financial resources provided, capacities enhanced, biodiversity issues and values mainstreamed, appropriate policies are effectively implemented, and decision-making is based on sound science and the precautionary approach."

7.3. **Strategic Goals and targets**

Strategic Goal A: Address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society

Target 1: By 2020, at the latest, people are aware of the values

of biodiversity and the steps they can take to conserve and use it sustainably.

Target 2: By 2020, at the latest, biodiversity values have been integrated into national and local development and poverty reduction strategies and planning processes and are being incorporated into national accounting, as appropriate, and reporting systems.

Target 3: By 2020, at the latest, incentives, including subsidies, harmful to biodiversity are eliminated, phased out or reformed in order to minimize or avoid negative impacts, and positive incentives for the conservation and sustainable use of biodiversity are developed and applied, consistently and in harmony with the Convention and other relevant international obligations, taking into account national socio economic conditions.

Target 4: By 2020, at the latest, Governments, business and stakeholders at all levels have taken steps to achieve or have implemented plans for sustainable production and consumption and have kept the impacts of the use of natural resources well within safe ecological limits.

Strategic Goal B: Reduce the direct pressures on biodiversity and promote sustainable use

Target 5: By 2020, the rate of loss of all natural habitats, including forests, is at least halved and where feasible brought close to zero, and degradation and fragmentation are significantly reduced.

Target 6: By 2020 all fish and invertebrate stocks and aquatic plants are managed and harvested sustainably, legally and applying ecosystem based approaches, so that overfishing is

avoided, recovery plans and measures are in place for all depleted species, fisheries have no significant adverse impacts on threatened species and vulnerable ecosystems and the impacts of fisheries on stocks, species and ecosystems are within safe ecological limits.

Target 7: By 2020 areas under agriculture, aquaculture and forestry are managed sustainably, ensuring conservation of biodiversity.

Target 8: By 2020, pollution, included from excess nutrients, has been brought to levels not detrimental to ecosystem function and biodiversity.

Target 9: By 2020, invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment.

Target 10: By 2015, the multiple anthropogenic pressures on coral reefs, and other vulnerable ecosystems impacted by climate change or ocean acidification are minimized, so as to maintain their integrity and functioning.

Strategic Goal C: Improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity.

Target 11: By 2020, at least 17 per cent of terrestrial and inland water, and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effective and equitable management, ecologically representative and well connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscape and seascapes.

Target 12: By 2020 the extinction of known threatened species has been prevented and their conservation status, particularly of those most in decline, has been improved and sustained.

Target 13: By 2020, the genetic diversity of cultivated plants and farmed and domesticated animals and of wild relatives, including other socio-economically as well as culturally valuable species, are maintained, and strategies have been developed and implemented for minimizing genetic erosion and safeguarding their genetic diversity.

Strategic Goal D: Enhance the benefits to all from biodiversity and ecosystem services.

Target 14: By 2020, ecosystems that provide essential services, including services related to water, and contribute to health, livelihoods and well-being, are restored and safeguarded, taking into account the needs of women, indigenous and local communities, the poor and vulnerable.

Target 15: By 2020, ecosystem resilience and the contribution of biodiversity to carbon stocks has been enhanced, through conservation and restoration, including restoration of at least 15 per cent of degraded ecosystems, thereby contributing to climate change mitigation and adaptation and to combating desertification.

Target 16: By 2015, the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their utilization are in force and operationally consistent with national legislation.

Strategic Goal E: Enhance implementation through participatory planning, knowledge management and capacity building

Target 17: By 2015 each Party has developed and adopted as a policy instrument, and has commenced implementation of an effective, participatory and updated national biodiversity strategy and action plan.

Target 18: By 2020, the traditional knowledge, innovations and practices of indigenous and local communities relevant to the conservation and sustainable use of biodiversity, and their customary use of biological resources, are respected, subject to national legislation and relevant international obligations, and fully integrated and reflected in the implementation of the Convention with the full and effective participation of indigenous and local communities, at all relevant levels.

Target 19: By 2020, knowledge, the science base and technologies relating to biodiversity, its values, functioning, status and trends, and the consequences of their loss, are improved, widely shared, transferred, and applied.

Target 20: By 2020, at the latest, the mobilization of financial resources to effectively implement the Strategic Plan 2011-2020 from all sources and in accordance with the consolidated and agreed process on the Strategy for Resource Mobilization should increase substantially over the current levels. This target will subject to changes contingent to resources needs assessments to be developed and reported by Parties.

National policy, legislation and regulation related to SRM and LDN.

The Egyptian Constitution

The Egyptian Constitution (2014) contains some articles concern with the conservation of biological diversity and natural resources in Egypt;

- **Article (29)** calls for the protection of agricultural lands from infringement.
- **Article (32)** Preserving the natural resources of the State and making good use thereof, and taking into account the rights of the next generations.
- **Article (44)** Protection and sustainable use of the river Nile and Groundwater.
- **Article (46)** for a healthy environment and the rational use of natural resources to achieve sustainable development.

Based on the articles mentioned above for the Egyptian Constitution, several relevant national Laws, Agencies, and authorities related to management and conservation of biodiversity and natural resources of Egypt have either amended their own laws or drafted new ones to be more effective on management and conservation procedures, taking into account the political, civil and socio-economic situation. Yet, examples include the executive regulations of the environmental law, is the protected areas law that includes the establishment of the Protected Areas Authority (PAA). In addition, a number of new laws are being considered by the Egyptian Parliament such as the biosafety and the Access and benefit sharing acts of plant genetic resources (PGR).

National Strategy for Sustainable Development

The National Strategy for Sustainable Development (NSSD) is being updated where environment as well as biodiversity are the main cross cutting sectors. The twenty national targets of NSSD related to RSM are as follow:

- **NATIONAL TARGET 1:** By 2030, protected areas (PAs) network secured and expanded to cover 17% of total terrestrial and inland water and at least 5% of coastal and marine representative areas, especially priority sites of particular importance for biodiversity and key ecological processes, and Effective management of PAs.
- **NATIONAL TARGET 2**: By 2020, develop and implement unified Egyptian methodology for the identification and monitoring of priority of all components of biodiversity according to the international standards to ensure the maintenance or rehabilitation of 50% of our most threatened species focusing on mammals and reptiles to a favorable conservation status.
- **NATIONAL TARGET 3:** By 2030, National conservation and rehabilitation programmes of threatened and endemic species at risk are developed and implemented with measures to evaluate its implementation.
- **NATIONAL TARGET 4**: By 2030, all IAS and pathways are identified and prioritized with measures in place to update and

verify these pathways, with national programmes for 30% of identified pathways to control and manage IAS.

- **NATIONAL TARGET 5:** By 2020, Conservation of natural resources through the adoption of ecologically sustainable agricultural management practices.
- **NATIONAL TARGET 6**: By 2018, apply CBD tools to monitor and control the impact of tourism on biodiversity, particularly in protected areas and vulnerable ecosystems.
- **NATIONAL TARGET 7**: By 2020, measures, including waste management plans and law enforcement, are in place to prevent and reduce the impact of pollution and waste on ecosystems, especially on wetlands and coastal and marine areas.
- **NATIONAL TARGET 8:** By 2025, negative effects of different sectoral policies (land-use planning, transport, energy, uncontrolled urbanization, etc.) on priority elements of biodiversity are minimized, and measures to correct these effects are applied through developing and implementing land use plans.
- **NATIONAL TARGET 9:** By 2021 rate of wetland loss reduced by 25% and water efficiency in irrigation improved by 50%.
- **NATIONAL TARGET 10**: By 2027, promote the implementation of good fishing practices in both Mediterranean Sea and Red Sea, favourable to fish protection and their habitats.
- **NATIONAL TARGET 11**: By 2020, Effective operational biosafety and ABS mechanism (measures and legislation) in

place, in accordance with national laws and relevant international obligations and serving as national priorities relating to biodiversity.

- **NATIONAL TARGET 12**: By 2020, to promote sustainable hunting and harvesting through adequate planning, restoration and protection of key biological resources.
- **NATIONAL TARGET 13:** By 2030, Research and implement measures and strategies to strengthen local-level biodiversity resilience to desertification.
- **NATIONAL TARGET 14:** By 2025, investigate and monitor all the effects of climate change on biodiversity and ecosystem services.
- **NATIONAL TARGET 15:** By 2020, the knowledge, the science base and technologies relating to biodiversity, its values, functioning, status and trends, and the consequences of its loss, are improved, widely shared, transferred, and applied.
- **NATIONAL TARGET 16**: By 2020, enhancing environmental awareness of Egyptians to the importance of biodiversity and ecosystem services through integrating environmental themes into university and school curricula, promoting green media, and supporting youth clubs and eco-industry.
- **NATIONAL TARGET 17**: By2018, biodiversity values are promoted and integrated into national planning process and mechanisms to support their incorporation into national accounting and reporting systems to be developed.

- **NATIONAL TARGET 18**: By 2018, ensure that the national strategy is supported by effective legislation and institutional frameworks to improve its enforcement.
- **NATIONAL TARGET 19**: By 2017, proper NBSAP and associated resource mobilization are in place, in addition to establishment of the national biodiversity committee to ensure periodic evaluation of NBSAP.
- **NATIONAL TARGET 20:** By 2020, adequate financial resources for the effective implementation of the Strategic Plan for Biodiversity 2011-2020 has been mobilized of from all sources and increased substantially from the current levels.

The Egyptian legislations and regulations

Nowadays, there are several approved laws that have articles concerning protected areas and rehabilitation of wild life either on earth or oceans and other laws have been amended to be more fit, such as the law of protection of the environment and others, while other new laws that are considered by the Egyptian Parliament (EP) such as the establishment of Protected Areas Authority, Biosafety and ABS Laws. Unfortunately, there are no legislation, strategy and action plans concerning to sustainable management of rangeland but there are different articles of national legislations and regulations that deal directly with livestock, feed, animal health and welfare, land ownership as well as agriculture and grazing as such:

- Ban of the slaughter of male buffalo calves less than the live weight decreed by the Minister of Agriculture except in situations decided by the local veterinary authorities.

- The Minister of Agriculture is authorized to regulate export/import of all livestock animals and poultry and has the authority to ban imports in order to safeguard the livestock and poultry industry.
- The Minister of Agriculture is authorized to decide if all or some animals must be recorded in areas deemed necessary by him/her, if animals have to be obligatory treated/vaccinated regularly and facilities Disinfection (at no cost to producers) and if animals have to be quarantined where the cost of feeding is borne out by the owner.
- All livestock owners and carers must report any disease to the nearest veterinary services unit.
- Animals with infectious or epidemic diseases cannot be traded or transported from one location to another.
- Slaughtering outside official slaughterhouse is not allowed in localities where there is such facility.

1. Animals

- Law 53/1966 - the Agriculture Law

ARTICLE 134: Animals imported for the purposes of slaughtering.

Imported animals for the purposes of slaughtering shall be slaughtered within thirty days from the date of consigning them to the veterinary quarantine. No duties shall be payable for consigning these animals, during the said period.

The Minister of Industry, in agreement and conjunction with the Minister of Supply and Internal Trade shall have the authority of issuing a decree extending this period for consignment to such quarantines as will be defined by him.

The owner of the livestock animals at the quarantine site has to feed them during the period of their consignment to quarantines. If the owner failed to do so, the Ministry of Agriculture may then feed them with expenses at his cost, according to the prices and rules to be specified by the Minister. ARTICLE148: Whoever violates the First Clause of article 134 shall be liable to punishment with a fine of ONE POUND for each head of cattle, and two hundred milliemmes per head of sheep or goat.

ARTICLE 143 bis, A person who in violation of the provisions of article 109 and article 136, and such decrees as are issued in implementation thereof, slaughters of un-imported pregnant females, or cows and female buffaloes and sheep., unless their weight or growth reaches the limits determined by the Minister of Agriculture, shall be liable to punishment with imprisonment for a period of not less than two years and not exceeding FIVE YEARS, and a fine of not less than FIVE HUNDRED POUNDS and not EXCEEDING ONE THOUSAND POUNDS, or either penalty

He shall also be liable in respect of each other violation of the provisions of article 109 and article 136, and such decrees as are issued for their implementation to punishment with imprisonment for a period of not less than SIX MONTHS and not exceeding ONE YEAR, and a fine of not less than TWO HUNDRED POUNDS and not exceeding FIVE HUNDRED POUNDS, or either penalty. These penalties shall be multiplied in case of recurrence.

In all the cases prescribed in the two previous clauses As added by law 154/80 then amended by law 207/80 a Court sentence shall be passed confiscating the items subject of the violation, for account of the Ministry of Agriculture, and closing down the trade

store caught slaughtering or selling meat in violation of the foregoing. Closing down the store shall be for a period of three months, as a penalty for the first time, and then finally for a recurrent case. The penalty prescribed in the second clause of this article shall be inflicted on each of the following:

A) Whoever prevents an investigating officer from having access to slaughterhouses or any places where slaughtering the animals takes place, or meat is sold or stored, or the locations used for flaying, maintaining and storing raw hides.

B) Whoever refrains from submitting the registers, documents or papers he is required to produce, or gives incorrect information while he is aware of all he is doing.

C) Whoever violates the provisions of item (A) of article 137 or article 138 and such decrees as are issued for their implementation.

2. Slaughter

Under the Agricultural Law (1966) it is prohibited to slaughter male cattle under two years of age unless they reach the weight requirements as prescribed by the Ministry of Agriculture. It is also prohibited to slaughter female cows, buffaloes and sheep unless they have already been replaced within a herd.

Decree No. 33 of 1967 details procedures regarding the slaughter of diseased animals.

Resolution No. 1225 (2010) relates to the establishment of slaughterhouses.

3. Veterinary quarantine

Law 53/1966 - the Agriculture Law regulate the VETERINARY QUARANTINE as follows:

ARTICLE 133: Imported animals, their meat, products, or wastes shall not be authorized to enter the country except after fulfilling veterinary quarantine procedures to ascertain they are free of contagious epidemic diseases. Those found to enter in violation of the provisions of this article shall be seized, and shall be destroyed if found infected with contagious or epidemic diseases, providing that the disease is established by a certificate from the concerned veterinarian.

4. Fodder

Law 53/1966 - the Agriculture Law regulate the fodder in chapter 2 as follows:

ARTICLE 110: In applying the provisions of the present Chapter, FODDER Raw Materials shall mean oil-cake or any materials used - without being blended with a mixture in feeding animals or poultry, whether they originate from a botanical or animal source, or mineral substances, vitamins and anti-biotics. PROCESSED FODDER shall mean a fodder blended from and with raw fodder materials.

ARTICLE 111:

A COMMITTEE by the name of ANIMAL FODDER COMMITTEE, shall be formed at the Ministry of Agriculture. The formation of the COMMITTEE and the system of work in it shall be issued by a decree of the Ministry of Agriculture

This Committee will concern with suggesting the kinds of fodder to be circulated, and determining their specifications and registration procedures as well as the conditions for their circulation. The

Committee shall also express its view with regard to decrees issued in the implementation of the present Chapter articles.

ARTICLE 112:

The Minister of Agriculture shall issue decrees in the following matters :

(A) Determining the substances and specifications of raw and processed fodder, and the conditions for baling and packaging processed fodder.

(B) Procedures of licences for trading in fodder materials and conditions for obtaining the licenses, as well as the fees payable therefor.

(C) Regulating and re-organizing the sale of processed and raw fodder, and their circulation and transfer from one place to another, as well as the distribution of fodder by cards to be prepared for this purpose.

(D) Conditions for the registration of processed fodder and its compounds and materials, and the renewal of its registration, as well as determining the fees and duties payable therefor.

(E) Re-organizing control on fodder factories, and trading stores, and determining the registers to be held as well as the method of entry in such registers.

(F) Method of obtaining samples of fodder and its materials, and their analysis, as well as the ways of challenging and contesting and complaining against the results of fodder analysis, and also the method of issuing a final decision in all and each thereof, and determining the fees and charges set therefor.

ARTICLE 113:

Trading in oil cake or raw fodder materials as determined by the Minister of Agriculture, or processed fodder, or putting them up for sale, circulating or transporting them from one place to another or holding and possessing such fodder materials for selling purposes shall be forbidden without obtaining a licence from the Ministry of Agriculture, providing also that the components of processed fodder, its specifications, and baling and packaging methods shall conform to the provisions of the decree to be issued by the Minister in this respect.

5. Land ownership

Law No. 122/1980: Agricultural Cooperation Law

Executive Regulations of Law 122/1980 recognized the grazing profession and define in Article 10 (5C) the membership regulation of Agricultural Cooperation. The membership must be inhabit to North-western coast, the New Valley, Baharia Oases, Sinai or the Red Sea. In addition they profession agriculture or grazing and they depend mainly on their wells and include cooperative societies for the reconstruction of the desert.

According to law 143 of 1981, the Egyptian government does not recognize tribal ownership - it describes desert land as wasteland and the state has the right to use it -. The lands were also confiscated by the government for the public benefit. Land ownership is a complex issue that is not related to social dimensions but to environmental factors.

Most of the land-use practices are subjected to the customary law (URF). It is a set of articles prepared by the tribes versus the official

law. The URF law regulates the individual behaviors within and among groups, thus the rules governing those behaviors. Also, it concerns with the provisions that are taken against individuals in the event of behavior violates the group's behavior.

6. Agriculture and grazing

Ali's Suns (Awlad Ali) Tribe follow the custom in the use of pastures like others in the sense of lands where barley is grown that is not owned by individuals but by tribes. Also, anyone pastures a herd in any area of their tribe. In order to benefit from other lands, it is necessary to consult with the elders/leaders of this tribe, depending on the success of the commissioners with the elders of this tribe through their peers according to the rules and customs. It was also customary for a whole herd to drink from a well on its way without anyone's approval, but if the use is regular as well as the pastoralism that follows, it requires obtaining approval and even paying the money if requested; the tribal system is still invalid and operates.

According to the article 41 of the traditional law of Ali's Suns (Awlad Ali) Tribe, if animals graze or enter a field at night, the herder guarantees the value of grazing to the owner of the field. However, if animals enter the field or graze during the day, there is no guarantee that the crops should protected during the day by the field’s owner.

Analysis

From the above text regarding the existing legislations, It is so clear, they are not sufficient for efficient management of the rangelands.

The poor recognition of the importance of animal health and welfare is a considerable barrier to progress. The lack /poor of government action/regulations on animal welfare, suitable transport and, slaughter regulations for farm animals resulted in the ban by the Australian government on live sheep export to Egypt, because of cruelty with animals , indicating that there are significant barriers to progress. In these circumstances, even trade-drivers secured no progress.

National institutions concerning the rangeland activities.

The Agricultural Directorate at Matrouh Governorate, Ministry of Agriculture and land reclamation is the governmental agency responsible for the management and animal health care of the rangeland area in the study area and all Matrouh governorate districts,

The responsibility of state and monitoring of rangeland is concerned to the Ministry of Agriculture and land reclamation. The research and technical overview mostly assign to the department of Environmental and Range - Division of Environment and Arid Land Agriculture of the Desert Research Centre – Ministry of Agriculture and Land Reclamation.

The Centre of Sustainable Development in Matrouh, as a part of the Desert Research Centre, assists in providing extension services, preserving the environment and developing rangelands at the North West coast including the study areas.

There is a fodder crop program at the Fodder Research Department (FRD) belonging to the Field Crop Research Institute (FCRI) – Agricultural Research Centre (ARC), Ministry of Agriculture and Land Reclamation (MALR). There are many research stations more or less related to rangeland activities, Bourg El_Arab Animal Research Station and Camel Research Station at Matrouh. Moreover, the approach of the ministry of environment is to conserve biodiversity all over Egypt as well as in the protectorates, some of them contain rangeland resources (Siwa, El-Omayed).

Regarding research activities, the Egyptian universities also, share in the field of rangeland researches especially, Cairo, Ain Shams, Alexandria, Matrouh, Zagazig, Al-Azhar and Suez Canal universities.

Unfortunately, there is no national committee for the rangelands as well as there is very poor coordination at the national or governorate level. Sometimes, there is bilateral cooperation between some stakeholders in a narrow field for a specific period.

Current situation of the rangeland resources

Agricultural production

In both sites of the study area, there are nearly similar trends for climatic conditions, soil type, livestock breeds, and plant varieties, consequently, these similarities will be reflected on a similarity of the vegetation cover, livestock sector, and land use. This information and data have mentioned and confirmed by pastoralists that exist in both study sites, the literature and the data obtained from the agricultural directorate at Matrouh governorate (Rizk et al., 2020), based on this solid information the proposed policies could be applied in both sites.

Rizk et al., (2020) described the vegetation cover in the study area as follow.

- Land cover vegetation based on 2019 classification images is presented in. Abou Mazhoud (site 1) contains 1308.56 Km^2 vegetation coverage available in winter that occupies 50.8 %. In summer 2019, there was 4.0656 km^2 vegetation coverage available of site 1 that occupy 0.16 % of site 1. While Al-Gaaween (site 2) contains 628.08 km^2 vegetation coverage available in winter that occupies 45.7% of site 2. In summer, there was 3.6677 km^2 vegetation coverage available of site 1 which occupy 0.27 % of site 2.
- The vegetation cover in summer is very low in comparison to winter (site 1, was 0.16 % vs 50.8 % and site2, was 0.27% vs 45.7%). That will reflect negatively on the natural fodder available for grazing animals. Consequently, the livestock keepers have to provide their animals with additional feeds like grains, concentrates, agricultural by-products, and etc.

instead of the free forage from the pasture to cover the feed gap between summer and winter.

- In the study area, the vegetation cover curve reaches the maximum in March then started to fall in April until reaching the minimum point in November every year. The growth of the vegetation cover in the study areas depends on rainfall quantity and its space range in the winter, while the spring represents the maximum vegetation cover and density, on contrary the autumn remains the minimum vegetation cover and density.
- Generally, the vegetation cover in summer is very poor, while the wild plant cover is moderately dense. The density of vegetation in the study areas response to rainfall quantity and area. The vegetation cover fluctuates from year to year, in site-1, the vegetation cover was low in 2017 and 2018, while in 2016 and 2019 it was relatively good. In site-2, the vegetation cover was very low in 2017 and 2018, while in 2016 and 2019 it was relatively good. This data is very important to regulate the grazing and initiate a grazing calendar in the study area to avoid overgrazing, which considers one of the main factors leads to deterioration and degradation of the rangeland.
- The density, frequency and plant cover of annual species are highly affected by the rate of precipitation. The precipitation period starts from November to March with a high percentage in January. The annual species are started to appear in the winter season and flowerishing in the spring season (March-May). Due to that most grazing species are annual, the

grazing in winter-spring season is more appropriate for the herders.

- The grazing area must be subjected to artificial preparation for the grazing season; rehabilitation of the grazing species such as sowing seeds of selected species, especially the annual and perennial.
- It is necessary to emphasize that the grazing species in the study areas require urgent management action to conserve its threatened status since they represent an important feeding source for both livestock and wild animals. The active cultivation is vital to sustain the grazing lands in the study area whereas the grazing land is soon degraded and lost forever if it is not regularly propagated by the target grazing species under the umbrella of a management strategic plan to develop the target area. Because the human culture of local communities has a heritage associated with the grazing system, the conservation and sustainable utilization of this area must be considered as a social enthusiastic.
- Most of the grazing plants of the study area (thirty-one species) have highly grazing value, followed by the very high value (twenty-four species) finally low grazing value is recorded in twenty-six species. According to the livestock species, Goats and sheep graze most of these species of (seventy-eight and seventy-six species, respectively), while camel graze thirty-three plant species only . Regarding the parts consumed of the plants, the young branches of thirty-two species are edible, followed by leaves of twenty-two species and flowers of fourteen plants. All parts consumed of

thirty-one species as well as the above-ground parts of only two species.

- Generally, the grazing ecosystem in the study area exposed to different types of stresses such as overgrazing, uprooting, woodcutting, aridity, different types of anthropogenic activities, and erosion of soil surface. Moreover, overgrazing caused ecosystem degradation by various kinds of mismanagement of the rangeland. This includes the extensive grazing of livestock and multiple-use of the land to develop tourism.
- The rangelands at the studied area are in a poor condition due to pressures of different types of stress that have either altered or destroyed the ecosystem because of overgrazing, uprooting of plants and off-route use by vehicles. These factors have resulted in an almost decrease or complete removal of vegetation cover and speeding up the desertification process in the study area.
- Overgrazing is a widespread problem where the meager winter rainfall produce a scant plant cover. Overgrazing is severe in the study area. The problem is increasing as the number of Bedouins and their livestock continues to grow over the stocking carrying capacity. Unregulated use of off-road vehicles particularly for recreation and tourism has increased dramatically in recent years. This leads to severe degradation of vegetation, disruption of top soil, and long term scarring of the landscape.
- Agriculture considers one of the main economic activities and sources of income in the study area. Crop production fluctuates according to the region and from year to year along

the north-western coast as it based mainly on rainfall rate and the availability of other sources of water. In the study area, according to the data obtained from the agricultural directorate of Matrouh governorate, the low precipitation rate in 2018 at Al-Nagila and Marsa Matrouh districts, led to no vegetable crop plantation on these areas while it reached a very low cultivated area at Barani district as only 6 Feddan vegetables and 4 feddans with melon, which clearly indicate that rainwater is the limiting factor for cultivation in the study area (Rizk et al., 2020).

- Rain-fed barley is the dominant cultivated crop in the study areas. As mentioned above, rainwater is the key factor for cultivating crops, so the highest barley yield was in the rainy seasons 2015/2016 and 2018/2019. The most barley yield comes from Barrani district. Regarding the wheat crop, the high yield observed in seasons 2015/2016 and 2016/2017. Barani district recorded the largest production area of wheat crop.
- Climate change further increases the risk of producing cereals in marginal lands, pastoralists may be in a position to reclaim these areas for grazing their animals. Increasing the designated area for cereal production and decreasing the area as pasture for livestock feeding maybe not wise. Cereals need high inputs and irrigation and are therefore unsustainable under desert conditions. Cereal production favours the pockets of rich people but does not enhance food security.
- The most important horticulture crops are figs, olives, grapes, date palm and almond. The leading district of cultivating

horticulture is Marsa Matrouh followed by Barrani and El-Negila.

- Rain-fed agriculture is generally risky due to high spatial and temporal variability of rainfall. The productivity of cultivated rain-fed crops is affected mainly by the amount and fluctuation of precipitation. Ouda et al. (2016) studied the effect of climate change on rain-fed agriculture of Marsa Matrouh. They expect that rainfall in Marsa Matrouh will be highly reduced in 2029/2030. The frequency of rainfall will increase; however, the amount will be much lower. Therefore, the productivity of cereal crops will be highly reduced to the extent that no grain yield will be produced in Marsa Matrouh. The biological yield will be reduced by 85 and 90% for barley and wheat crops, respectively. Olive yield will be reduced by 56% in Marsa Matrouh. Consequently, this will reflect negatively on livestock production (the main land use) in this area. They suggested also that productivity of fruits will be affected at lower rate than field crops. Therefore, a production package should be implemented in this area to increase its resilience to cope with rainfall variability in the future.

Livestock production

The extensive agro-pastoral livestock farming system is the mainstay and backbone of livestock production in the study area. The livestock population during the period 2007-2018 avaraged 104767 heads with a decreasing trend. It represent 21.5% of the total livestock in Matrouh governorate (487264 heads) representing a significant percentage of the total population of the governorate. The livestock population in the study area shows fluctuation with a decreasing trend during the period from 2007 to 2018. The private

sector (pastoralists) plays the main role in livestock production as most livestock owned by them while the governmental/public sector owns very minor numbers of animals.

TABLE 1: LIVESTOCK POPULATION (HEAD) RAISED IN MATROUH GOVERNORATE AND THE STUDY AREA DURING THE PERIOD 2007-2018.

	Year*							
	2007	2011	2013	2015	2016	2017	2018	Mean
Matrouh governorate	588152	494108	630453	566340	359967	288821	483006	487264
Study area	152140	112911	137893	122535	83240	43644	81003	104767
Site 1	134419	95163	110866	95350	73248	35618	55114	85683
Site 2	17720	17749	27028	27184	9993	8026	25890	19084

Data source: Agricultural Directorate, Matrouh Governorate, Ministry of Agriculture, Egypt (2019).

*Over the past 10 years, both locations of the study have been hit by successive years of drought that negatively affected production of crops, livestock and vegetation cover, prompting many breeders to sell a large numbers of their herds to feed the rest of the flock.

Flock/herd size is between 50 and 200 but it could reach up to thousands in a few occasions. This small flocks size represent a major constrain for applying new technologies and proper breeding program. Also inbreeding is seen clearly there on the majority of the flocks. Inbreeding consider one of the main problems facing livestock production. Small ruminants' production dominated in the study area (more than 90% of livestock population. Sheep (68%) followed by goats (23%) are the most common species and the ratio between the two varies with the rain condition and the market. Local

Barki sheep and Barki goats are the main breeds raised in the area (Heneidy, 1992).

Small ruminants can convert low-quality roughages into meat and milk for human consumption (in addition to produce fiber and hides). Small ruminants are well-suited to foraging on marginal and hinter grazing lands that are unable to support the grazing of large ruminant's species (cattle and buffalo). Therefore, they represent a wonderful opportunity to increase the production of animal source foods thereby reducing problems associated with food insecurity.

The main breeding season is June–July months. Consequently, parturition synchronizes with the beginning of the natural grazing season which usually extends from November to March. This short grazing season is usually followed by a long dry season during which breeding and pregnancy occur. After weaning, male lambs are fattened mainly on grains (mostly barley), feed concentrates and crop by-products, while female lambs used for replacement either for older or compensating numbers sold for cash for supplementary feeding. In summer, straw of barley and/or wheat is an important feed source after ending the grazing season. Straw represents the extent of range produced by rain irrigation during drought summer season which extend for not less than six months of the year.

Feed is the major input cost for livestock production, it is accounting for 65–70% of the total running cost. Poor nutrition of animals has been identified as the major constrain to animal production across the developing world (FAO, 2000). So, the profitability of livestock production is highly correlated with the feeding cost. Consequently, in the rangeland livestock production, the free forage from the

pasture is a paramount important factor for reducing the running cost.

Rangeland fodder is the main feed source for the livestock population in the rainfall season. But, nowadays rangeland has been diminished as a result of drought, poor management, soil degradation, low rain, overgrazing. Rangeland fodders provide a good and free feed source for livestock in the grazing season, and there is a close relationship between the development of pastoral plants and livestock production. However, vegetation cover of the rangeland has been deteriorated rapidly as a result of many reasons as mentioned above in order to keep a symbiotic relationship between both of them. Consequently, if we need to develop and promote the livestock production it will be extremely important to pay attention to rangeland plants by using and applying proper methods and techniques to develop the vegetation cover, as a result of that rangeland will effectively contribute to solving the problem of feed shortage during the summer months.

In the dry period, the supplementary feeds such as feed concentrates, wheat, barley, bran, straw, and agricultural by-products are supplied to the animals, and supplementary drinking water becomes more necessary. Water consumption by grazing animals depends on five main factors: (1) air temperature, (2) amount of dry matter ingested, (3) water content in the feed, (4) salinity of drinking water, and of feed (Le Houéou & Hostte, 1977 and Heneidy, 1992).

Water resources

Heneidy (1992) reported that sheep and goats in the coastal region do not need a supply of drinking water during winter and spring since

the water content of the vegetation is enough to cover their water requirement. However, in the other seasons watering of the animals is a must. The reason of that, because In the dry grazing period, the animals are being supplied with dry feed subsidies such as feed concentrate, wheat, barley, bran, straw and, agricultural by-products are supplied to the animals, and supplementary drinking water becomes more necessary.

The rangeland area exhibits dynamic changes in livestock activities in connection with livestock keepers' networks which are the prevalent socio-economic actors. A typology of livestock keepers based on mobility and animal performance in the agro-pastoral region shows that only the large flock owners were able to maintain long transhumance during the last 15 drought-years. However, this temporary migration negatively reflected on profit gained due to increasing mortality rate of lambs, the cost of feeding input the cost of drinking and transportation of animals to and back from irrigated lands. water shortage and the high cost of the animal feed supplement which becomes mandatory outside the grazing season. On the other hand, some small and medium-sized livestock keepers have reduced feed supplements (mainly grains), adopting a strategy of maintaining minimum productive livestock, while others have increased feed supplements for maximizing the profitability per animal during drought periods, depending on other sources of income such as tourism (Alary et al. 2016).

Part II: Policy analysis

Identifying the impact of different policy interventions on SRM and LDN.

Overview.

Historically, many interventions for sustainable rangelands management have been driven by the perceived need for better resource stewardship and protection of natural resources from degradation. A modern definition of degradation is “a persistent decrease in the capacity of an arid or semiarid ecosystem to supply a range of services, including (but not restricted to) forage, fuel, timber, crops, fresh water, wild-harvested foods, biodiversity habitat and tourism opportunities” (Scholes 2009).

Despite this recognition of the need to assess degradation in terms of land users’ objectives, range condition and degradation continue to be judged uncritically using inappropriate criteria. This includes the many studies that judge common rangelands to be degraded based on comparisons of the abundance of Increaser and decreaser grass species (notwithstanding the fact that some Increaser species provide adequate grazing and good ground cover under heavy grazing).

Policy should allow for different ways of assessing and managing different types of vegetation (and different areas within them) to ensure that rangeland users can meet their needs without resource deterioration. Currently available research and alternatives should be synthesised to draw some generalisations about which areas are most vulnerable to degradation, which can inform the prioritisation of areas for intervention. An assessment of the extent and

distribution of severe grazing impact should inform interventions, rather than untested perceptions that entire areas suffer from degradation.

The Egyptian Government has two major policy goals: to provide all Egyptians with adequate, basic food at reasonable prices, and to become self-sufficient in as many food commodities as possible. Egypt is concerned with food self-sufficiency because the country's production falls far short of its needs, and rising imports place a burden on its foreign exchange reserves. Imports accounted for about 50 percent of Egypt's basic food commodities (cereals, meat, vegetable oil, beans, and sugar) in 1982.

According to the 2019 Global Hunger Index, Egypt suffers from a moderate level of hunger, ranking 61 of 117 countries, compared to 61 of 119 countries in 2018. Food affordability, quality and safety remain challenges as Egypt continues to rely on global markets for more than half of its staples (World Food Programme (WFP), United NTIONS, 2020).

The Government has multiple policy objectives for the livestock and poultry production sector, including increasing meat production and safeguarding consumer welfare by preventing substantial price increases. The Government's policies encourage livestock production activities with higher value added per unit of product marketed, increase the income of small farmers and stimulate rural employment, improve the country's supply of protein, and increase the supply of livestock products to keep pace with the increased demand which is expected to grow more rapidly with rising income and population.

Animal production and importation policies effects.

Slow growth in domestic meat production and rapid growth in the demand for meat have caused meat prices to increase recently in Egypt. In an attempt to slow meat price increases, the Government increased imports of frozen meat. Imports accounted for 30 percent of the meat consumed. The Government has encouraged domestic production by providing loans with low interest for meat production farms such as in fattening young male buffaloes, as well as regulating imports of high-grade fresh meat and providing extension services for animal farmers all over the country.

Government intervention in the meat market increased to prevent price hikes and to encourage domestic meat production to enhance meat security.

Government intervention proved relatively weak. As a result, the feed-cost subsidy, per metric ton of meat produced, increased by six fold, while total meat production increased by only 2.7 percent. This increase in meat production was inadequate to keep pace with the growing population and the increasing demand for meat which stemmed from income growth.

The Government agencies are the main importer of meat in Egypt, however the private companies as well as the Egyptian ministry of defence are allowed to import live animals, carcases and meat. The extensive import of meat might affect the animal production sector due to the low price of imported meat. On the other hand, this will lead to shrinking the domestic production of meat consequently, more producers and employees will leave the sector. Government policies are not expected to change. The Government is expected to provide subsidized meat with low prices and poor quality to avoid

sharp price increases. The import portion could increase to about 35-44 %, depending on the magnitude of growth in income and population.

Impact of stocking rate and overgrazing in the rangelands of the study area.

Natural range is the most valuable natural resource for feeding wildlife as well as livestock at both locations since ruminants will convert the pasture fodder into different animal products for human consumption and other uses.

Appropriate stocking rates of livestock on the rangeland play a fundamental role in soil and water conservation, by adding organic matter to the soil and helping to improve the physical construction and properties of soil and ease of water uptake through the pores in it and increase the ability to retain the nutrients. While overgrazing has a negative impact on the soil, direct (trampling) and indirect by reduction of vegetation cover, (Enne et al.,1998). A high number of grazing animals per specific area may cause soil compaction, surface horizon disruption, reduction in infiltration, development of animal trails. The degree of this impact on a specific site depends on the interaction among vegetation, soil, weather, and animals.

Stocking rate control has a significant impact on short, medium, and long term sustainability of rangeland resources.

Stocking rate influences both livestock performance and controll forage production. Thus, livestock stocking rates are a paramount management decision that affects the rangeland economy and resource. Based on that, the local authority and policymakers of

rangeland constantly face the problem of balancing between animal demands and the fluctuating forage supply. Demand to forage must balance with forage available to guarantee effective and stable convert of forage to animal production while the range production maintained or improved. Timely stocking rate adjustments improve economic benefits and minimize overstocking during drought.

Livestock population is one of the main factors responsible of deteriorate the rangelands and decrease their contribution to animal feed. As a result, livestock production increasingly become dependent on heavy use of feed concentrates, cereal grains, and agricultural by-products. Range degradation is exacerbated by increased wrong practices by uprooting of shrubs /logging/felling trees for fuel wood for cocking and increasing transfer of rangeland to cropping, leading to overutilization of the remaining areas of rangeland (especially areas near the coast) which is highly adapted to the prevailing climatic condition.

In the pastoral area, flocks depend on range forage in the grazing season. As mentioned earlier in the report, the rangelands in both sites of the study area have been subjected to, periodic and prolonged droughts, overstocking and soil & land degradation in addition to water scarcity which resulting in the deterioration of the quantity and quality of the available forage.

This resulted in the reduction of rangelands in size and production per area unit as well as the acceleration of soil degradation and radical vegetation changes. Moreover, under heavy overstocking grazing for long periods, highly palatable and productive genotypes of plants have been lost and disappeared which would narrow the plant genetic resources.

On the other hand, the livestock population raised in the area is over the pasture capability/capacity to produce forage during the last decade. Consequently, the stocking rate has drastically increased which resulted in additional grazing pressure on the remaining rangelands. Furthermore, and because of the low productivity of rangelands in most areas, pastoralist plough the best areas of rangeland to grow barley and/or wheat production for summer feed and to reduce the high cost of buying the additional feed like grains, bran, feed concentrates and etc..

Overgrazing is a widespread problem where the meager winter rainfall supports a scant plant cover. Overgrazing is widespread in the study area. The problem is that the pasture area is degraded and their production of forage becomes unable to cover the need for feeding the livestock raised on it, although the livestock number is stable or slightly decreasing. The pasture carrying capacity is decreased, which means that amount of forage available for grazing animals is less than amounts required for grazing animals for a specific time period.

Hence, the cultivated area allocated for orchards, barley, and wheat has significantly expanded at the expense of good rangeland. This phenomenon in addition to, the continuous decrease of the grazing capacity/potentiality of the pasture would have a very detrimental effect on the returns of livestock producers.

Nowadays, livestock fed on range fodder areas for a part of the year, and the rest of the year they are fed on the available feed concentrates, grains, straws and other crop by-products.

Breeding and crossbreeding plans and their effects on the livestock sector.

The mean livestock population in the study area during the period 2007-2018 was 104767 heads distributed in 8 species (sheep, goats, camels, donkeys, cattle, buffaloes, horses and mules). In all species, there is no national or governmental breeding program plan. Which means that livestock keepers are dependant and isolated in plans to breed flocks.

Small ruminants occupy a huge percentage of the total livestock in the study area (94%), consequently studying them intensively is paramount important. Barki sheep is the main breed and kept as a pure breed with very minor cases that livestock keepers cross it with Rahmani or Ossaimi local breeds aiming the added hybrid growth potential on lambs produced for getting larger body weight at slaughter. In other cases, they buy the male lambs after weaning from Rahmani or Ossimi breeds for fattening them, the reason for that is the low price and the slightly high growth rate of these lambs compared with Barki lambs. Pure Barki goats were dominant for long years in the region. However a successful effort to introduce Damascus goats implemented by APRI (CALAR Project) at 1986 by distributing 47 Damascus bucks in all Matrouh bring the new crossbreed into the area of the study. This Barki-Damascus crossbreed has been widely accepted by the livestock keepers and local communities, because of its good productive traits (meat and milk). Nowadays, Barki –Damascus crossbred goats play an important role by supply the herders with a good quantity of milk to be used as fresh milk or to produce cheese and/butter, which helps them to promote their food security and their health, for getting the

good results and not deluting the potential of added genotype of this cross animals a proper breeding plan should be applied.

Regarding the other species, donkeys, cattle, Buffaloes, horses and mules there is minor information about their breeding program and their production performance. Most of the animals raised in the study area of buffaloes, donkeys and mules are local breeds (undefined), while most cattle, arelocal-Fresian crossbreed without any available information about its morphological or productive characteristics/treats, production environment, etc..

Flock/herd size is between 50 and 200 (mainly small ruminant) but it could reach up to thousands on a few occasions (Heneidy, 1992). This low population size of flocks representing a major constrains for applying proper breeding program as a result inbreeding is seen clearly there in the majority of the flocks. Inbreeding consider one of the main problems facing livestock production. Moreover, the vast majority of livestock population owned by the private sector (pastoralists), unfortunately they do not apply a breeding plan for their animals, also they keep their sire animals for many generations which led to an inbreeding problem in the herds.

For better management of the livestock sector which is the main source of income in the study area proper breeding plan should be applied. Also, there is an urgent need to monitor the unidirectional cross breeding applied in the study area.

Marketing and transportation policies effects.

One of the main challenges to reduce poverty in pastoral and agro-pastoral areas is to ensure that produced goods have sustainable access to markets while maintaining traditional practices and

nomadic lifestyles. The marketing of the grazing products (such as dairy products, meat, fiber, etc.) depends on a number of factors including the distance to markets, types of markets (cash versus barter), competition with other producers and demand for products. International trade and tariff systems have been charged for curbing the prices that sponsors expect to obtain from the market and thereby endangering long-term financial sustainability for grazing.

The animal markets in the three districts (Al-Nagila, Marsa Matrouh, and Barrani) have specific traditional features, just a piece of land un-shaded with or without a fence, exposed to direct sun in summer or rain in winter. The sellers bring their animals very early after dawn and the market ended the same day at the afternoon or before.

PHOTO 6: LIVESTOCK MARKET OF MATROUH UNFORTUNATELY, THE MARKET CONTAINS POOR FACILITIES, EVEN WITHOUT SHEDS TO PROTECT THE ANIMALS FROM THE SUN OR RAIN..

PHOTO 7: THE SHEEP MARKET IN MATROUH

PHOTO 8: THE SMALL RUMINANTS MARKET AND ANIMAL FEEDS AT THE SAME LOCATION, USUALLY, LIVESTOCK KEEPERS BRING THEIR ANIMALS TO SELL THEM AND BUYING THE FEED FROM THE MARKET IN MATEROUH.

Feed policy effects.

The shortage of balanced feed constrains the meat and milk industry. Egypt has little areas of natural pasture, and forage and fodder must be produced on irrigated land. The high cost of land reclamation limits the irrigation potential, and the large, rapidly growing population, relative to cultivated area, increases the opportunity cost of using land to produce feed. The feed scarcity is especially severe during the summer.

Subsidy policy effects.

There are many subsidy policies according to the overall objectives that could be applied in the study area as follow:

a) settlement subsidy policy

In order to discouraged nomadism, the government subsidized growing orchards such as almond, olive, and fig trees. Where orchards require more attention and protection than growing barley crops. With the introduction of a water pipeline along the coast, of social and medical services (however inadequate), and of employment opportunities, the attractions of the coastal settlements became harder to resist. Many Bedouins moved to the towns and cities to benefit from the services provided by the government In pursuit of educational services or the well-being of city life, or an economic purpose such as various job opportunities.

b) Feed subsidy policy

It is a direct subsidy to livestock owners for purchasing feed such as barley as a feed complement are provided through cash transfers according to the size of one's herd. This policy is totally encourage drought in rangeland. It is making the Bedouin population more sedentary, whether it contributed to increasing livestock numbers and whether. It possibly resulted in an over-reporting of livestock numbers by herders. Reducing the feed subsidy lead to increase the production cost. It leads to increase the price of meat and milk, as well as the mass sale of sheep by livestock owner.

Finally, it leads to the weakness of the livestock sector by removing small and medium-sized animal breeders from the field, and letting large animal breeders and importers of live and slaughtered animals control the market. It leads to the prices of local and imported meat getting rise to high levels.

c) Feed-Industry subsidy policy

To ensure the feed needs for livestock, Subsidy of local and national feed industry must be encouraged for feed mass production, which in turn achieves lower prices on the local market, and enhances levels of food security.

d) Water subsidy policy

It is a direct subsidy to livestock owners for the harvesting of rain-water via the construction of a small ground collection reservoir. There are also relatively bigger reservoirs that need mechanical tools that cost relatively high. This encourages the livestock owners to settlement and provide them with the principal factor of production.

e) Tax exemptions subsidy policy

Supporting tax exemptions: Supporting customs exemptions, whether totally or partially, leads to a lack of tax revenues that could be obtained and then affects the state budget in an "indirect way". The tax exemptions granted to some governmental bodies and NGOs in the area of importing live and slaughtered meat leads to the creation of unequal opportunities between producers in the field of animal production. It leads to the weakness of the livestock sector by removing small and medium-sized animal breeders from the field, and letting large animal breeders and importers of live and slaughtered meat control the market.

Socio-economic

In the study area, livestock farming systems have evolved to adapt to current and future pressures along the time. Over the last decades, the agro-pastoral system faced increasing pressures include the shortage of water resources, floods, strong demographic growth, urbanization, increasing demand for animal products, and high competition for land and water. Also, increasing the number of Bedouins and their food demand. Unregulated use of off-road vehicles particularly for recreation and tourism has increased dramatically in recent years. This leads to severe degradation of vegetation, disruption of topsoil, and long term scarring of the landscape. In this context, pressure on biomass to feed animals raises many challenges and sometimes competition in the trade-offs of the use of resources (land, water, and nutrients) that can affect sustainable development. Meanwhile, the synergies between cropping and livestock raising offer many opportunities for a sustainable increase in production, notably by raising productivity

and improving resource use efficiency for both households and agro-pastoral communities. Unfortunately due to the low perception rate for many years in the study area obstacle this option.

Urbanization.

In general, still move from rural/pastoral land to urban areas is attractive for new and young generations. Young people still believe that urban environment provides more opportunities despite high unemployment and cost of housing in the cities. Recent governments have made progress in providing rural areas with electricity, drinking water, and roads, but the main obstacle facing the development of rural areas remains the lack of job opportunities, pushing many (mainly young men) in those areas to migrate to larger cities. As urbanization increases, rangelands become increasingly fragment and surround by civil development.

The lack of basic urban amenities in rural-rangeland coupled with land degradation is driving today's youth more towards peri-urban and semi-urban areas in Matrouh governorate and north west coast, creating high trend for young generation to local migration with Lack of motivation to return.

The lack of motivation to return to pastoral land, the un-developmental rural set up is the largest barrier for inter-stakeholders cooperation in land restoration.

Tourism.

Over the decades, tourism has become one of the fastest growing economic sectors in the world, a key driver for socio-economic

progress and a key income source for many communities. The Mediterranean region, with its unrivalled natural beauty, has long been one of the top tourism destinations in the world. The investment in the tourism sector in the Mediterranean coastal region led to many negative effects on the rangeland. The tourism services draw many labours from the nearest rangeland local community as it allow better personal income and raise livelihood.

On the coastline of the study area. There is a demand for summer vacation of national citizens the area has a dramatic coastline with white sandy beaches and pristine water. Moreover there are hopes that such new economic driver would lead to a change in Bedouin life as it offer employment opportunities, though being seasonal, and add new markets opportunities for local products. Indeed, Bedouin families have found alternatives to adapt to this new context, offering agricultural products from cultivation (olive and fig), rain fed crops, and livestock farming systems.

The most important feature of the Bedouin community is to keep its customs and traditions that distinguish it from other communities. Nevertheless, over time, tourism can affect the Bedouin community and some change in customs and traditions has occurred.

“Tourism is an important tool to achieve national development goals. The North West Coast of Egypt is a promising region for development, able to provide great economic help to the local community and to the national economy if it is properly managed, developed and sustained.

Invasive plants.

Exotic plant species are having impacts on rangelands at an unprecedented rate, resulting in enormous economic and ecological costs each year.

Invasive plants at rangeland can have a significant impact on both humans and the environment. Their impact on human activities can be associated with livestock production, including interfering with grazing practices, lowering yield and quality of forage, increasing costs of managing and producing livestock, slowing animal weight gain, reducing the quality of meat, milk, wool, and hides, and poisoning livestock. Noxious weeds cause more economic loss in rangeland than all other pests combined. Any alien species should be assist by the competent authority before introduced at the rangeland.

Analysing of the current policy framework

Without further knowledge on rangelands ecosystem functions and services, it is not possible to judge the impacts of current policies on their livelihoods and these ecosystems. Underestimating the number of pastoralists and underrating the benefits of livestock mobility may mean that governments do not provide sufficient or appropriate services to pastoralists. Furthermore, insufficient attention to gender and youth issues of pastoralists may mean misunderstanding what pastoral women and children need and want. If governments do not value rangelands correctly, they may rush towards domestication the region. Undervaluing rangelands may lead to a lack of resources for studying, protecting and monitoring rangeland resources, despite the increasing need to understand them as climates continue to change.

Large information gaps exist for thematic topics that are considered specifically challenging for remote and mobile populations, including mobile education and health services, representation and participation, alternative livelihoods, access to development and infrastructure, and livestock mobility within or across the governorate.

While there is considerable focus on land degradation, land policy changes, rangeland condition, productivity and water scarcity, there is less coverage of specific issues such as pollution, disasters and displacements. Much attention is being given to land-use change, with less attention focused on land grabbing.

Production sustainability and efficiency of the study area

Natural grazing is the most valuable natural resource for livestock feed in the study area since ruminants convert it into food and other products for human consumption. livestock flocks depend entirely on range forage communally grazed in the grazing season. The ranges of the area have been subjected to heavy overstocking, periodic and prolonged droughts, and negative effects of climate change which led to the deterioration in the quantity and quality of the available forage (Rizk wet al., 2020). This has resulted in the reduction of rangelands in both sizes and per unit area production as well as the acceleration of soil erosion and radical vegetation changes. The changes largely embody the thinning out of the vegetation, destruction of perennial grass, and spreading of undesirable bush and woody species as well as toxic plants. Moreover, under heavy grazing for prolonged periods, highly palatable and productive genotypes have been lost and disappeared which would narrow the genetic resource. On the other hand, overstocking of livestock in the area has been increased during the last decade. Consequently, the stocking rate has drastically increased which resulted in additional grazing pressure on the remaining rangelands. Furthermore, and because of the low productivity of rangelands, pastoralists plough best areas of rangeland for barley production for summer feed and to save on concentrates. Unfortunately,this will not solve the problem since the yield of barley is not satisfactory for the producers Hence, the cultivated area allocated for orchards, barley and particularly wheat has significantly expanded at the expense of good rangeland. This phenomenon and the continuous decrease of the grazing capacity

of the range would have a very detrimental effect on commercial stock farming. At present, livestock grazes range areas for part of the year, but for the rest, they are fed on concentrates and other crop by-products.

Crop production fluctuates in the study area from year to year it based mainly on rainfall rate and the availability of other sources of water. The productivity of cultivated rain-fed crops is affected mainly by the amount and fluctuation of precipitation. So the high barley yield (the main crop produced in the study area) was in the rainy seasons. According to the data obtained from the agricultural directorate of Matrouh governorate, the low precipitation during 2018 at Al-Nagila and Marsa Matrouh districts, led to no vegetable crop plantation in this area and it reached a very low cultivated area (Rizk et al., 2020). Rain-fed agriculture is generally risky due to high spatial and temporal variability in rainfall. According to the impact of climatic change on the rain-fed agriculture, drastic consequences are expected to occur in Marsa Matrouh at 2029/2030, where barley and wheat will not produce any grains as a result of low rainfall (Ouda et al., 2016 and Rizk et al., 2020). The biological yield will be reduced by 85 and 90% for barley and wheat, respectively. Olive yield will be reduced by 56% in Marsa Matrouh.

Assess the strengths and weaknesses of the existing policy, legislation and rules related to SRM and LDN.

There are many weaknesses and problems obstacles the development of the rangeland in the study area as will be discussed below.

Vegetation cover in the rangeland

Legislations and regulations

Until now, there is no legislation, regulation and strategy for the management and sustainable development of the rangeland of Egypt. In the study area, all activities applied are related to the development/research projects, which have been executed by different organization.

Most of the land-use practices are subjected to the customary law (URF العرف). The term ʿurf, meaning "to know", refers to the customs and practices of a given society. It is a set of articles prepared by the local communities (tribes) versus the official law. The URF law regulates the individual behaviors within the group and among groups, these rules governbehaviors. Also, it concerns with the provisions taken against individuals in the event of behavior violates the groups.

Proposed solutions

- New/amended legislation and regulations are needed for the efficient and sustainable management of the rangeland in the study area and total northwest coastal zone.
- Establish customary law council to protect the rights of communities.
- Formulate policies that:
    a. Provide incentives, technical support and training to herders to maintain biodiversity, environmental system and promote production.
    b. Integrate rangeland resources into protected areas legislation.
    c. Protect IPRs over wild and cultivated material of rangeland.

d. Regulate access to genetic resources.

Sustainability

Herders, breeders and producers need to congregate into larger bodies for a better business organization. Also, public awareness is key gap that needs to be covered.

Proposed solution

- Establish a local entity of all rangeland stakeholders (union or association) to protect the legal rights of the region/community over their rangeland resources.
- Grant full authority to local government councils and/communities to manage and conserve their rangeland.
- Setup a platform (NGO) to ensure full participation of all herders' stakeholders and sustainability of rangelands.
- Establishment of a national registry for herders' resources.
- Support activities to document traditional knowledge.
- Need of a public awareness campaign about rangeland topics.
- Establishment of pilot areas for protecting and controlled grazing in each of the main habitats and communities to determine the optimum livestock capacity at different times of the year.
- Initiation of a cooperative system for grazing management among the main social sectors (tribes) mainly to arrange the grazing activity and determine the optimum livestock load for each area all around the year.
- Formation of an extensive program for the propagation and seed production especially grazing species which is threatened by extinction.
- Initiate program for the propagation of multipurpose species in the study area and establishment of nurseries for propagation as well as a demonstration of field experiments.

National plan of action.

There is no clear national plan of action for the management, conservation and sustainable utilization of rangeland over Egypt.

Proposed solutions

- Formation of an extensive program for the propagation of endangered grazing species.
- Establishment grazing protectorate areas.

Livestock sector

Nowadays in the study area; the livestock sector is facing many and hard challenges in many fields, to overcome this problem decision-makers, research institutions and extension services have to support livestock activities to overcome the loss of production, unidirectional cross-bred programs, overgrazing, inbreeding and degradation of pasture area; worsening of animal products, and enlargement of land desertification and the worsening of animal health accompanying the effects of flocks migration during drought and the climate change.

Animal health will be worsening under the negative effect of climate change, which will increase the occurrence of infectious animal diseases. Occurrence of infectious diseases reduces the stability and resilience of the food supply from livestock, affecting everyone along the production and market chains. They can have four different effects:

- Rreducing the livestock population through death or culling;
- Reducing the productivity of livestock;
- Creating market shocks when demand falls and supply contracts in response;

Problems identified regarding livestock production in the study area will be discussed below.

Production

- Decreasing livestock population from 2006 to 2018 because of many reasons (feed shortage, drought, disease outbreaks, high feeding cost, etc).
- Inbreeding and overgrazing.
- Lack of suitable land with good vegetation cover for feeding animals.
- Poor technology applied in rangeland plants and livestock.
- Production losses through poor management.
- Scientists and policymakers have little knowledge about local feed sources and local animal genetic resources to maintain them for making the right policy decisions and establishing good management plans for the rangeland in the study area.
- Weak ability to invest in pasture improvement
- Lack of genetic tools to select animals with high genetic merits for breeding in the local flocks.
- Little knowledge about local feed sources.
- Poor knowledge about the right stocking carrying capacity of number animals/area at specific time of the rangeland.

Feed resources

- Very low quantity and Poor quality of forage at pasture in the dry season.
- Shortage of additional feed resources at affordable prices.
- Little appreciation of the role of nutrition in production losses (growth rate, mortality rate, conception rate, etc).
- Lack of transferring agricultural by-products to efficient feed resources for feeding animals such as silage making,

treatment of agricultural by-products physically or chemically, crushing, soaking etc...

Health care & veterinary

- Inadequate animal health services provided to the animal keepers.-
- Poor veterinary services and disease control.
- High animal mortality through infectious diseases and neonatal animals.
- High Expense of vaccines for infectious diseases.
- Negative effects of diseases both on mortality, reproduction, and productivity.
- Inadequate and inconsistent supply of vaccines.
- Pastoralists are reluctant to use vaccines or are doubt of the benefits.
- Weak and low effectiveness of vaccines or drugs because of improper storage and transportation applied.

Marketing

- Poor marketing systems for live animals or their products.
- Fluctuated/unstable product price.
- Poor meat processing, manufacturing and marketing facilities.
- Milk collection, processing, and manufacturing activities have not been developed yet.
- A high expense for selling the animals or their products due to payment of high commissions to many middlemen.
- A high cost for transportation.

Infrastructure

- Limited access to capital and loans.
- Poor availability of facilities and extension services.

- Limited technical support and insufficient proven practical livestock extension
- There is a general lack of technical knowledge on the application of alternative successful practices applied abroad about animal production technologies.
- Largely inefficient roads and transport facilities.

Environmental

- Severe degradation of some pasture areas.
- Negative effects of climate change.
- Long drought seasons and severe floods in other seasons.
- Weak ability to adapt to climate change.
- Weak mitigation activities to climate change.

Political/institutional

- Livestock keepers have limited political power and are not well organized to lobby for their rights.
- Land rights are weak providing little protection to pastoralist communities
- Weak bargaining/negotiation power of pastoralists.

Gap analysis

Under the oversight of multi-stakeholder, multi-sectorial and multi-disciplinary (3 M approach), a serious of policy survey activities applied aimed at identifying needs and priorities. It includes focus group meetings and individual interviews with experts (face-to-face). The target stakeholders that represent the community under study divide into:

1. The government sector (governorate of Matrouh);
2. Local administration (Agriculture Administration);
3. Researchers (Desert Research Centre "DRC", Agricultural Research Centre "ARC", Animal Production Research institutes "APRI");
4. Non-Governmental Organization (Barky Sheep Association, Association of Ramsa);
5. Community leaders (Parliament representatives);
6. Traders (livestock market), and
7. Herders of the two target areas.

All of the thematic topics reviewed are identified and compiled as follows:

I. **Direct drivers**

a. Pollution
   - Waste disposal sites
   - Mining/fracking

b. Grazing
   - Extensive systems
   - Semi-intensive systems
   - Overgrazing/under-grazing

- Soil fertility

c. Landscape change
    - Landscape change
    - Mining
    - Roads/urbanization
    - Habitat fragmentation

d. Disaster risk
    - Vulnerability to climate change
    - Affected populations

e. Management change
    - Forced displacement
    - Abandonment of rangelands
    - Change in mobility
    - Privatization of land

f. Natural drivers
    - Extreme weather/climate
    - Disease/pandemics
    - Invasive species
    - Resilience
    - Desertification
    - Land degradation neutrality

II. Indirect drivers

a. Global obligation
    - Inclusion of national plans
    - Conventions, international agreements

b. Political representation
    - Members of parliament
    - Local administration
    - Campaigns

c. Access to support
    - Development policies
    - Donor projects
    - Extension services
    - Pastoral associations
    - Technical support
d. Policy
    - Economic (taxation and subsidies)
    - Investment
    - Land sales/grabbing
    - Gender (access to credit, education, etc.)
e. Laws
    - Protection, access, grazing rights
    - Desert land laws
    - Enforcement capacity
    - Mobility (tribal transboundary)
    - Customary laws
f. Institutions
    - Different research institutions
    - different guidelines and quotas
    - Strategies and Practices
g. Water
    - Availability
    - Quality
    - Rain /precipitation
    - Aquifers, wells and dams
h. Economic
    - Access to markets
    - Price instability.

- Seasonal market

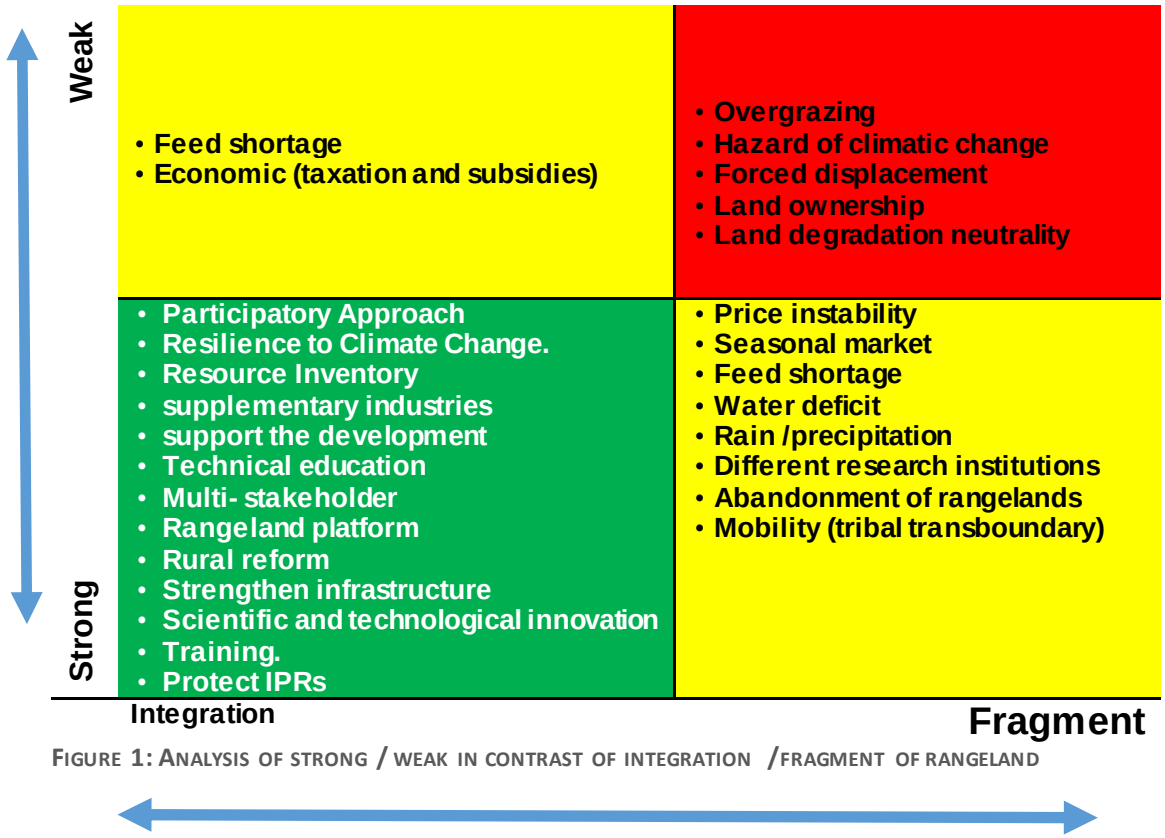

FIGURE 1: ANALYSIS OF STRONG / WEAK IN CONTRAST OF INTEGRATION /FRAGMENT OF RANGELAND

Policies and activities for better rangeland management and conservation of the study area.

The primary use of rangelands in the study area is raising livestock in an agro-pastoral production system. This form of rangeland use provides the cheapest/free source of feed for livestock. Therefore, the improvement of rangeland management is fundamental for improving livestock production. To sustain the livestock production systems for agro-pastoral communities we have to integrate the available technical, institutional and policy options in the developing process. .

Empowering agro-pastoralists local communities

- One of the most important entry points for the rangeland restoration and better management is empowering pastoralists' local communities; this can be done through the following intervention/mechanisms.
- Involvement pastoralists in the planning and implementation phases of the development plans/project (participatory approach) to ensure that the project is sustainable and answers real and urgent local needs.
- Formation of pastoralist organizations (sheep raising association, goat breed organization, etc.) or producer groups able to improve production, market, and bargaining powers. The main objective of forming the groups is to target the poorest members of the communities so they can be involved in development activities and gain advantages of pooling economies of scale for input purchases, agricultural crop production, and marketing.

- Enhancing and promoting the sustainable management of the agro-pastoral resource, which includes agricultural biodiversity, water resources, water and soil conservation, rangeland improvement infrastructure to health and education matters, etc., which correspond to the priority needs of the local community.
- Collaboration and knowledge sharing among pastoralists can help strengthen their community's capacity for long-term rural development. Knowledge can be gained from modern, scientific research and from the experience of local rural populations.

Establishment of a department for rangeland in the agricultural directorate at Matrouh governorate.

Although, the agro-pastoral production system is one of the main economic activities in Matrouh governorate, in which grazing animals in the pasture is one of the main economic activities. The agricultural directorate at Matrouh has not an effective department for rangeland to provide the technical and extension services, therefore it is very important to activate the department of rangeland to cover this technical and institutional gap. One of the main objective of the department is to establish a management strategy, at the governorate level, for both plant and animal genetic resources. This strategy should be prepared and executed by involving all stakeholders in a participatory approach including the local community representatives.

Establishment of environmental pastoral Protectorates (reserves):

The establishment of pastoral protectorates enable the improvement and sustainable use of the rangeland ecosystem under the supervision of the Ministry of Environment. It will help in:

1. Preserving some distinct pastoral environments that have a special significance.
2. Preserving some rare or endangered plant and/or animal species that have special value.
3. Improving the quantity and quality of pastoral production.
4. Research and Studies.
5. Some of them serve as feed forage for grazing during the dry years.

Mainstreaming of rangeland restoration and conservation in **national development action plans**

The mainstreaming of rangeland restoration and conservation, as well as, climate change strategies within Matrouh governorate and national development action plans needs to be fostered.

There is a need for governorate/national policies that provide clear guidelines for integration and implementation of strategies, plans, programs, actions, and activities. Governorate and national economic policies need to be reviewed to ensure that they build the resilience of the poor pastoral members and enhancing their capacity to adapt to the impacts of rangeland deterioration.

Support natural resources conservation activities.

Supporting the activities dealing with natural resources conservation activities such as water harvest and rational use, restoration of native grazing species, protect local animal breeds are vital activity sustainable of the rangeland ecosystem.

Adaptation Technical option (Newly adapted techniques and technologies)

Technology has a significant role to play in tackling the causes of rangeland deterioration and helping pastoralists to adapt to its negative impact. We can develop new, cleaner technologies and breed plants and animals more able to tolerate climate variability and pasture deterioration. A major push in research and development, information exchange, extension, and training, is needed to create farming systems that are more resilient.

Adapting new techniques and technologies offer an efficient solution. Pasture communities in the study area have to develop these jointly. Partnerships with research institutions and extension service centers, non-governmental organizations and private companies will be of utmost importance. As an example, options for alleviating heat stress on summer season include adjusting animals' diets to minimize diet-induced thermogenesis (low fibbers and low protein) or by increasing nutrient concentration in the feed to compensate for lower intake; taking measures to protect the animals from excessive heat load or enhance heat loss from their bodies; or genetic selection for heat tolerance or bringing in types of animals that already have good heat tolerance.

Several other techniques have the potential to effectively alleviate the pressure applied to rangelands. Supplementation is a common practice in the region. Unfortunately, the high cost of conventional feed concentrates prohibits their wide-scale use, especially by small animal keepers. Therefore, it is necessary to find alternative low cost supplements to improve nutrition and thus the productivity of small ruminants. The practice of feed block is gaining popularity.

Promoting legislations, regulations and strategy for the sustainable rangeland management.

Objectives, membership, managing and administration systems must accurately and clearly legislate permitting to fairly implement Herders' right on legal frame. Members of herders' associations must include different stakeholders. Right now there is no legislation, regulation and strategy for the management and sustainable development of rangeland in Egypt. A new proposed legislation must address the following:

- Sustainable management of rangeland.
- Integrate rangeland resources into protected areas legislation.
- Establish customary law council to protect the rights of communities and pastoral communities indigenous knowledge.
- Protect IPRs over wild and cultivated material of rangeland.
- Regulate access to GRs
- Provide incentives to herders to maintain biodiversity, environmental system and promote production.

Improving water harvesting

- Rainwater harvesting via the construction of small ground collection reservoirs of low cost or if financial resources are available or bigger reservoirs by using mechanical tools.
- Increasing groundwater obtained via drilling water wells. Water salinity obtained from the wells varies widely which needs some small desalination units in case of unsuitable salinity to have water suitable for drinking or irrigation.

Introduction of an early warning system.

Rangeland restoration efforts should be fostered through the adoption of action plans that address pasture deterioration and

climate change issues, and through the development of a national early warning system for weather forecasts, risk assessment and monitoring of extreme events such as droughts and floods in addition to livestock stocking rate. Establishing an early warning system at the national level will increase the efficiency of the restoration process.

In a practical way, the early warning system should be done for all districts of Marsa Matrouh governorate, certainly not only for the study area.

Improving market access

One of the main challenges to reduce poverty in pastoral and agro-pastoral areas is to ensure that produced goods have sustainable access to markets while maintaining traditional practices and nomadic lifestyles. The marketing of the grazing products (such as dairy products, meat, fiber, etc.) depends on a number of factors including the distance to markets, types of markets (cash versus barter), competition with other producers and demand for products.

Enforcement access to markets can be supported by:

- Marketing distinctive products;
- Including the sustainability considerations in purchasing decisions;
- Provide support to coordinate the supply chain;
- Facilitating access to credit;
- Capacity building for sponsor producers associations;
- Providing veterinary services to maintain the quality of meat and dairy products.

Establishing animal Genetic Resources Management Strategy

A combined management strategy on the governorate level for both plant and animal genetic resources becomes an urgent need since it is not possible to do that for the study area alone/only. This strategy should be prepared and executed by involving all stakeholders in a participatory approach including the local community representatives. This strategy should include both plants and animals in an integrated approach to avoid clashing between each other, which will help in the balance between the development plans for each, in terms of animal stocking and the status of the vegetation cover.

The following is a proposal for a management strategy to conserve animal genetic resources.

1. Establish an AnGR Advisory Committee.
2. Conduct Resource Assessments regarding AnGR Resource Assessments through the following.
   - 2.1. Inventory Characterization.
   - 2.2. Human and Technical Assessment.
   - 2.3. Livestock Sector Assessment.
   - 2.4. AnGR Role Assessment.
3. Develop and Implement the Management Strategy and Implement of Action Plans.
   - 3.1. Advance AnGR Characterization.
   - 3.2. Species by Species.
   - 3.3. Training and Capacity Building of Network.
4. Funding and budgeting the activities/programs.

5. Develop a Monitoring Program and prepare progress reports to evaluate animal genetic resources.

Closer collaboration between government and scientists with pastoralists would enhance documentation of the breeds and also support their use. Recognition and participation of pastoral livestock keepers are keys to success.

Guarantee of land and water rights

1. The Egyptian government does not recognize tribal ownership - it describes desert land as open land and the state has the right to use it - Law 143 of 1981. The lands were also confiscated by the government for the public benefit. Land ownership is a complex issue that is not related to social dimensions but to environmental factors.
2. Pastoral and agro-pastoral systems depend on sustainable access to land and water resources. When access to these lands is disrupted or usufruct rights are uncertain, overuse and land degradation can often occur
3. Most of the pastoral lands were usually owned in common with institutional, community and governance structures preventing the "public tragedy."
4. Land tenure in the public domain can take many forms: community pastures, community management of high-value lands (such as water sources) or land grants or usufruct rights for traditional presidential bodies that manage land on behalf of the community.

5. Determining individual land ownership can still result in sustainable and productive pastoral systems. When there is a shift away from communal or unspecified land acquisition to individual tenure, some of the following elements must be taken into account:
    - Provisions to facilitate the movement of herds;
    - Equitable division of lands to avoid conflict;
    - Mechanisms to respect women's rights;
    - Legal guidance to local communities to guide them through the process and make them aware of their rights and responsibilities.

Domestication of new animal species.

- Domesticated new animal species could be an important factor for adoption with climate change and rangeland deterioration. Although, domestication process is complicated and need a long time, it is very important to continue the attempts to domesticate new species especially wild populations (e.g. wild rabbit and deer). Because of their unique adaptive capacity, resistance, tolerance of climate changes and extremes, disease-resistant or fluctuating market conditions or changing societal needs-.
- As known among the world’s 148 non-carnivorous species weighing more than 45 kg, only 15 have been domesticated. Moreover, only six have become widespread on all continents (cattle, sheep, goats, pigs, horses, and donkeys), while the remaining nine (dromedaries, Bactrian camels, llamas, alpacas, reindeer, water buffalo, yaks, Bali cattle, and Mithun) are important

in more limited areas of the globe. The proportion is even lower in the case of birds, with only ten species (chickens, domestic ducks-, Muscovy ducks, domestic geese, guinea fowl, ostriches, pigeons, quails, and turkeys) currently domesticated out of around 10000 avian species (FAO,2007).

Moving animal genetic resources as part of climate change adaptation strategies.

One option for adapting production systems to the effects of climate change is to bring in breeds that are better adapted to the changed conditions (Pilling and Hoffmann, 2011). These animals are likely to come from production environments where for many years they have been exposed to environmental conditions similar to those now prevailing in the areas to which they are being introduced.

If climate change leads to major changes in local agro-ecosystems, at a rate that outstrips the- capacity of livestock and their keepers to adapt, such shifts in breed distribution may become increasingly necessary and frequent. Currently, however, the dominant pattern of gene flow on a global scale does not focus on the movement of locally adapted animals into equivalent agro-ecological zones, but on the movement of high-output breeds that need highly controlled production environments. as an example local cattle breeds could perform better than crossbreeds which is exist now in the study area.

If development agencies are contemplating introducing a breed into a new area in response to climate change, it is essential that livestock keepers are properly consulted as part of a thorough assessment of the breed's suitability for use in the current and projected future production environment (FAO, 2010). Another point that should be noted in the context of introducing adapted breeds to new areas is that differences in animal's capacities to thrive in harsh conditions – particularly their feeding behaviour –are not merely matters of genetics but also of learning. Young animals learn from their mothers and other members of the herd or flock (Provenza and Burritt, 1991; Glasser et al., 2009)

Developmental solutions

- **Rural reform and implement the preferential pastoralism policies.**
- **Strengthen infrastructure construction and improve production capacity.**
- **Strengthen scientific and technological innovation and support the development of rangeland science and technology.**
- **Strengthen the training of herders and improve the scientific and cultural education of herders.**
- **Encourage the development of supplementary industries and enhance the competitive advantage.**
- **Resource Inventory on Sustainable Rangeland Management.**
- **A Multi- stakeholder Decision Support Tool for Optimizing Sustainable Land Management Technologies**
- **Enhancing Resilience to Climate Change in Agropastoral Production Systems**

- **Establishing an annual livestock-stocking rate rules.**

Establishing an annual livestock-stocking rate for rangeland is a fundamental factor for efficient rangeland management and restoration plan. On the other hand, it will keep enough forage for feeding livestock in a proper way. Since the Stocking rate affects both livestock performance and climatically controlled forage production. A high number of grazing animals per hectare may cause soil compaction, surface horizon disruption, reduction in infiltration, development of animal trails.

- **Efficient utilization of freshwater resources**

Access to water is a limiting factor when determining the population size of herds for many individual herders and communities. Therefore, there is a high risk that competition for water will lead to overuse. This is especially true when considering additional other water needs. Proposed solutions as follows:

  - Store freshwater in reservoirs for the summer uses.
  - Rationalize the use of water.
  - Development of rangelands to reduce the water deficit, as it will reduce the area of agricultural land used for growing horticulture or barley.

- **Controlling overgrazing (Grazing pressure management)**

The problem of overgrazing is the exaggerated consumption of land forages continuously and without giving an opportunity to these pastures to rebuild themselves, due to grazing large number of animals than capacity of areas. Absolutely the over stocking rate leads to the problem of overgrazing. Overgrazing has been one of the main factors causing the deterioration of ecosystem productivity in the Mediterranean coastal region. It has resulted in a severe reduction of perennial cover, soil erosion and formation of mobile dunes (Heneidy, 2002), consequently, that will be reflected negatively on the population, performance, health, and productivity of livestock and wild animals. Proposed solutions as follows:

  - Proper manage animals and use grazing plans to implement periodic grazing.

- Proper manage land use by monitoring rainfall patterns and defining seasons of drought to determine the proper livestock load/area.
- Store enough feed for the animals in the spring, so that there will be enough feed in the summer or buying subsidies feed during the shortage period.
- Choose suitable lands for grazing.
- Keeping range only for feeding mature animals and replacement ewe lambs while male and culled lambs transfer directly after weaning to in yarns feeding.

- **Overcome feed shortage**

  The main feed resources are forages from natural pastures during the grazing season which extend for a maximum of 6 months. Range fodders show marked seasonal variation in availability and quality based on the variation in rainfall quantity and distribution. During the rest of the year the livestock fed mainly on barley, wheat, concentrates, agriculture by-products, bran, and grains (maze).

  - Regulation of grazing

  It is important to regulate grazing, the grazing of young plants before flowering make them more vulnerable and threatened and year after year the seed content in the soil will diminish until it extinct. This problem is not hide to anyone interested in the environment and biodiversity, and this appears through comparison of open land and land protected by a fence. It is a national problem that needs to be resolved urgently. Therefore, there must be big effort to protect our environment

from desertification resulting from unregulated grazing/overgrazing.

- Using by-products/waste as a feed resource for livestock.

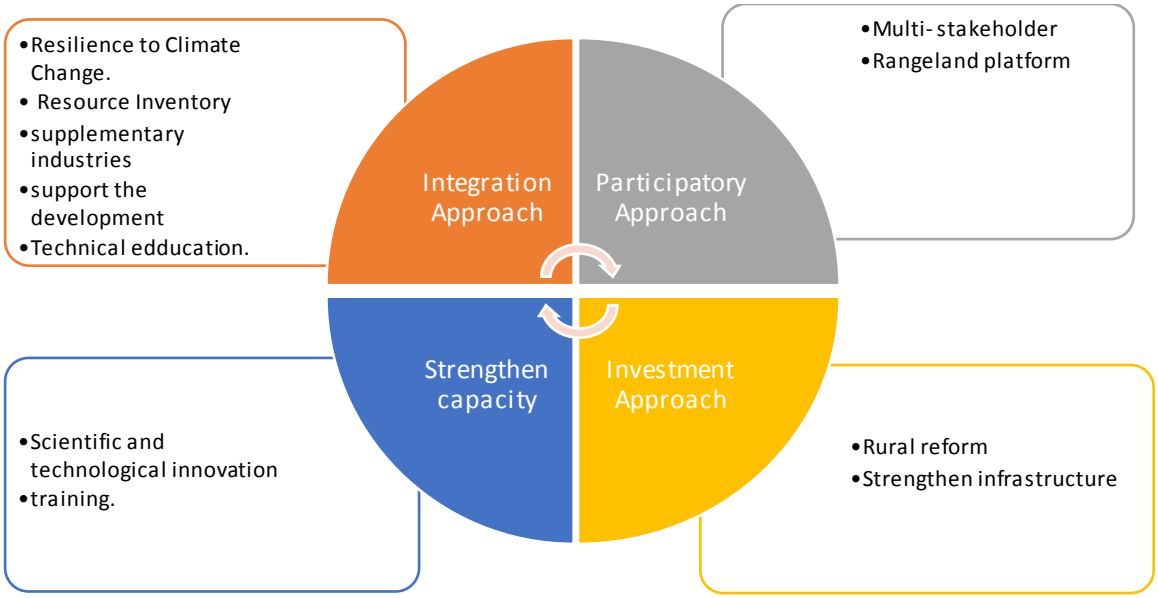

FIGURE 2: PROPOSED SOLUTION CATEGORIES FOR SRM

Part III: Policy formulation

Developing pastoral policies, legislations and institutional framework on SRM and LDN

Egypt owns rich biotic resources many of which are now under threat and some already extinct. The future development of the country must be a sign of the intrinsic value of its landscapes, ecosystems, habitats, populations, species and genes.

The new policy should be at the core of sustainable development by all stakeholders with the main player of herders.

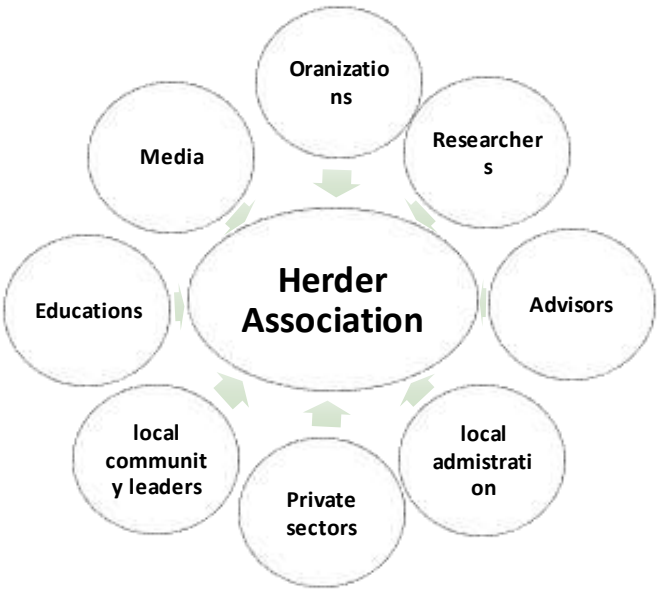

FIGURE 3: INTERRELATION OF MULTI-STAKEHOLDERS IN RANGELAND COMMUNITY

Guidelines for establishing an efficient strategy related to SRM and LDN

Overview.

The starting point for the development of any policy or regulatory framework and strategic plan is to define a clear idea of what it is supposed to achieve.

The objective of the policy measures is to help managers to integrate and apply more cost-effectively assessment, monitoring tools and transition models into their management decisions, while avoiding many of the pitfalls associated with the individual application of these tools. The milestone of successful strategy is to identify the involved stakeholders in the field and set up the national strategy and action plan. Followed by determination of responsibility for each of the stakeholders. By clearly defining how each of the tools can be used at each stage of decision making, the strategy helps apply the tools most effectively, while understanding where research is needed to improve or replace the tools. Finally, validation, reviewing and updating the policy at intervals.

Vision, goals and objectives

The vision and objectives of sustainable Rangeland Management strategy base on adoption of an integrated approach to achieve the Sustainable Utilization of Rangeland Resources.

The overarching goal of policy for the development and management of the rangeland should maintain and improve human and environmental well-being through achieving:

1. Greater contribution of rangelands to rural livelihoods (through - livestock production and other activities, both formal and informal) and to the national economy,
2. Greater equity in the way benefits from rangeland resources are derived, and
3. Better resource management to ensure the sustainability of different land-use activities.

The objectives of the policy should base on:

1. Efforts exerted at local level are the basic triggers for the national development.
2. Focusing on development priorities.
3. Achieve stability of the rangeland communities.
4. Achieve sustainability of the rangeland resources.

Principals of SRM strategy

The strategy principals should contain the followings:

- Implementation of rangeland management principles
- Monitoring the rangeland resource.
- Effective management and utilisation of plants and animals.
- Enhancement of soil condition.
- Manage the drought period.
- -Land use mapping.
- Traditional and heritage practices.
- Establishment of an institutional framework.

- Integration approach among stakeholders.

Rangeland's management action plan

Designing a grazing action plan is the first step for SRM. The grazing plan should include all components of the grazing and pasture system and serve as a road map for making management improvements. The amount of grass available is limited thus we have to plan to allow the full use of the resources available. There is an urgent need to balance between forage availability and livestock numbers in the rangeland areas

Management of rangelands and natural resources in general has increasing complex. There is an atmosphere of increasing expectations for conservation efforts associated with a variety of issues from water quality to endangered species, invasive plants or animals etc.

In the study area, we have to take an action regarding the unidirectional cross-program plans with both Barki sheep and Brki goats, in order to keep their .purity. Since the pure breed of both is highly adapted for the local environment with good production quality traits.

Increasing expectations

The complexity of rangeland conservation itself is set within an atmosphere of increasing expectations from our conservation efforts. Recently, the primary drivers of changing expectations is identified as: 1) advances in conservation theory, 2) emerging geospatial technology and 3) increasing accountability for management efforts; to this list we add the "democratization" of

decisions (Whaley 1993). Changes in expectations resulting from these catalysts include moving from site-scale conservation to focus on producing sustainable populations and landscapes, from active-based conservation (where more of everything is better) to science-based activities with measurable objectives (NEAT 2006) and from top-down administrative decision-making to public/interest group involvement at multiple scales. These increasing expectations do not relate to any taxonomic group or habitat type, while has general trend on natural resources conservation. The reality is that most managers and conservationists are embarking on a journey to manage complex problems at large spatial scales…and the question is "how can we collectively discuss this journey and develop a road map for success?"

A good framework and a keen understanding of the ecological processes underlying a complex problem do not necessarily translate into "on the ground" solutions, and even when they do, the spatial/temporal applicability of such "solutions" may be limited. For a framework to be useful in addressing complex problems, we have to be able to translate knowledge of ecological processes into management options in a way that accounts for barriers of management in both space and time (Thompson et al. 2001).

Rangeland management in space and time

When faced with limited management opportunities, one way to think about the task at hand is to identify practices that allow us

to shift the ecological space-time relationship in favour of increased restoration success. Shifting the ecological space-time relationship would be predicated on a process-based knowledge of the system, and would take the form of specific treatments aimed at modifying the ecological factors thought to be limiting the chances of restoration success in space and time.

Therefore, the strategy has to deal with the problems that exist in the study area such as the prolonged drought periods, climate change and water scarcity by innovation methods.

Adaptive management

Adaptive management (Figure 4) can be an effective approach to deal with complex problems. The idea of adaptive management is not new (Holling 1978, Schreiber et al. 2004) and there is published information on the practical application of the concept (e.g., Reever Morghan et al. 2006).

Adaptive management is a model that uses a process of planning, doing and learning to iteratively improve our knowledge of the ecology of the system, and allows us to evaluate both the success of management practices, as well as the validity of assumptions underlying management direction.

In this model, biological planning is used to identify and prioritize conservation needs, set objectives, and develop working models that link management actions to biological processes. This information serves as the basis for a spatially-targeted conservation design. Mechanisms for conservation delivery are then put together based on science and experience/intuition with both the natural and social systems in play. Follow-up monitoring

provides a reference for gauging the success of conservation planning and delivery. Research is primarily concentrate on testing the assumptions underlying biological planning and conservation design. This process results in an increased understanding of the ecology and management of the system of interest, and that increased understanding can be plugged back into the planning and design elements. The important point here is that an approach that embraces adaptive management helps us to overcome both of the "brutal facts" by: 1) laying out a framework for effective partnerships, and 2) using a planning, doing and learning model to create the feedback loop necessary to manage in an uncertain environment.

Adaptive management plan begins with building models that biologically link potential management actions with desired changes in the ecological system (biological & ecological planning). This information translate into a spatially explicit sustainable conservation design that indicates what will be done and where it will occur on the landscape. Following implementation, research and monitoring are used to document management impacts and assess the validity of assumptions made in the planning process. This process links different conservation elements into an iterative cycle of planning, doing and learning that allows for management in the face of uncertainty.

Adaptive Management Challenges could be persuades programmatic culture, conservation partner ecosystems, ecological frameworks and rangeland management in space and time.

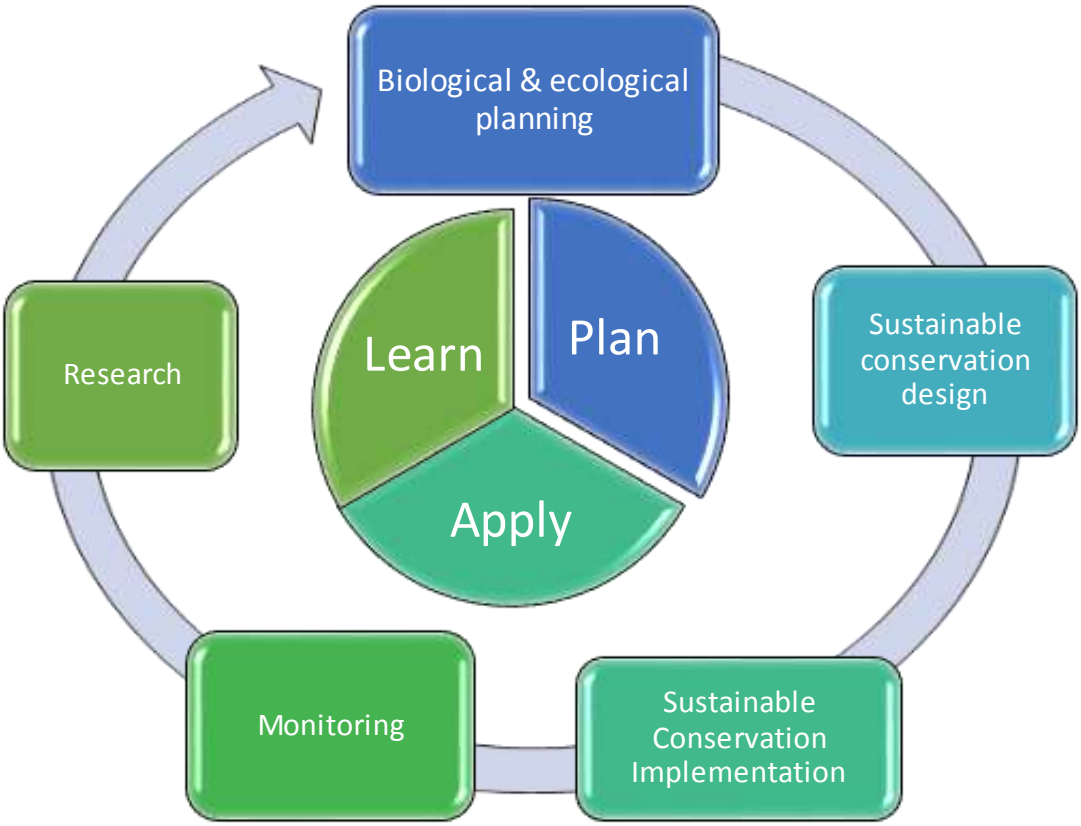

FIGURE 4: ADAPTIVE MANAGEMENT ACTION PLAN OF RANGELAND

To address complex problems science and management need to interact on a more continuous basis to iteratively refine both our knowledge of the ecology of the problem and the results of "on the ground" application of that knowledge.

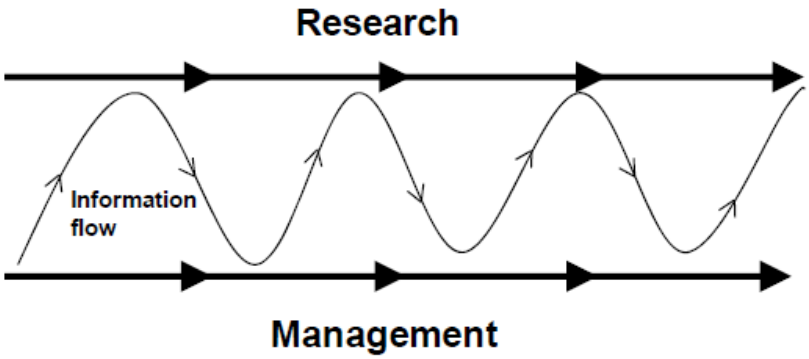

FIGURE 5: RESEARCH / MANAGEMENT RELATION IN SRM ACTION PLAN

Grazing protocols

A grazing protocols should be established based on soil types, size, distance from villages and water bodies, quality and availability of drinking water for animals, diversity of vegetation, wind direction and inter and intra-seasonal. The protocol could be addressed the following issues:

- **Sequencing grazing after the rains**: to ensure the growth stage of grasses, avoid leaches and slugs in the fields and also promote regeneration of the grassland for the next year.
- **Consciously controlling grazing**: carefully monitors by stock dispersal.
- **Sharing pastures**: sharing the grazing area among Herders' tribes, given the expected reciprocation of grazing rights.
- **Observing the livestock's understanding of vegetation**: the breed's ability to feed selectively on the diversity, different tastes and quality of grasses
- **Sharing knowledge and work**: for creation of community maintained water harvesting wells to ensure water for cattle even during a prolonged drought.

FIGURE 6: PROPOSED GRAZING PROTOCOL

Organizational framework aspect

Competent Authority & Control bodies

The competent Authority shall have the power of national coordination among the different bodies related to the rangeland, pastures and feed supply over Egypt as well as international cooperation in the context. This responsibility might be for a proposed General Administration for rangeland Sustainability at Ministry of agriculture and land reclamation. The proposed General Administration should have pillars at Desert Research Centre, Agricultural Research Centre, Ministry of Environment and the local administrations. Some points must be taken in consideration as follow:

- Establish local authority of all herders' stakeholders (union or association) to protect the legal rights of the region/community over range resources.

- Grant full authority to local administration councils and/communities to manage and protect their rangeland.
- Setup a platform (NGO) to ensure full participation of all herders' stakeholders and sustainability of rangelands.

National Rangeland Committee

The competent authority will supervised by a National Rangeland Committee (NRC) consist of different Egyptian stakeholders to achieve the following:

1. Advice the Minister on all policy matters and development action plans related to rangelands and in coordination with national policies relating to rangelands;
2. Advise the Minister on matters relating to international and regional cooperation for the sustainable management of rangelands resources
3. Advise the Minister on regulations, orders, decrees, schedules or notices accompanying this Law and in particular on matters related to the powers and functioning of the Authority and the procedures for the sustainable management of rangelands resources;
4. Designate a National Focal Point for rangeland

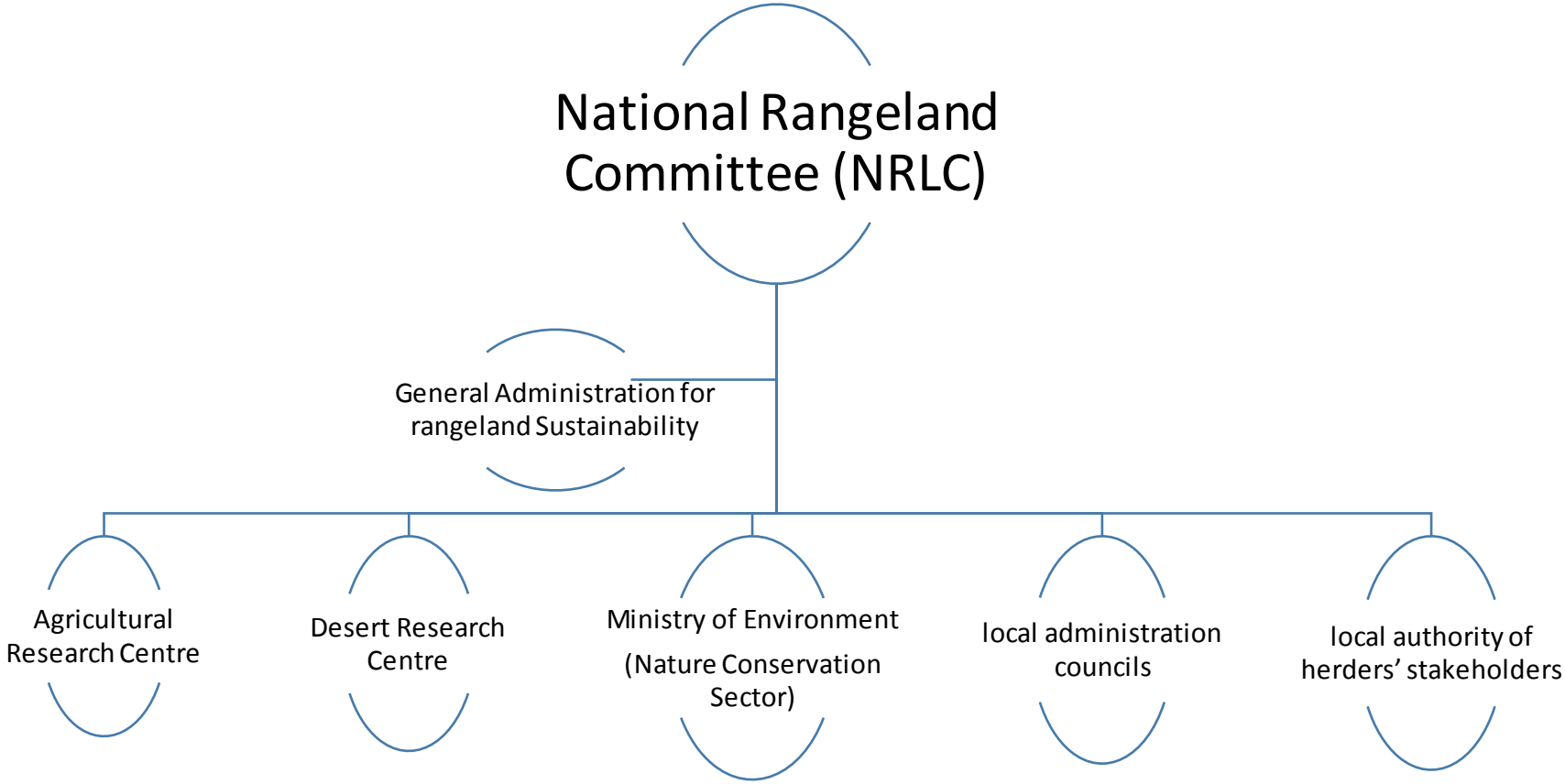

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FIGURE 7: PROPOSED NATIONAL RANGELAND COMMITTEE

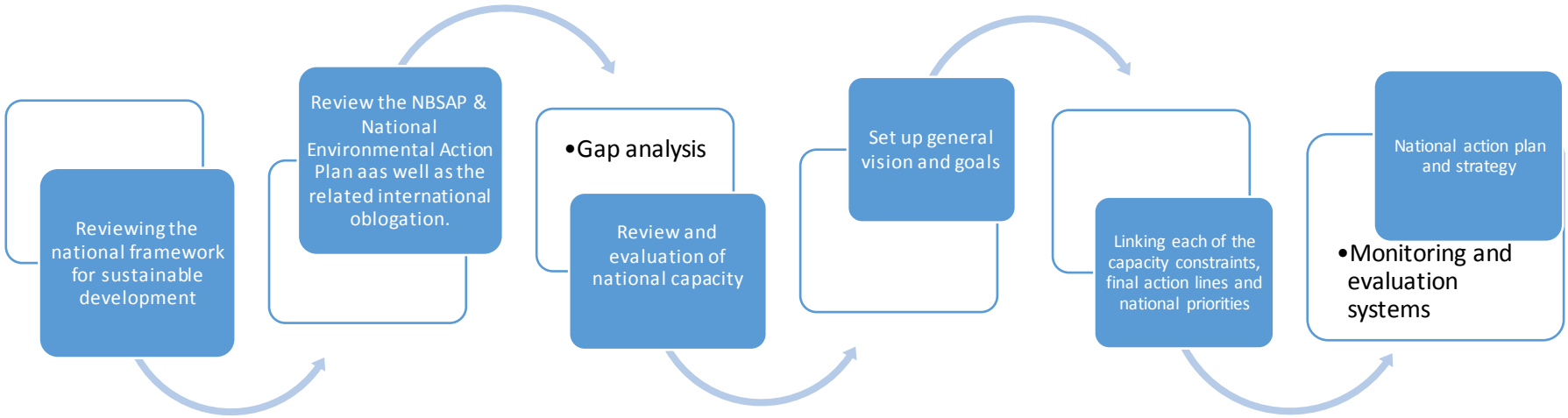

FIGURE 8: PROPOSED REVIEWING THE NATIONAL FRAMEWORK FOR SUSTAINABLE DEVELOPMENT.

Legislations aspect

A proposed legislative of sustainable rangeland management requires brevity and focus on the problems and solves and the consequences of not acting on it (Adherence to the principle of rights and duties). It must integrate and align with other national legislations as well as the religious value, custom law and traditional values & heritages practices of local community as well as takes into account the regional and international obligations in the context. The legislation shall promote the sustainable utilization and development of rangeland.

Traditional & heritage knowledges aspect

The products of the rangeland are renewable; thus, the ranges are capable continuously to provide goods and services such as forage, fibre, meat, milk, water, areas for recreation etc. These resources consider an integral part of their traditional heritage, which adds special importance to their value.

Unregulated use of off-road vehicles particularly for recreation and tourism has increased dramatically in recent years especially in the sea coastline. This leads to severe degradation of vegetation, disruption of top soil, and long term scarring of the landscape.

Livestock species grazed on the pasture are different in their effect on the pasture land. Camel grazing does not cause degradation in the rangeland because of the non-occurrence of overgrazing of grazed plants. While, sheep or goats cause more damage when

grazing because they eat large quantities of herbal plants especially the newly developed herbs, which are difficult to re-grow.

The agro-pastoral ecosystems dominated in the study area are suitable for sustainable indigenous livestock production systems, especially based on local breeds of small ruminants (Barki sheep and Barki goat breeds). Agro-Pastoralists provide services that have economical and socio-cultural importance to the country. Indigenous livestock breeds can be used by smallholders as a tool against poverty. In addition, livestock activities play multiple roles on reducing vulnerability of fragile environments and their roles on diversification and intensification.

Losing of indigenous and traditional knowledge, innovations and practices can reduce the environmental and economic sustainability of the rangeland, so documentation and conserving of them become an argent need to be available for the new generation.

In rangeland management for the purpose of conserving biodiversity and reducing poverty, it is important to ensure that appropriate policy frameworks are developed to support and protect local knowledge, innovations and practices.

The Akwé Kon Voluntary Principles of the Convention on Biological Diversity (Convention Secretariat 2004) may be beneficial to the pastoral sector by providing methods and tools to ensure that indigenous and traditional knowledge, innovations and practices do not become extinct as a result of development projects or new policy approaches. Some of these guidelines include:

a. Establish an agreed process to record the views and concerns of indigenous members and local community that may be influencing them;
b. Identify and provide adequate human, financial, technical and legal resources to ensure the effective participation of the indigenous and local community;
c. Concluding agreements on mutually agreed terms between the proposed development supporters and the affected indigenous or local communities;

Developing an action plan to protect, preserve and promote pastoral communities' indigenous knowledge and mainstream it into the Governorate's macro-economic framework. Development of this plan will involve identifying, documenting and gathering local traditional knowledge practices from areas including pasture, agriculture, livestock, and poultry, housing models, health, culture, and religious beliefs, and then feeding them into a legislative framework.

Economic aspects

Rangeland is one of the most valuable ecosystems, providing a range of critical environmental, economic and social benefits. They provide food, feed and livelihoods in addition they support biodiversity. Ensuring a sustainable future for rangeland can help countries achieve multiple economical, societal and nutritional objectives, aligning with and supported by policies implemented at the local, national, regional or global levels. The benefits from conserving and restoring rangeland can also help countries to

achieve some targets and indicators associated with Sustainable Development Goals (SDGs).

Promote economic incentives or integrate range into sustainable national plans as a source of local income from SRM activities.

Furthermore, sustainable management of rangeland ecosystems is a critical component of sustainable 'green economies', as the services provided by these ecosystems underpin diverse economic activities and sources of revenue. Inclusion of rangeland management, conservation and restoration should be a critical component of sustainable green economy strategies moving forward.

Livestock farming systems have experienced important changes due to the social and political changes that have affected livestock management (settlement, mobility, and transhumance), land tenure and land use, the sustainability of whole production systems, and the increasing demand for animal products that are linked to the demographic growth.

Livestock plays an important role in adding value to the resources of these environments. However, high competition on animal products at the international level reduces profitability. Egypt in the current time imports meat from the international market with a low price with low quality compared with the local meat that affect negatively on the local meat marketing. While land access and comparative valorisation prospects threaten the social and environmental sustainability of these systems and their future. This highlights future challenges in the study area concerning the efficiency of this system and its contribution to food security.

TABLE 2: RANGELANDS ECONOMIC BENEFITS MODULE.

Type of rangeland system		Characteristic
Subsistence rangeland system	Without profit potential	• Small number of livestock. • High family labor density. • Limited access to market. • Barter manner • Low soil vegetation. • Low rainfall. • Low water quality. • Remote location. • Family production system
	With profit potential	• Appropriate number of livestock. • Limited access to market. • Cash manner. • Limited financial capital. • Limited access to infrastructure. • Moderate soil vegetation. • Low scale production system.
Commercial rangeland system		• Appropriate financial capital. • Appropriate access to complementary feed. • Appropriate access to infrastructure. • Large production system.

Subsidy aspects

Many countries follow subsidy policies that target the agricultural sector, take various forms and apply it in multiple ways. It aims to stimulate production to achieve food security or increase export rates.

f) Measures to optimize subsidy of the rangeland sector:

- Reducing the cost of production requirements and directing support for the development of the grazing sector.
- Support the energy prices in the feed production sector.
- Maintenance of rangeland resources and support establishment of pastoral protectorates.
- Supporting the cultivation of cereal crops especially barley.
- Issue and amend legislation related to the protection of rangeland resources and regulates the exploitation of available resources.
- Capacity building of workers in the agricultural sector.
- Provide and improve the extension services, phytosanitary and animal health measures.
- Implementing programs and projects for the development of the rangeland sector.

Social aspects

- The social relations that link pastoralists with their government and citizens are an important factor in their development. With the efforts of educating the pastoralists, improving their living conditions and respecting their religious values, customs and traditions, as pastoralists have become better represented, which enhances their social relations. This will positively influence their economic status and welfare.

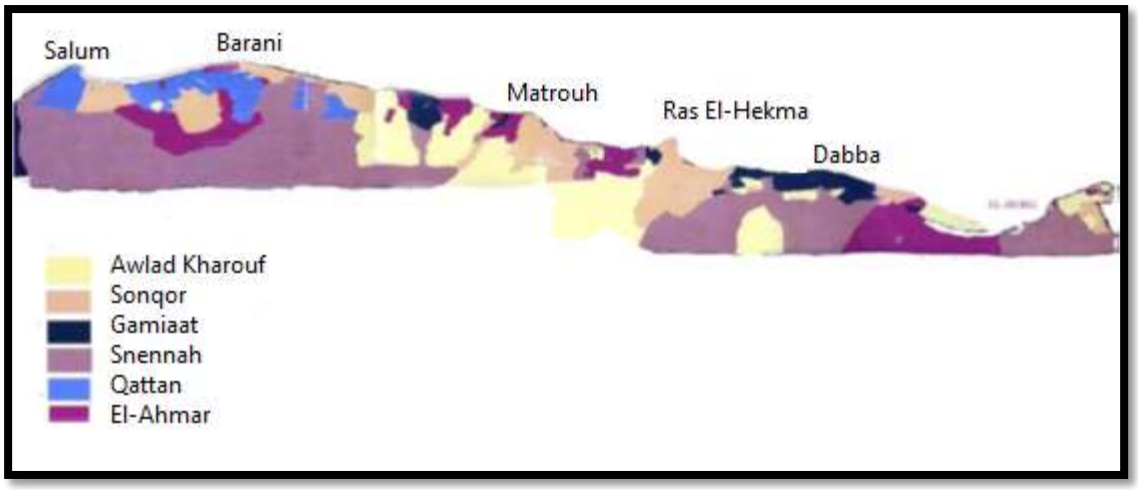

FIGURE 9: TRIBAL LAND ALLOCATION IN MATROUH GOVERNORATE (SOURCE: CARRIED OUT BY LAND USE PLANNING AND ENVIRONMENTAL MONITORING PROJECT (LUPEM), CITED BY EL MINIAWY ET AL. 1990)

- The local community is a nomadic or semi-nomadic which tends to be sedentary due to the government policy. The process from semi-nomadic to sedentary began about 40 years ago when the Bedouins began to build stone houses. This does not mean that the mobility of house dwellers for grazing is affected on the entire family of tent dwellers move with the “bait” after the barely season. The population in the most sedentary; a fact is probably promoted by registered land holdings.
- Excluding the pastoralists from major development efforts by supporting non-pastoralists and those who compete with pastoralists for resources, such as those who are working in tourism at the sea coastline and building tourist villages /camps on the sea line leads to their marginalization and rangeland resources degradation.
- Pastoral youth today stand at the intersection of opposing issues– urban versus rural, wage labour versus subsistence labour, statutory versus customary, and so on. They face

increasing opportunities as well as threats. While on the one hand growing recognition of pastoralism and the penetration of technology provide favourable conditions, on the other, loss of resources and exclusion from policy dialogues deter them from a future in pastoralism. Despite their importance to the long-term sustenance of pastoralism, the voice of pastoral youth remains unheard.

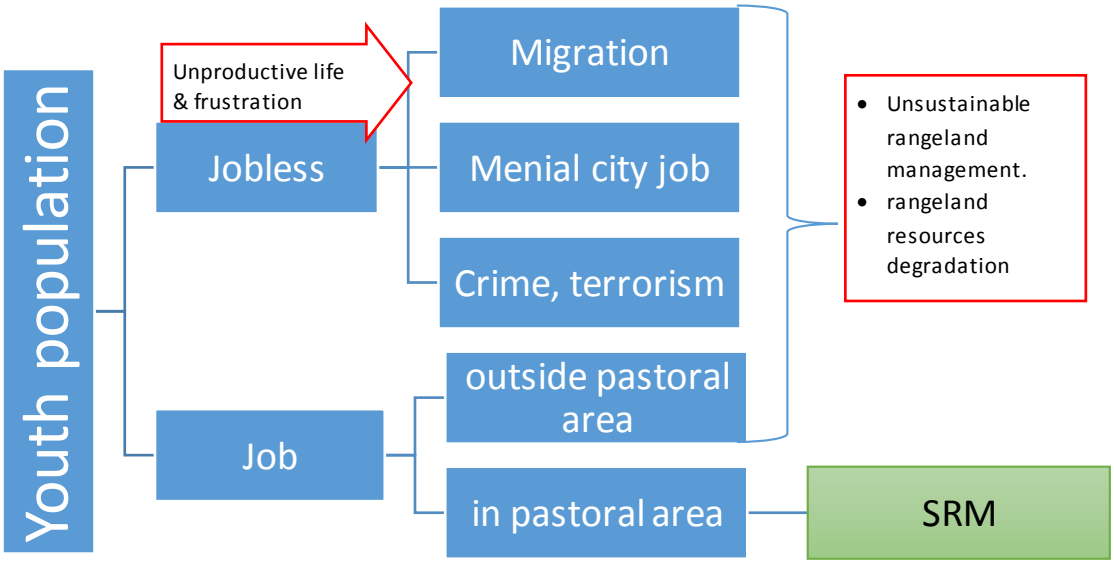

FIGURE 10: YOUTH POPULATION CHART

- Education and technology provide two important opportunities for pastoralist youth to adapt pastoralism to the changing times. So a Policy Framework for Nomadic Education must be established for pastoralism young generation. The target education for them must fit their actual needs to help them for getting the skills that they need in their work environment.

Educational aspects

Initiate pastoral-education model

The pastoral-education school will help this group of people mainstream of formerly predominantly rural society, permanently settlement inside of the pastoral. Therefore, the improvement and development of the education sector in pastoral areas need to be prioritized in the Matrouh governorate.

Education efforts should focused on the younger generations rather than the current labouring generations (parents and grandparents) through providing them with a good education in order to create access to more economic opportunities for them in pastoralism areas.

Thus, the long-term sustainable development of the pastures would be achieved based on an active and permanent educational system.

There is a need to develop a curriculum with topics relevant for pastoralism.

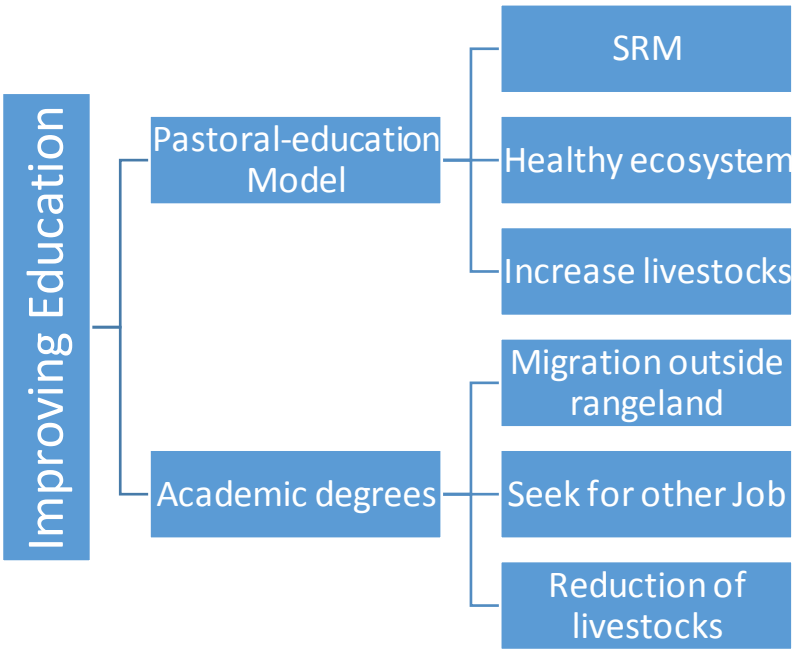

FIGURE 11: IMPROVING EDUCATION CHART

Technical & innovation aspects

Communication through mobile technology can be used to access pasture, water, veterinary services, market and security. It provides safeguards against the vagaries of nature and market by closing information gaps. Mobile banking provides a safe saving mechanism for those who cannot access conventional financial services and an electronic money-transfer system. Mobile banking could be applied easily if the pastoralists trained will to use this technology.

Information access enabled by technology allows pastoralists to keep informed, to better organize themselves and be represented in policy processes. But technology also has its limitations; rangelands often have unreliable networks, lack electricity and also vendors to buy goods.

Innovations such as solar powered cellular charges allow pastoral youth to remain connected even while migrating.

Governments should make greater efforts to develop infrastructure to support the telecommunication of pastoralists.

Rangeland resources aspects

Rangeland inventory is information collected to document and describe the existing resource status within a management unit. In rangeland situations are likely to involve vegetation types, range sites, range condition, carrying capacity, soil types, utilization patterns, topography, streams, and habitat assessments for wildlife, livestock and improvements such as roads, water points, and fences. Data collected from a range of inventory provides a valuable baseline against which to compare responses through monitoring. Monitoring is usually based on observations of key areas and key vegetation attributes carefully selected to meet the objectives of the program.

Inventory and monitoring have always been central themes of rangeland management, as tools to assist in making wise decisions according to the productive potential of the land resource, such as, carrying capacity, utilization levels, grazing systems, animal and plant genetic resources and range improvements. Today under the philosophy of multiple use and increased legislative demands, however, inventory and monitoring programs serve a greater variety of interests and groups. Artz (1984) enumerated the following objectives of inventory and monitoring programs.

1. To develop high quality land use plans.
2. To allocate resources to uses and users.

3. To assess current conditions and to monitor conditions in the future for measurement of progress towards goals.
4. To assess impacts of proposed land use actions.
5. To assess capability or potential of resource production under various levels of management.
6. To establish a common basis of measurement between various land types and ownerships.
7. To assist in defending decisions in hearings and court actions.
8. To satisfy legal requirements.

Climate change & ecological aspects

Egypt recognizes its own vulnerability to climate change in vital areas threatening the sustainability of its natural and socioeconomic systems. Egypt is among the first Arab countries joint the cooperative global efforts to confront climate change threats. Indeed, since the Rio de Janeiro Earth Summit in 1992, Egypt ratified the United Nations Framework Convention on Climate Change (UNFCC) in 1994 and accordingly Egypt has prepared a National Action Plan on Climate Change to coordinate its efforts to face this serious and important challenge. Moreover, in 1999 Egypt signed the Kyoto Protocol (which aim to help member parties to reduce their emissions).

Natural disasters play a major role in agricultural development and the economic cost associated with all natural disasters has increased. Natural disasters are classified into hydro-meteorological and geophysical disasters. The Impacts of droughts and bush fires on agriculture and rangeland are notable with suitable examples. While the predominant impacts of these disasters are negative,

there are some positive impacts as well. Environmental degradation is one of the major factors contributing to the vulnerability of agriculture and rangelands to natural disasters because it directly magnifies the risk of natural disasters. There is an urgent need to mitigate the effects of hydro-meteorological disasters through improved use of climate and weather information and forecasts, early warning systems, and appropriate methods of management of land and natural resources (Qiu *et al.,* 2017).

In spite of the fact that Egypt is highly affected by climate change, there are no accurate studies on the negative impacts that could occur in Egypt due to climate change. However, the sea level rise threatens Egypt's long coastal stretch on the Mediterranean Sea with potential damages to the ecosystem in general. Moreover, there are predicted socioeconomic implications due to human migration, land loss and soil salinity. It expects that the environment and biodiversity might be affected by climate change and deterioration of environment.

Climate change is one of the factors affecting pastoral and agro-pastoral communities and one of the challenges needs to address. While climate change is a global phenomenon, its negative impacts are more severely felt by fragile communities in developing countries, especially in the pastoral and agro-pastoral areas, who rely heavily on the natural resource base for their livelihoods. rainy-agriculture and livestock keeping are amongst the most climate-sensitive economic sectors and rural poor communities are more exposed to the effects of climate change.

Climate change comes as an additional factor affecting the livestock sector in the study area that is already highly dynamic and facing

many challenges. Climate change creates a number of problems in many areas such as animal husbandry (housing, feeding, health care, etc.), water resources, soil degradation and rangeland vegetation, which will threaten the sustainability of agro-pastoral livestock production systems. At the same time, many of the specific challenges associated with climate change (as high temperatures, disruption of feed supplies, disease outbreaks, etc,) as well as the general unpredictability it brings to the future of the livestock sector, highlight the importance identify the mitigation and adaption policies options for the future.

Climate change is an imminent threat facing the world in the 21st century and beyond. The consequences of increased temperatures, changes in rainfall patterns, extreme weather events, and changes in biodiversity will have significant impacts on pastoral and agro-pastoral communities economies, livelihoods and development in general.

Climate change should be taken in account in the coming strategy and action plans.

Sustainable Development Goals aspect

Rangeland ecosystems can directly or indirectly support progress towards most of the United Nations SDGs and are essential to the delivery of targets relating to climate change and food security. The benefits from conserving and restoring rangeland resources can share achieve 20 targets and 23 indicators associated with 8 SDGs, including SDGs 1, 2, 6, 7, 11, 12, 13, and 15 (TABLE 3). Conservation and restoration of rangeland can thereby provide countries with multiple benefits

and help them achieve commitments that align with their national targets.

TABLE 3: SHARING OF RANGELAND ECOSYSTEM IN ACHIEVEMENT OF SUSTAINABLE DEVELOPMENT GOALS.

Indicators	Targets		Targets	Indicators
15.3.1, 15.5.1, 15.A.1	15.3, 15.4, 15.A		1.5, 1.A, 1.B,	1.5.2, 1.A.1, 1.A.2
13.2.1, 13.3.1, 13.3.2, 13.B.1	13.2,13.3, 13.B		2.4, 2.5	2.4.1, 2.5.1
12.2.1, 12.2.2, 12.7.1, 12.8.1,	12.2, 12.7, 12.8,		6.4, 6.B	6.4.1, 6.4.2, 6.B.1
11.4.1, 11.A.1, 11.C.1	11.4, 11.A, 11.C		7.B	7.B.1

Aichi Biodiversity Targets and the post-2020 biodiversity framework aspects.

Many of the five strategic goals of the CBD's Strategic Plan for Biodiversity 2011–2020 and its 20 Aichi Biodiversity Targets are directly or indirectly relevant to rangeland.

These goals in particular are; those addressing the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society (target 1, 2, 3 &4). Goal of Reduce the direct pressures on biodiversity and promote sustainable use (target 5, 8 & 9). Goal of improve the status of biodiversity by

safeguarding ecosystems, species and genetic diversity (target 11, 12 & 13). Goal of enhance the benefits to all from biodiversity and ecosystem services (target 14, 15 & 16). Goal of enhance implementation through participatory planning, knowledge management and capacity building (target 17, 18, 19 & 20).

Rangeland ecosystem can support the delivery of countries' national biodiversity strategies and action plans (NBSAPs) and national reports.

National and Aichi Targets compatibility.

Table 4: National and Aichi Targets compatibility

Theme	Aichi targets	National targets
ENDEMIC AND ENDANGERED SPECIES	5: Habitat loss halved or reduced. 12: Extinction prevented	2: By 2020, develop and implement unified Egyptian methodology for the identification and monitoring of priority of all components of biodiversity according to the international standards to ensure the maintenance or rehabilitation of 50% of our most threatened species focusing on mammals and reptiles to a favorable conservation status.
ALIEN INVASIVE SPECIES (AIS)	9: Invasive alien species prevented and controlled.	4: BY 2030, all AIS and pathways are identified and prioritized with measures in place to update and verify these pathways with national programs for 30% of identified pathways to control and manage AIS
AGROBIODIVERSITY	7: Sustainable agriculture.	5: By 2020, conservation of national resources through the adoption of ecological sustainable agricultural management practices
TOURISM	3: Incentives reformed. 4: Sustainable consumption and production.	6: By 2018 apply CBD tools to monitor and control the impact of tourism on biodiversity, in particular in protected areas and vulnerable ecosystems.
LAND USE PLANING	3: Incentives reformed.	8: By 2025, negative effect of different sectorial policies (land-use planning, transport, energy, uncontrolled urbanization, etc.)on priority elements of biodiversity are minimized, and measures to correct these effects are applied through developing and implementing land use plans.
ACCESS TO GENETIC RESOURCES AND	13: Genetic diversity maintained.	11: By 2020, effective operational biosafety and ABS mechanism (measures and legislation) in place, in

SHARING OF BENEFITES		accordance with national laws and relevant international obligations and serving as national priorities relating to biodiversity.
SUSTAINABLE USE OF TERRESTERIAL WILEDLIFE RESOURCES (FUANA AND FLORA)	3: Habitat loss halved or reduced.	12: By 2020, to promote sustainable hunting and harvesting through adequate planning, restoration and protection of key biological resources.
ADDRESSING DESERTIFICATION	15: Ecosystems restored and resilience enhanced.	13: By 2030, research and implementing measures and strategies to strengthen local-level biodiversity resilience to desertification
CLIMATE RELATED BIODIVERSITY ADAPTATION AND MITIGATION	15: Ecosystems restored and resilience enhanced.	14: By 2025, investigate and monitor all the effects of climate change on biodiversity and ecosystem services.
TRADITIONAL KNOLAGE AND INTERDISCIPLINARY RESEARCH	2: Biodiversity values integrated. 18: Traditional knowledge respected. 19: Knowledge improved, shared and applied.	15: By 2020, the knowledge, the science base and technologies relating to biodiversity, its values, functioning status and trends, and the consequences of its loss, are improved, widely shared, transferred, and applied.
PUBLIC AWARENESS, EDUCATION AND TRAINING	1: Awareness increased. 2: Biodiversity values integrated.	16: By 2020, enhancing environmental awareness of Egyptian of the importance of biodiversity and ecosystems services through integrating environmental themes into university and school curricula, promoting green media, and supporting youth clubs and eco- industry.
VALUATION OF ECOSYSTEM GOODS AND SERVICES	1: Awareness increased. 2: Biodiversity values integrated. 17: NBSAPs adopted as policy instrument.	17: By 2018, biodiversity values are promoted and integrated into national planning process and mechanisms to support their incorporation into national accounting and reporting system to be developed.
LEGAL AND INSTITUTIONAL FRAMEWORK	2: Biodiversity values integrated. 17: NBSAPs adopted as policy instrument.	18: By 2018, ensure that the national strategy is supported by effective legislation and institutional frameworks to improve its enforcement.
NBSAP IMPLEMENTATION	20: Financial resources all sources increased.	19: By 2017, proper NBSAP and associated resource mobilization are in place, in addition to establishment of the national biodiversity committee to ensure periodic evaluation of NBSAP.
FINANCING THE IMPLEMENTATION OF THE NBSAP	20: Financial resources all sources increased.	20: By 2020, adequate financial resources for the effective implementation of the strategic plan for Biodiversity 2011-2020 has been mobilized of from all sources, and increased substantially from the current levels.

Part IV: Policy iteration and legal drafting

Draft policy related to SRM and LDN.

A new proposed legislation of sustainable rangeland management must address the following:

- Sustainable management of rangeland.
- Integrate rangeland resources into protected areas legislation.
- Establish customary law council to protect the rights of communities and pastoral community's indigenous knowledge.
- Protect IPRs over wild and cultivated material of rangeland.
- Regulate access to GRs
- Provide incentives to herders to maintain biodiversity, environmental system and promote production.

Draft state law of the Sustainable Rangeland Management land degradation neutrality

Part I - Scope and objectives

Article 1 - Preliminary

This Law cites as the Sustainable Rangeland Management Law (herein refers to as the “Law”) and will come into force on the date of publication in the Official Gazette.

Article 2 - Scope & implementation

This law will apply to sustainable management of rangeland resources and regulates licence for pastoralists over the rangelands through:

- The provisions of this law shall apply to all range lands defined by maps prepared by the competent department after their approval by the General Survey Authority, the Ministry of Defence and the Ministry of Environment.
- The Minister may in consultation with the competent authorities, amend these maps whenever the need arises.
- The rangelands mentioned in item (1) are limited to the lands suitable for natural grazing plants used for feeding and are known to the rangers.

Article 3 - Objectives

This law aims to regulate and develop natural pasture affairs through:

- Maintenance of pastoral resources in the natural pastures and organizing their sustainable utilization.
- Organizing grazing according to scientific principles.
- Protection and sustainability of natural plants.
- Carrying out studies and research to develop and protect natural pastures.
- Providing the necessary services for the natural pastures, in coordination with the relevant authorities.

Part II – Definitions

Article 3 - Definitions

- “The Minister” means the Minister of agriculture and land reclamation who responsible of the implementation of this Law.
- “Traditional Knowledge and Practices” means knowledge, understanding, practices and technologies created, developed or maintained by pastoralists and local communities related to sustainable management of rangelands.
- “Rangeland” means lands that are eligible for range plants, used for feeding, and known among the pastoralists, according to the designed maps.
- “Authority” means the authority designated by this Law as the autonomous entity responsible for implementing this Law.
- “National Rangeland Committee” means the national committee established under article 6 of this Law.

Part III - Administration

Article 5 - Minister responsible for the implementation of the Law

- The Minister of Agriculture will be responsible of the implementation of this Law.
- The Minister may make, amend, or revoke regulations, orders, schedules or notices, which he/she considers appropriate to give effect to any of the purposes of this Law.
- The Minister has the right to take adequate measures to organize grazing and develop rangelands, as required by the Authority, to protect national income and the natural resources, taking into account relevant treaties and agreements.
- The Minister or whomever he authorizes in coordination with the Ministry of the Interior may prevent grazing in some areas of natural pastures for a specific period of time in order to preserve, maintain, improve and sustain pastures.

Article 6 – National rangeland Committee

- A National rangeland Committee is hereby established, to consist of:

(a) five staff members of the Ministry of Agriculture, including the Head of the Authority ; and

(b) a representative of each of the following:

- The Ministry responsible of the environment;
- An institution of public or private higher education;
- An institution of public agricultural research;
- An association of pasture;
- An association of livestock;
- An association of trade;
- Local pasture communities.

Article 7 - The missions of the committee

The national rangeland Committee will:

- Advise the Minister on all policy matters related to rangelands and on coordination with national policies relating to rangelands;
- Advise the Minister on matters relating to international cooperation for the sustainable management of rangelands resources
- Advise the Minister on regulations, orders, decrees, schedules or notices accompanying this Law and in particular on matters related to the powers and functioning of the Authority and the procedures for the sustainable management of rangelands resources;
- Designate a National Focal Point for rangeland

Article 8 - The competent Authority

(1) A General Administration for Sustainable rangeland is hereby established at Ministry of Agriculture and Land Reclamation.

(2) The General Administration for Sustainable Rangeland shall be responsible of carrying out the functions assigned to the Authority under this Law, as may be further specified by ministerial decree.

Article 9 - Competencies and powers of the competent authority

The competent authority will have the following powers: -

- Regulating grazing and developing the productive capacities of pastoral resources and reducing their degradation.
- Developing sustainable management of the pastoral areas.

- Cultivation of forage bushes using modern techniques and improve the diversity of vegetation by introducing new feed species.
- Improve the socio-economic conditions of pastoralists.
- Conserve rangelands and Protection against overgrazing.
- Preserving the biological diversity of plant and animal genetic resources and expanding the establishment of natural pastoral protectorates.
- Monitoring environmental changes and combating desertification.
- Public awareness about adopting good behaviour towards rangeland.
- Development of the nomadic sector and attention to rural women
- Organize and manage water
- Imposing fees for the use of rangeland for common & private protections.

Part IV - Conservation and sustainable use of Rangeland

Article 10 - Sustainable Rangeland Management

- The Authority, taking into account the guidance of the National Rangeland Committee and in collaboration with other bodies as appropriate, shall develop programmes and activities with the aim of sustainable rangeland management.

Article 10 - Acts prohibited within the rangelands

(1) It is forbidden to dispose rangelands in any form of disposal of property or restriction of it except after the approval of the competent Minister and based on the recommendation of the competent authority.

(2) The following acts are prohibited within rangelands: -

- Destroy rangelands in any way or drive vehicles outside the authorized roads on rangelands.

- Entering or remaining in common or private protection with the aim of grazing without permission.
- Removing, collecting and exploiting fodder trees and plants within the common or private protection without permission.
- The use of water resources within common or private protection for purposes other than grazing.
- Damage to forage crops, the introducing of any materials or plants harmful to the rangeland, throwing or burying waste, or setting fire to, or any of the works that help to this.

Article 12 - Fodder seeds & seedlings

When producing, distributing and importing fodder seeds & seedlings, the regulations issued by the General Seed Administration of the Ministry of Agriculture must be followed.

Article 13 - Manufacture of agricultural waste

- Agricultural waste considers as fodder and it should not be wasted or burned.
- Agricultural waste that is not stored considers a pasture for all.
- Prohibition of uproot trees or fodder resources, and use them as waste to manufacture untraditional feed.
- Prohibition of using Hay industry for commercial purposes.

Article 14 - Granting grazing and investment licenses:

- The relevant pastoral agency determines a rental allowance for artificial pastures for each head of livestock.
- The relevant pastoral agency grants individuals, public institutions, and companies licenses to invest in natural and artificial pasture crops after paying the prescribed fees.

Part V - Pastoralists' Rights

Article 15 - Protection of pastoralists' rights

- The State recognizes and protects the rights of pastoralists and local communities to their traditional knowledge, innovations and practices.
- Pastoralists and local communities shall have the right to participate in making decisions, at the local level, on matters related to the sustainable management of rangeland

resources, including through mechanisms to be established by the Authority.

- The Authority shall develop a scheme for the protection of pastoralists' rights, including measures to compensate concerned pastoralists at dry seasons and Epidemic diseases.
- The pastoralist or the Herders have the right to graze his livestock in the rangeland of the natural and artificial in the desert unless they are covered by the provisions of the temporary prohibition in this law.
- The pastoralist or the Herders have the right for veterinary services and extensions from the related administrations.

Part VI – Enforcement actions

Article 16 – Offences and Penalties

Any Person who contravenes any provisions of this Law will be guilty of an offence and will be subject to penalties that may include:

- written warning;
- fines;
- cancellation of the pastoral permit;
- confiscation of equipment or anything used in the perpetration of the offence;
- Permanent ban from the pastoralism in some or all regions.

Article 17

The fact that an act contrary to the provisions of this law is a crime whose penalty is more severe under another law, so the most severe text applies.

Conclusion & Recommendation.

Rangelands produce a wide variety of goods and services desired by the community, including livestock forage, wildlife habitat, water, mineral resources, wood products, wildland recreation, open space and natural beauty. The geographic extent and many important valuable renewable resources of rangelands make their proper use and efficient management vitally important to people everywhere especially in the fragile communities in the study area. It is very important to establish an efficient development strategic plan for the rangeland in the short, medium and long term to be able to maintain healthy ecosystems for rangeland development in the target areas or at the national level.

In order to refine and achieve sustainable range management (SRM), the data and information about the current situation in the study area, we need more accurate data and information from the field for making informed decisions concerning the rangeland.

To easily establishing a development strategic plan for rangeland restoration and management, the regional and international agreements, treaties, and protocols related to SRM and LDN have to be studied carefully. In order to make the plan in line and compatible with these agreements.

In parallel with studying the regional and international agreements, treaties, and protocols related to SRM and LDN, the national policy, legislation, and regulation related to SRM and LDN have to be studied.

Based on the studies of baseline and the current situation, there are no specific legislation, strategy and action plans specifically concern to the sustainable management of the rangeland in the national, governorate or locations level, so there is an urgent need for preparing an efficient development strategic plan and proper legislation as soon as possible.

The grazing ecosystem exposed to different types of stresses such as overgrazing, uprooting, woodcutting, aridity, different types of human activities, and erosion of soil surface, therefore proper, and innovative interventions are required as soon as possible since the livestock production is the main economic activity in the study area.

There is an urgent need to establish an efficient development strategic plan related to SRM and LDN at the national, governorate and locations levels. Also, herders, breeders and producers need to congregate into larger bodies for a better business organization. Also, public awareness is a key gap that needs to be covered. Besides that there is an urgent need for developing pastoral policies, legislations and institutional frameworks on SRM and LDN. In order to achieve these objectives, the current study contains a guideline for establishing a development strategic plan and Draft state law of the Sustainable Rangeland Management land degradation neutrality.

Rain-fed agriculture in the study area is generally risky due to the high spatial and temporal variability in the rainfall level. So it is not recommended to expand the within cultivated area.

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