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Promoting Regional Cooperation in Reversing Land Degradation in the ESCWA Region: A Working Paper

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CONTENTS

ACRONYMS

ADMA	Arab Desertification Monitoring and Assessment network
ACSAD	Arab Center for the Studies of Arid Zones and Dry lands
ADPC	Asian Disaster Preparedness Center
ALECSO	Arab League Educational, Cultural and Scientific Organization
AOAD	Arab Organization for Agricultural Development
ASSOD	Regional Assessment of the Status of Human-induced Soil Degradation in South and Southeast Asia
AVHRR	Advanced Very High Resolution Radiometer
BGR	German Federal Institute for Geosciences and Natural Resources
CEDARE	Center for Environment and Development in Arab Region and Europe
CIHEAM	International Center for Advanced Mediterranean Agronomic Studies
CNRS-CRS	National Council for Scientific Research-Center for Remote Sensing (Lebanon)
EC	European Commission
GCC	Arab Gulf Cooperating Countries
GEF	Global Environment Facility
GEO	Global Environment Outlook
GIS	Geographic Information System
GLASOD	Global Assessment of the Status of Human-Induced Soil Degradation
GLCN	Global Land Cover Network
GM	Global Mechanism
GORS	General Organization for Remote Sensing (Syria)
GTZ	German Technical Aid Agency
ICARDA	International Center for Agriculture Research in Dry Areas
IDRC	International Development and Research Center (Canadian)
IFAD	International Fund for Agricultural Development
IMPETUS	International Management and Planning and Engineering of Transportation and Urban Systems
IRICP	International Research Institute for Climate Prediction
ISRIC	International Soil Reference and Information Center
LADA	Land Degradation Assessment in Dry Areas
MENA	Middle East and North Africa
NAP	National Action Programs (on desertification)
NDVI	Normalized Differential Vegetation Index
OSS	Organization Observation Spatiale de Secheresse
RLDP	Regional Land Degradation Program
ROWA	Regional Office for Western Asia
RSC	Regional Steering Committee
SIDA	Swedish International Development Agency
SRAP	Sub-Regional Action Program
UNCCD	UN Convention for Combating Desertification
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	UN Framework Convention on Climate Change
WB	World Bank
WMO	World Meteorological Organization

EXECUTIVE SUMMARY

The negative impacts of land degradation in the ESCWA Region are significant. ESCWA's initiative on enhancing cooperation among its member states to control and reverse land degradation is timely, but a challenging undertaking.

The **Introduction**, explains the gravity of the land degradation problem in the Region and then provides an overview of the problem, whereby its cross boundary nature is emphasized. Accordingly, regional cooperation is a must to properly tackle the problem.

Indeed, the extent and severity of the problem, as well as the resources needed to reduce or eliminate its impacts, call for effective coordinated efforts. Regional cooperation at national and institutional levels facilitates the sharing of the required expertise, know-how and methodologies for the design of a proper regional program to control and reverse the adverse impacts of land degradation.

In the **Background Section**, it is indicated that despite the seriousness of the problem, adequate data is lacking. This is notable when dealing with the overwhelming causes of land degradation, such as deforestation, agricultural mismanagement, water mismanagement, improper land use, poverty, pollution, and climate variability.

Socio-economic aspects of land degradation are extremely important as driving forces leading to several pressures that can impact and worsen land conditions. Improving market access is vital for the opening of new horizons of cooperation on reversing land degradation through encouraging exchange of information, products and expertise. Several initiatives to assess land degradation have been undertaken, the LADA (Land Degradation Assessment in Dryland Areas) approach is one of those still ongoing initiatives, and it is a continuation of previous initiatives such as GLASOD.

Targeting gender and poverty issues in soil, water and land management, would contribute tremendously to solving many problems on the sidelines of land degradation as women and the poor are usually the most affected by degradation. This, if done through a proper participatory approach, would significantly reduce anthropogenic activities leading to desertification. But what's important here is the need to provide updated and useful information to both the community and decision-makers.

More specific activities on reversing land degradation and combating desertification at country levels are presented in the section on **Land Degradation at the Country Level**, where the dynamic nature of the ESCWA Region is tackled. It is stressed that monitoring and interventions must consider socio-economic and biophysical variables. Hence, several aspects of land degradation are discussed, starting with deforestation and soil erosion, where the general picture of non-availability of fully adequate reliable data emerges.

Other aspects include the lack of integrated management systems, especially related to soil and water resources. Fragile dryland environments in the ESCWA Region are undergoing land degradation due to aeolian and fluvial erosion, soil salinization, pollution and groundwater deterioration, among other malpractices. Mismanagement of soil resources is leading to their loss over widely increasing areas, and climate change is becoming an everyday challenge for water resources in many areas of the Region. Similarly, water mismanagement, notably amplified with emphasis on supply rather than demand, is leading to water scarcity in areas which have not experienced such scarcity before.

Further discussion on land contamination, chaotic urban expansion, rangeland degradation, and socio-economic conditions reveal other dimensions to the problems of land degradation. All of these undermine the over-riding fact, prevailing in the Region, which is the improper management of the environment and the lack of compliance with modern environmental codes, standards and policies and hinder sustainable development, especially of the agriculture sector.

In the section on the **Status of Regional cooperation** it is revealed that this aspect is quite weak, except for partnership on internationally-funded projects. Several cooperation projects were carried out under the umbrella of Regional or International Agencies, which seem to play a catalyst role in enhancing cooperation. Activities included workshops on capacity building, assessment of methodologies, promoting guidelines, and preparedness for drought.

Monitoring and warning systems are given importance in some programs and projects. Networking is an important element to serve connectivity and strengthen cooperation. ACSAD's efforts in establishing the Arab Desertification Monitoring and Assessment (ADMA) program, with the help of GTZ, are a good example of an attempt at starting drought and land degradation monitoring networks. Problems of land degradation are increasing and actual cooperation activities are lacking; those that exist have several shortcomings in administration, management, and technical features.

In the section on **Enhancing Regional cooperation on land degradation**, the need for holistic approaches is emphasized, making cooperation on the subject matter a priority. The cooperation should cover managing cross-boundary resources, institutions, training, monitoring and exchange of know-how.

There is a call and necessity for establishing a Regional Steering Committee (RSC) with coordinating powers, which through the help of cooperative bodies and focal technical expertise, can play an effective role in helping ESCWA countries develop and implement appropriate strategies to face the problem. The urgency of the matter is clear as time is running out.

Promoting the above cooperation is dealt with at both country and institutional levels. The former starts by elaborating land degradation in the ESCWA countries with their common root causes and pressures, especially regarding shared resources. Thus, rangeland degradation in neighboring countries, rangeland and Badia management, shared water resources under scarcity and mismanagement, treated and untreated wastewater, the salinity increase, droughts mitigation, etc. and projects dealing with these issues are tackled.

At the institutional level, the study points to the need for a well planned regional program with time-frame priorities. It could ensure uniformity of approach, compatibility, complementarity and, therefore, effective results and attraction of funding. It tackles and emphasizes the four shortcomings as mentioned earlier, such as the administration as coordinated through the Regional Steering Committee (RSC), and the management with emphasis on securing funding as the market is highly competitive, where co-sharing is a good option. Other important management issues are addressed such as awareness, participation and integration especially of regulatory mechanisms, notably needed with crisis management.

For the technical and know-how features, the important thing is the proper definition of roles and human resources development. The exchange of knowledge, and the sharing of information and expertise, or local experiences on "bright spots", whether through networking or personal expertise lies at the core of meaningful cooperation. The presence of a regional monitoring networking system is crucial for that purpose. The level and extent of environmental awareness, at government agencies and within the community, as well as capacity building, should be addressed critically.

The preceding is followed by two sets of **Recommendations** for enhancing regional cooperation in two parts, the first set covers recommendations for the countries while the second set covers recommendations for regional institutions.

The study concludes with a project proposal entitled “Promoting Regional cooperation in reversing land degradation in the ESCWA Region”. The project proposal focuses on enhancing cooperation on land degradation to serve several purposes toward achieving food security, sustainable development and the Millennium Development Goals while using integrated, holistic and participatory approaches, and covering different natural settings of the ESCWA Region. Output maps for different stakeholders are envisaged as decision tools, supported by training and capacity building.

I. INTROCUTION

Even though the implementation of a number of national plans of action to combat desertification and land degradation in countries of the ESCWA Region is in progress, the rates of degradation with consequential losses of natural resources have not yet been curtailed. As the majority of countries in the Near East including the ESCWA region have arid and semi arid bio-climatic conditions, lands are undergoing a striking rate of degradation (FAO, 2005; ESCWA, 2005). Understanding the problem and its causes, mitigating it, and putting effective cooperation management plans into action, especially at regional level, constitutes a major priority.

As the land degradation problem is inherently cross-boundary and regional, facing its consequences, and indeed dealing with its processes, which not only deteriorate productive land, but also impact the socio-economic situation and the livelihood of local communities- must be tackled through regional cooperation. Further, it has to be emphasized that in order to face the problem successfully, i.e. to manage it with sustainable development perspectives, a multitude of human resources expertise with institutional and cross sectoral capabilities is needed to assessing the problem and its causes, applying various methodologies for mitigating the process, including involvement of local communities on participatory basis, and monitoring on-going trends notably to make available proper databases for facilitating the decision making process. This must be supported by establishing a pragmatic management program giving due importance to a workable strategy based on relevant regulations and modern policies. Most developing countries in the ESCWA Region lack one or more of those resources and capabilities and, therefore, must cooperate together for both enhancing their capacities and achieving tangible results in reversing the cross boundary problem of land degradation.

Hence, the aim of this paper is to reflect on the requirements of enhancing Regional cooperation in combating land degradation. It starts by explaining the nature of the problem of land degradation, its causes, how it evolved in scientific circles, and examples of the major different methodologies and management plans that have become recognized for that purpose. This is followed by a briefing on the land degradation, as exposed by relevant national authorities, of the Region, reflecting on their positive outcomes and constraints, and showing their tendencies towards cooperation. That sets the grounds to talk about the status of Regional cooperation on land degradation, which, together with the next topic on enhancing that Regional cooperation, is dealt with both the country and regional institutions level.

The paper further gives recommendations for enhancing the Regional cooperation on the basis of the operational phases needed to deal with the problem. This implies assessing the problem, applying the proper methodologies for its mitigation, monitoring the trends and setting a sustainable management cooperation plan that encourages sharing and exchange of information, as well as coordinated common steps and procedures including possible harmonization of relevant regulations and policies.

II. BACKGROUND

One half of the world's countries have parts or all of their land in dryland environments. These lands represent one-third of the earth's surface and are home to nearly 40 percent of the world's population. Land degradation, intensified by human pressure and climate change, results in higher rates of desertification in semi-arid and arid areas. There is not enough available data on land degradation but it is likely that soil degradation has affected some 1900 million hectares of land worldwide, 550 million hectares of which are located in Asia and the Pacific (UNEP/ISRIC 1991). Drylands are diverse in terms of their climate, soils, flora, fauna, land use, and people. Land degradation is driven by recurrent core variables, such as climatic factors, economic factors, institutional, national policies, and population growth. At the proximate level, these factors drive excessive operations such as cropland expansion, overgrazing, and infrastructure extension (Geist and Lambin, 2004). Land and environmental degradation in dryland areas are occurring at alarming rates, often leading to desertification, and threatening the livelihood of more than 900 million inhabitants. Fragile dryland environments are undergoing land degradation through aeolian and fluvial erosion, soil salinization, and loss of vegetation by overgrazing, over cutting of fuel wood and trees, and other excessive uses of the land and natural resources by people (El-Baz, 1991).

World total drylands, excluding hyperarid desert areas, account for 5.172 million hectares (ha), 69.5 % of which are degraded lands (Dregne and Chou, 1992). More than 45% of the world rainfed cropland, which exceeds 450 million hectares, is classified as desertified and degraded. Approximately one-quarter of the irrigated land, half of the rainfed cropland, and three-quarters of the rangeland in the world are degraded and desertified. The world is losing at least three hectares of arable land every minute because of soil salinity where soil becomes highly saline and almost irreclaimable. The financial losses resulting from salinization of irrigated land are rising to around US$ 250/ha, constituting about US$ 11 billion in total losses (FAO, 2006).

Globally, when land degradation was at least moderate in severity, the amount of income foregone on irrigated, rainfed, and rangeland represented, approximately, a 40 percent loss in productivity. For irrigated land, this economic loss represents $250 (U.S.) per hectare per year. Income reduction drops to $38 on rainfed cropland and $7 on rangeland (Dregne and Chou, 1992). Worldwide, productivity reduction by land degradation was equivalent to $11 billion for irrigated land, $8 billion for rainfed cropland, and $23 billion for rangeland. According to Dregne and Chou, rehabilitation of degraded irrigated lands requires three to five years for land recovery to an approximately previous state after an acceptable drainage system has been installed, perhaps five to 10 years to improve eroded rainfed cropland, and as much as 50 years to bring rangeland in the drier areas to a good range condition.

Global population in the year 2020 is projected to reach nearly 8 billion, 35 per cent higher than the 1995 level. During the period 1995–2020, the food grain and livestock production in the developing countries will increase by only 1.5% and 2.7% per year, respectively (Scherr, 1999). Meanwhile, soil degradation leading to reduced land productivity is not seen as posing a serious policy concern. Many policymakers remain unconvinced that agricultural soil degradation warrants priority attention, and scientists are in part responsible for this situation.

Mismanagement of soil resources is not only driven by weak knowledge, but also by overexploitation of these resources. Thus, excessive fertilization and irrigation to secure higher yields, on a week environmental background in different agro-climatic zones, cause secondary soil salinization (Darwish et al., 2005). Soil chemical and physical deterioration is associated with utilization of productive lands by urban expansion (Eswaran and Reich, 1999; Darwish et al., 2004). However, more than 90% of land degradation cases in North Africa and West Asia are due to over-cultivation, overstocking and wood cutting

(Le Houérou, 2002). The Earth could, in theory, support far more than its present population but the distribution of good soils and favorable growing conditions does not match the growth rate of the population (GEO, 2000). The problem of overpopulation is being exacerbated by increasing land degradation caused by deforestation, poor management of arable and pasture land, including over-use of fertilizers and pesticides, the clearance of marginal land for cultivation, poor management of watersheds and water resources, uncontrolled dumping of wastes, and deposition of pollutants from the air and poor land-use planning. Poverty is the underlying pressure factor behind these driving forces. In MENA countries, about 30 percent of the region's population lived below the poverty line in 1987 (Adams and Page, 2001). In Egypt and Jordan, the average incidences of poverty are 20-50% higher in rural communities than in urban ones, and this was associated with a 10% and 32% decrease in per capita expenditure between 1981 and 1997, respectively.

The highest percentage of degraded irrigated lands and degraded rainfed croplands are located in Asia and Africa, respectively. Human activities and migration of poor farmers and herders from traditionally productive lands of Northwest Egyptian coast, after their conversion into urban landuse, to rural areas with fragile rangelands shifted population density and the pressure of land degradation to new areas with limited soil and water resources. On irrigated land, the principal human-induced degradation problem is salinization, followed by waterlogging. Slight and moderate soil degradation cause up to 25 percent loss of potential crop yield, severe and very severe soil degradation cause 25-50 percent loss and greater than 50 percent loss, respectively.

The poor land management and irrigation practices by ever-increasing numbers of rural poor are among the root causes of land degradation in Asia and Africa (Geist and Lambin, 2004). Land use concerns are related to increasing urban and rural populations, increase of agricultural areas at the expense of forestland, and encroachment of urbanization and industrial activities on agricultural land (Spaargaren and Van Engelen, 1999). The principal criterion for classifying land degradation into one of the four degradation classes (slight, moderate, severe, very severe) was the impact degradation had on economic plant yield, on both croplands and rangelands (Dregne and Chou, 1992). Slight and moderate land degradation is usually reversible; severely degraded land is categorized as land, which cannot be rehabilitated economically.

Desertification of rainfed cropland is caused by accelerated water and wind erosion. Water erosion is much more damaging to long-term soil productivity than is wind erosion. Rangeland desertification is vegetation degradation followed by water and wind erosion after vegetation degradation has been initiated. Cultivation and overgrazing are by all measures the principal causes of rangeland degradation in the Arab steppes and semi-desert areas. Cutting woody species for forage, fuel, charcoal production, or construction material and excessive groundwater pumping are the other major causes of rangeland deterioration in the Gulf area.

While the UNCCD convention prioritized the development of National Action Plans to Combat Desertification (NAPs), these plans are still not finalized in some ESCWA countries like Syria and Yemen or have yet to be fully implemented like in Lebanon and Jordan. NAPs implementation requires the elaboration and realization of regional and national projects which are complemented by mitigation and preventions plans. Common elements in reversing land degradation underlined the necessity to improve market access for good quality agricultural products, and building capacity and policies to support and sustain improvements in natural resource management. The management is more effective when targeting women and their roles in land and soil management. Resource constraints, weak political will and the low priority often given by national governments to land degradation, contribute to the forces slowing down progress in

its control. The first and most important step is to provide tools for land evaluation through soil and natural resources information. It must be based on detailed soil-land mapping, where geometric information is related to attribute data through modern software allowing effective data storage and retrieval, and the production of thematic maps. Remote sensing and GIS seem to be a strong supporting tool for the analysis and monitoring of land degradation on national and regional basis. These tools help strengthen regional cooperation and serve decision-making, vulnerability assessment and landuse planning.

Highlighting land resources management implies the presence of policies oriented to safeguard and improve the lifestyle of current generations, and to protect the interests of future generations. Man-made deserts may result from anthropologic activities and destructive land abuse. In an attempt to justify the lack of soil and water conservation policies, and the absence of actions at the watershed level, land degradation is often blamed on climatic change towards increasingly arid conditions. In most cases, blaming the climate is a misleading notion aimed at providing the socio-economic driving forces with good conscience and favorable census. However, in the northern Sahara, it is the human element that created the desert, the climate being only a supporting factor (Le Houerou, 2002).

Information on the physical aspects of soil degradation, as traditionally reported by soil scientists (rates of soil erosion, the extent of farming areas with particular degradation processes and tons of soil lost), is inadequate as a guide and catalyst to policy action (Scherr, 1999). Landuse policies, based on which crops give the best economic return with associated subsidies and price signals, do not take into account impacts on the environment. The percentage of soil surface and landscape reorganization that accompanies modern intensive farming strongly influences erosion. There are many examples of the encouragement of certain crops or practices directly leading to degradation (Boardman et al., 2003). Sugar beet subsidies in Lebanon resulted in sewage water application to irrigate the water demanding crops in the water scarce Bekaa region during the late summer. Replacing sugar beet by the subsidy of wheat cultivation resulted in the profound depletion of soil water reserve and development of deep cracks and compact soil layers. Recent expansion of the area under banana cultivation in the Jordan valley caused the loss of plantation due to drought, water scarcity and crop sensitivity to saline water. Irrigation of cotton on gypsiferous soils in Syria dissolved the impermeable layers and caused a rise of saline water table. Similar rise of groundwater table was observed in North Delta rice cultivated areas of Egypt. Promoting cotton production in Yemen and wheat in Saudi Arabia caused the depletion of groundwater resources and seawater intrusion into coastal aquifer. Thus, there is a need to produce a new generation of studies on soil degradation that are more rigorously designed, forge a stronger link between technical and socioeconomic analysis, and provide more policy-relevant findings. Geo-referenced databases containing information on aspects like terrain, soils, land use, climate, vegetation, degradation and conservation, etc., have proven to be an excellent tool for land use planning, monitoring changes (positive or negative), modeling and scenario research (Spaargaren and Van Engelen, 1999).

Recently, Lebanon, Tunisia, Algeria, Egypt, Jordan, Morocco and Syria initiated new studies on the estimated cost of environmental degradation using environmental damage cost assessments for priority setting, and as an instrument for integrating environmental issues into economic and social development in the MENA region (Sarraf et al., 2004). A loss of 215 million US $/year was attributed to the degradation of natural resources and wildlife in Lebanon. A vast multi-year international program was launched under the Land Degradation Assessment in Drylands (LADA) initiative to assess land degradation in dryland areas, to identify degradation causes and effects and propose remedial actions (Antoine, 2005). Several methods were implemented for the global assessment of soil degradation (GLASOD, ASSOD) using expert estimation or real data with more focus on the impact of land degradation on soil productivity and functions. The ESCWA Methodological Framework appears to be workable at national, sub-national and regional scales. The objective is to develop practical methods of land degradation assessment and monitoring systems,

incorporating both biophysical and socio-economic factors, critically needed to target appropriate and adaptive remedial and restorative actions and investments.

III. LAND DEGRADATION AT THE COUNTRY LEVEL

Driving forces and pressures of land degradation in the ESCWA Region have been the subject of several studies. This dynamic region witnessing rapid economic growth and increased poverty problems is spread over a diversity of climatic conditions ranging from sub-humid on the eastern coast of the Mediterranean Sea to hyper arid climate in the Arabic peninsula desert. Soil erosion in the area and deforestation is an ongoing problem and relates to complex orography (Osborn, 1985) and ancient human interventions (Eswaran and Reich, 1999). For this reason it is difficult to draw a clear border between human-induced land degradation and natural processes. The assessment of land degradation is problematic because of the absence of consistent data in many countries to demonstrate the extent and the intensity of desertification. Land degradation process is considered as a biophysical process disregarding its socio-economic nature (Reynolds and Stafford Smith, 2002). Land degradation was modeled as a function of farmers' perception of soil quality, indigenous knowledge of soil properties, slope steepness, grazing pressure and conflicting landuse (Zurayk et al., 2001). Land degradation in dry areas, involves both human and environmental drivers. Hence, any monitoring and intervention must include both biophysical and socio-economic factors (Middleton, 2004).

Additionally, the distinction between areas affected by land degradation and those highly vulnerable is not clearly marked in many estimates. This makes it difficult to quantify the extent of the process and creates confusion for the decision-makers on what type of solution to adopt, and which conservation and prevention measures to undertake. In this regard, mitigation measures must be site specific, supported by real data and based on stakeholders' acceptance and active participation. Remediation technologies require specific assessments and testing before tackling a given problem.

A. DEFORESTATION AND SOIL EROSION

Several studies have reported severe deforestation and catastrophic erosion resulting in entire ecosystem degradation and disappearance of entire human societies (Yassoglou et al., 1997). The emergence of degraded lands or the disappearing of rivers was often attributed to human activities, with the oldest record of forest clearance by humans in the Ghab valley, Syria, dating some 11000 years ago (Yasuda et al., 2000). Many ESCWA countries recognize climate change but some of them are not aware of land degradation dilemma and if they recognize this problem, they lack measurable data on the rate and extent of degradation. With climate change the rainfall amount by 2050 will decrease by 25% in Egypt, Saudi Arabia, Syria, Jordan and Palestinian Territories accompanied by a temperature rise of 2-3 degrees Celsius (Ragab and Prudhomme, 2002). In North West Syria, heavy rainfall, barren mountains and steep slopes cause severe soil erosion with extreme annual soil loss reaching 275 tons per hectare. Estimation on the global economic effect of soil erosion does not exceed 0,05 % per year of the total production value (Wiebe, 2005). The off-site effects of soil erosion can cause much higher economic damage. Studies in the mid 90s predicted higher figures reaching as much as 10 % of the value of agricultural production each year (Pimentel et al. 2003). These estimates raise the critical issue of data availability and reliability. Many shortcomings in land degradation assessments are also derived from the lack of cause-effect relationships between severity of degradation and its impact on agricultural productivity. Criteria for designating classes of land degradation must be based not only on land properties but on the impact of soil erosion on productivity (Nachtergaele, 2000).

A projected reduction of rainfall amount, change in their distribution and intensity and higher temperature would pose a severe problem to the vegetation cover. Torrential rainfall in Lebanon causes flash floods and erosion which sometimes leads to mass movements due to rain intensity, slope effect, restricted drainage, poor vegetation cover and weak lithology (Abdallah et al., 2005). Converting large areas of

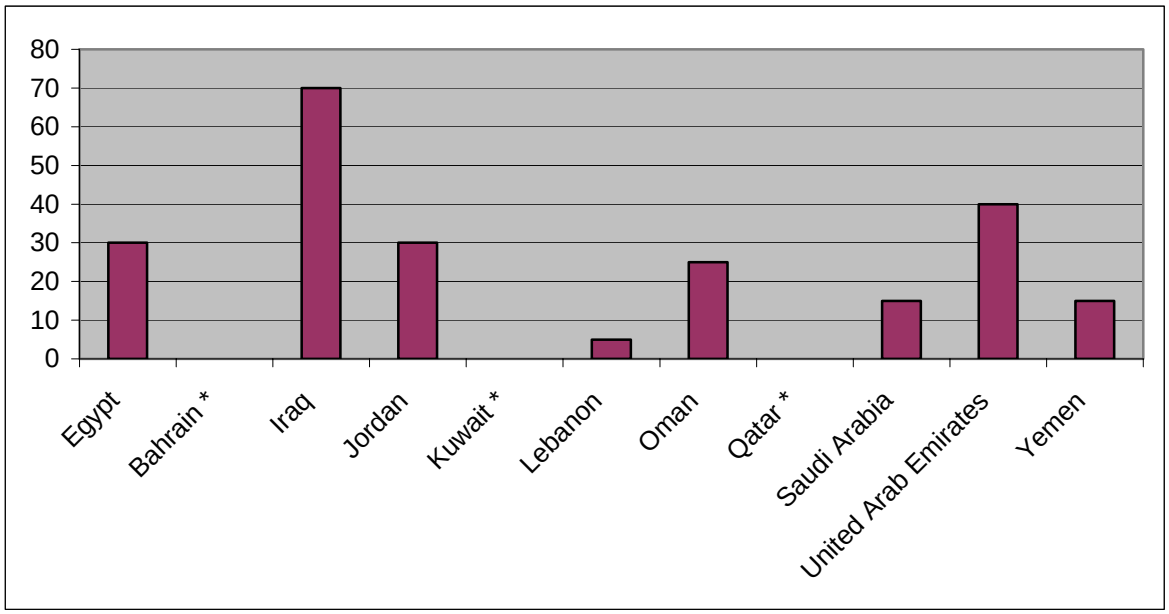
wetlands in Iraq with native shrub cover into arable lands changed the ecosystem and negatively affected the water balance and land quality. Recurrent droughts coupled with human pressure result in increased forest fires risk and deterioration of forest cover. This accelerates soil erosion and makes the spontaneous vegetation recovery a very slow and complex process. Reforestation of Lebanon highlands showed low survival rate for transplanted trees varying between 10 and 40 percent (USAID/ECODIT, 2002).

B. LAND RESOURCES

Integrated ecosystem and natural resources management is the key of success in the process of combating land degradation. Economic benefits from different technical and development projects must be assessed from the environmental impact point of view. Elaborating indicators of land degradation should be coupled with a practical use of such indicators, and they should be easily and adequately measured in order to set the base line for monitoring the desertification process. Fragile ESCWA dryland environments are undergoing soil degradation through major human made pressures (El-Baz, 1991). In Kuwait, very severe desertification prevails, due to increasing formation of new active sandy bodies and deterioration of natural vegetation cover associated with soil compaction (Al-Awadhi, 2003). In Lebanon, Syria, Jordan and Yemen soil erosion is accelerated by the abundance of steep slopes and barren lands notably in the mountain areas. The abundance of bare and deteriorated lands with shallow soils points to processes of severe erosion. The analysis of potential soil erosion as a function of soil characteristics (soil depth, structure, texture, organic matter content, structural stability), geomorphology and climatic conditions show the frequent occurrence of medium, high and very high erosion on the escarpments of the western mountain chain in North Lebanon (Darwish et al., 2002). In Syria, large areas of rolling hills and gentle mountain slopes have been turned into bare land. If soils are not properly managed, soil erosion leads to decreasing soil productivity in the short term and to irreversible soil degradation in the long term (Abed, 2000). When facing the combination of heavy rainfall, steep slope inclination and bare slope surface in the coastal mountains, erosion exceeds 200 tons per hectare per year. Studies in the delta of the Jordan River using radiocarbon dates on organic residue showed that the 15 m of slide has accrued over the past 5000 years, yielding a short-term fall rate of 3 mm/year for the late Holocene (Marco et al., 2005).

Mismanagement of soil resources is not only driven by lack of knowledge, but also by the nature and overexploitation of these resources. Thus, excessive fertilization and irrigation for securing higher yields, on a week environmental background causes secondary soil salinization in the east Mediterranean (Darwish et al., 2005). Salinity hazards reduced leaf area index (LAI is the ratio of total upper leaf surface of a crop divided by the surface area of the land on which the crop grows) and potato tuber yield (Karam et al., 1998). Desertification of irrigated lands reached catastrophic levels in ESCWA countries, which have the major soil and water resources with the oldest irrigation practices like Iraq and Syria followed by Egypt and Jordan (Figure 1). Reduced surface soil salinity and improved infiltration were achieved by adding farmyard manure with saline water in arid areas (Kahlown and Azam, 2003). Therefore, a relatively low soil buffering capacity can multiply the risks associated with plant tolerance and reaction to salt stress. The evaluation of soil vulnerability to desertification in Lebanon was based on soil parameters such as depth, texture, organic matter content, water retention capacity and structural stability. Results revealed that more than 75% of the Lebanese territory is highly prone to desertification (Darwish, 2002). If this figure is intersected with the geomorphology, vegetation, climate and social indexes, the area prone to desertification in Lebanon becomes close to 90% of the total area of the country (NAP, 2003).

Figure 1. Mismanagement of irrigation practices leads to severe environmental problems on irrigated lands



Source: Calculated from UNEP (1996) and Dregne, H. E., and N-T. Chou., Global Desertification Dimensions and costs In Degradation and Restoration of Arid Lands. Lubbock: Texas Tech. University, 1992).

(*): data is not available for Bahrain, Kuwait and Qatar.

C. WATER RESOURCES

The semi arid-sub humid eastern Mediterranean and arid zones of the Arabic Peninsula are highly sensitive to climate change, witnessing a higher frequency of droughts and periodic torrential rains signifying an apparent trend towards more aridity. Water mismanagement coupled with increasing water demand constitute a problem to water availability. Existing conditions and plans for water supply and demand clearly show a water deficit building up annually everywhere (Hamdy and Lacirignola, 2006). This is further linked to another deterioration factor, namely, the possible effects of sea level rise as seawater intrusion will increase, further impacting the quality of coastal fresh water. In fact, a general increase in the Chloride ion content of coastal water wells has been observed over the past three decades. Following lower precipitation rates in Lebanon, the groundwater quality in the coastal area has been deteriorating, especially with excessive pumping and reduction in natural recharge (Khawlie, 1999; El Moujabber et al., 2004). Groundwater quality in southern Lebanese region was studied through the interrelations between the chemical and physical constituents of groundwater and revealed to be subject to seawater intrusion. This intrusion was directly and simultaneously related to the pumping period and intensity but weakly linked to the quantity of rainfall (El Moujabber et al., 2006). Seawater intrusion was also related to the geologic nature of the study area. The actual intrusion in the study zone increased the already existing salinity problems leading to intolerable levels of water and soil salinity, inadequate for the cultivation of many crops, thus threatening their growth and production and reducing the agrodiversity in the region.

The salinity build-up in the soil-groundwater system is affected by not only agricultural practices, including the crop rotation and fertilization, but also by water quality and irrigation management.

Observations in semi arid Jordan showed no direct soil salinity hazards when farmers apply surface irrigation or sprinklers. Furrow soil surface treatment and frequent irrigation are recommended for soils suffering from surface crust formation inhibiting seed growth and the establishment of young seedlings (Akasheh and Abu-Awwad, 1997). Similarly, a reduction of salinity problems by sprinkler irrigation practices were observed and recorded in Northeast semi arid Lebanese region (El Khatib et al., 1998). A simple barley or wheat-based rotation including legumes and filed crops was proposed as alternative to land abandonment due to salinity buildup or salt leaching by excess water input (Darwish et al., 2005). Phytoremediation using salt tolerant fodder plants revealed a successful practice in the remediation of salt affected soils in Syria (Kurdali et al., 2001).

In dry land agriculture, the most critical element is water. Surface water resources in the area are limited and thus farmers rely mainly on deep wells. Due to over pumping, overgrazing and reduced recharge, the water table significantly dropped in Oman. This caused the recession of grasslands and notably the loss of the traditional fodder plant, locally known in Arabic as "Gaf" (prosopis cineraria), which develops a deep rooting system reaching 60 m depth (AlAlwi, 2007). Green cover deterioration was also associated with groundwater salinization by seawater intrusion as had been observed in coastal Lebanon (El Moujabber et al., 2006) and coastal Yemen (Darwish, 2001). Water salinity has increased due to long term pumping from regional aquifers, like the Dhuleil-Jordan representing the major resource for domestic and agricultural purposes (Abu-Sharar et al., 2003).

D. LAND CONTAMINATION

Applying treated sewage sludge on sloping lands improved soil structure and aggregate stability and controlled soil erosion by reducing run-off (Abu-Sharar, 1996). The application of non-treated wastewater and the use of waters from polluted rivers for irrigation is an option farmers use out of necessity. This, however, results in the accumulation of heavy metals in the soil and surface water resources, as was observed in Ghouta (Syria) and Central Bekaa (Lebanon), exhibiting anthropogenic increased values (Moller et al., 2005). More than 800,000 m3 of liquid wastes coming out of 500 olive presses in Lebanon containing high percentage of oil (> 2%), organic and toxic substance, which destroy soil aggregates and increase fine fractures in soil texture, are indirectly leading to the deterioration of the soil and groundwater quality.

E. DISORGANIZED URBAN EXPANSION

Soil chemical and physical deterioration is associated with the diversion of productive lands by urban expansion (Eswaran and Reich, 1999; Darwish et al., 2004). However, more than 90% of land degradation cases in North Africa and West Asia are due to over-cultivation, overstocking and wood cutting (Le Houérou, 2002). In the Jordanian badia the process of settlement has occurred over the last 20 years and the steady expansion of settled and a cultivated area is still underway. While there are more than 35 villages within the basaltic Jordanian area (Harra), land tenure is still unclear, limiting the local community sense of responsibility towards the resources of the area (Shahbaz et al., 2006).

F. RANGELAND DEGRADATION

Climatic conditions and overgrazing are the two main causes of rangeland degradation in the ESCWA countries. Livestock production is growing out of balance compared with the ecosystems which are under so much pressure that early signs of environmental degradation are increasingly evident (Shahbaz et al., 2006).

Recent changes in land cover/use in the Lebanese rangelands led to the expansion of forestland on the western mountains (Masri et al., 2002) and fruit trees in the inland semi-arid area (Zurayk et al., 2001) at the expense of grasslands, which are currently overgrazed (Darwish and Faour, 2006). Multitemporal analysis of the normalized differential vegetation index (NDVI) revealed some improvement of the vegetation cover over recent years in Kfarselouane watershed with a steady state on the eastern mountain chain and a change in the length of the growth season and intensity of vegetation reflection index. This indicates increased vulnerability to drought in the dry and sub-humid Lebanese areas and the necessity for supplemental animal feeding during the dry months with little reliance on pasture lands.

In Syria, over 20% of rangelands are degraded due to overgrazing, removal of vegetation, and conversion of land. All contribute to desertification and loss of biodiversity. Because less rangeland is available, 13.5 million sheep need to rely on barley, feed maize and crop residue (Bolt, 2003).

One of the means of combating desertification in Jordan is to reduce the number of animals and maximize per head productivity. But, reducing the number of animals means changing people's livelihood, which requires a national policy to deal with poverty and unemployment in the Badia. The Jordanian government maintained a consistent policy toward land ownership in the Badia, the land belonged to the state and the tribes held additional rights of access and use. In recent years, the government introduced a new policy, which transfers the ownership of land to individual tribal members, which in turn encouraged the sale of Badia land. Government attempts to bring tribal lands under private ownership have ended up removing large areas of land from grazing due to the growing interest in using pastures as farms. However, this type of farming has proved to be both uneconomical and devastating to the ecosystem, particularly on water resources (Al-Oun, 1997, cited by Shahbaz et al., 2006).

G. SOCIO-ECONOMIC CONDITIONS

Poverty is an underlying factor of land degradation. In Egypt and Jordan, the average incidences of poverty are 20-50% higher in rural communities than in urban ones, and this was associated with a 10% and 32% decrease in per capita expenditure between 1981 and 1997, respectively. A loss of 215 and nearly 300 million US $/year was attributed to the degradation of natural resources and wildlife in Lebanon (Sarraf et al., 2004) and in Jordan respectively (NAP, 2006). In Syria, the environmental cost of resources degradation, expressed as percent to global domestic product (GDP) was as follows: soil salinity (0.49%), water erosion (0.25%), rangeland degradation (0.54%), i.e., the total cost of land degradation in Syria constituted 1.28% of GDP (Bolt, 2003). Egypt, Syria, Jordan, Lebanon, Kingdom of Saudi Arabia and United Arab Emirates are classified among the best world countries in term of biodiversity ranking and environmental sustainability index (ESI), which is a composite index tracking 21 elements of environmental sustainability covering natural resource endowments, past and present pollution levels, environmental management efforts, contributions to protection of the global commons, and a society's capacity to improve its environmental performance over time (NCSA, 2006).

IV. STATUS OF REGIONAL COOPERATION ON LAND DEGRADATION

Worldwide and regional risks of soil and land degradation might have been under estimated and the real quantified figures of economic damage of land degradation over estimated (Kaiser, 2004), additionally, land degradation is seen as a purely physical process separated from its socio-economic and political context. Soil degradation does not necessarily lead to food shortages as land productivity also depends on the type of technological packages used. The proper application of technological packages and practices could alleviate the impact of land degradation. A policy support is needed to estimate the real cost of economic and social damages of land degradation.

Many realize that the ESCWA Region is becoming hotter and drier, with expectations that the available water per capita will be reduced by nearly 50% (Ragab, 2005; Palutikof, 2001). This, together with the population growth being witnessed in the Region, implies increasing stresses on the natural resources, notably land, water and green cover, leading to further degradation. Confronting this situation certainly surpasses any one country's capabilities; as such there is a need for regional and international cooperation. The recent episodes of drought that hit several areas in the near east had a huge toll on many countries generating a range of problems, and affecting mostly the rural communities and productive lands, thus impacting the socio-economic fabric, sometimes beyond existing capabilities (Hamadallah, 2005). The problems have a transboundary dimension, which justify regional cooperation. In a Region where water is declining, while demand for it is increasing by 50%, and the extent of land degradation is increasing, this is a cause for concern. Therefore, enhanced regional cooperation is called for to face the impacts of land degradation.

Regional cooperation on tackling the impacts of land degradation is still weak. Partnership in projects or programs, as protocols directed at land degradation mitigation, adopting common monitoring and assessments methodologies, and exchange of data, information, expertise and benefit from local experiences, interaction through special focus networks, and sharing an early warning system could enhance the status of setting regional cooperation.

The Regional activities focused on partnerships in internationally funded projects and programs. Various countries in the Region have participated in those activities within the Framework of UNCCD, but there is no sustainable interactive cooperation commitments in relevant projects across borders. Several projects were initiated in the Mashrek, Maghreb and Arab Gulf Cooperating Countries (GCC) countries.

Regional organizations like Desertification Control project of the Arab Center for the Studies of Arid zone and Drylands (ACSAD), the Economic and Social Commission for Western Asia (ESCWA), the International Fund for Agricultural Development (IFAD), the International Center for Agriculture Research in Dry Areas (ICARDA), the Center for Environment and Development in Arab Region and Europe (CEDARE), the Organization Observation Spatiale de Sécheresse (OSS), the International Center for Advanced Mediterranean Agronomic Studies (CIHEAM), the Arab League Educational, Cultural and Scientific Organization (ALECSO), and the Arab Organization for Agricultural Development (AOAD) have played a crucial role in the success of some projects on desertification control. Certainly the UN organizations and programs have given support to launching those projects, such as ESCWA (several activities focused on land degradation including training workshops and assessment of methodologies (ESCWA, 2005), FAO (several Regional workshops including that on promoting the LADA program – Land Degradation Assessment in Dryland Areas Data Base on Drought Mitigation), the Mediterranean Action Program-Participatory Action Plan (MAP-PAP) with United Nations Environmental program (UNEP) (also several activities related to land degradation, i.e. training workshops and excellent guidelines on mapping

erosion of soil, as well as on desertification control management), the World Meteorological Organization (WMO), the World Bank Regional Office for Western Asia (WB-ROWA), the United Nations Educational, Scientific and Cultural Organization (UNESCO), the Global Environmental Facility (GEF) notably its project on indigenous knowledge on drought, the United Nations Development Program (UNDP) especially its Drylands Development Center initiative on Drought Preparedness and Mitigation, UNCCD, the UN Framework Convention on Climate Change (UNFCCC), etc.

Also considerable support has come from the European Commission programs, plus European countries support such as the German Technical Aid Agency (GTZ), the German Geological Survey (BGR), the Swedish International Development Agency (SIDA), among others, and Arab and Muslim Funds. There are many specialized international institutes that are collaborating with several countries in the Region, i.e. the International Research Institute for Climate Prediction (IRICP), the Asian Disaster Preparedness Center (ADPC), the African Center of Meteorological Applications for Development (ACMAD), the Drought Monitoring Centers in Kenya, plus several agencies in the United States of America. In Sahel Africa, there is also the Committee for Drought Control (Tahoun, 2005).

Monitoring and warning systems concerned with the impacts of land degradation (programs) have been developed by FAO in different parts of East Africa for food security (using remote sensing techniques), while another early warning system for famine was funded by US AID for the same region. Also proposed programs on one of the major causes of land degradation, i.e. drought, are spreading in cooperation between several countries. Although some projects serve only one country, their results are being shared with other countries, having similar geo-environmental conditions, to evaluate the approaches used and improve on them. Examples are: The FAO TCP project for Establishing Early Warning System in the Syrian Badia was approved, and a similar one approved for Iran for capacity building on Drought Mitigation and Preparedness. Two additional TCP projects are under way for Turkey and Jordan, and FAO is trying to initiate a sub-regional TCP on Drought Mitigation and Preparedness Planning to cover Iran, Jordan, Morocco and Syria (Hamdallah, 2005).

A noticeable cooperation track is observed, among some Arab countries through linkages between their remote sensing centers. The application of remote sensing is a most effective tool for monitoring, especially at a large scale covering large spans of land within a short-time interval. Furthermore, the technological advances being introduced into this field, such as differentiating the intensity of green and healthy vegetation cover, or characteristics of soil cover, or aspects related to integrated water management, human interference etc. and the great leaps made in spatial resolution of satellite imageries and data acquisition, point out to the necessity of relying on space-based monitoring. In this regard, ACSAD has been playing a vital role in getting several Arab countries to work together, such as in the ADMA network for monitoring land degradation as mentioned later.

Also, during the last few years a series of workshops and activities were organized by ACSAD, ESCWA, UNESCO together with other Regional or international agencies concerned with the Region, on topics related to land degradation. Several Arab countries have participated in those activities reflecting their stand and interest in cooperation. Thus in 2003 UNESCO gathered several representatives from the Region, along with the World Climate Research Program, to look into water scarcity problems in this semi-arid to arid area for the purpose of sustainable development. Also an attempt at joining Tunis and Egypt from north Africa together with Lebanon, Syria and Jordan the from eastern Mediterranean, under ACSAD and the French National Research Council, to form a long-term ecological observation network was undertaken in 2003. Its main goal was to monitor specially selected lots of lands undergoing degradation. Another Regional initiative that started in 2003 is the
(REMEPE) program formed by the European Union, aimed at getting all Mediterranean countries together to monitor environmental degradation especially in the coastal areas. Further interest in an integrated

approach came in 2005 when the Islamic Development Bank together with ACSAD, UNEP-ROWA, joined efforts to present several studies from the Arab countries on water issues and their link with desertification, environment, climate change and biodiversity. Essentially those efforts continued in the same year with another Arab expert meeting on drought, in which UNESCO also participated. Again this presented a wealth of information on the problem of land degradation in the area. This was followed also in 2005, through a regional cooperation meeting, by FAO and the Mediterranean Priority Action Program that focused on their experience in combating land degradation in Mediterranean coastal areas. The Coastal Area Management Program (CAMP) proved quite valuable as a cooperation platform because those Arab countries undergoing CAMP exchanged their expertise and developed several interactive domains.

The beginning of 2006 witnessed an important event of Arab cooperation, holding of the workshop on decision support systems for soil and water resources management. Several water modeling schemes were presented from different Arab countries, most of which relating to integrated water management, conservation of soil and land. In fact, in 2006, the UNDP called for the formation of a Regional network, through a meeting of experts held in Syria, to cooperate in reducing the impacts of risk due to desertification, drought and other problems affecting the land and the community. An interesting breakthrough came about in June 2006 when Algeria, in response to a call put before by the Arab Ministers of Environment as well as by ALECSO, organized the 1st Arab meeting for initiating a program to set in an Arab satellite observation system of the environment. Further meetings are scheduled to follow up which, if when completed, would prove one of the highly promising lines of cooperation geared for environmental assessment. Further, 2006 showed several concerted efforts, in this regard an important cooperation meeting took place at ACSAD where together with ESCWA, UNEP-ROWA a gathering of Arab experts on the status and prospects of Arab deserts and associated land degradation took place, and witnessed the attempt of developing a common regional project on the subject matter. These efforts continued into 2007 where another workshop on decision support systems for soil and water resources management was held calling for facing land degradation in the area cooperatively. On the World Day to Combat Desertification, June 2007, an exemplary cooperation program was demonstrated joining Lebanon, Jordan, Syria and Egypt under the umbrella of BGR and ACSAD where a flood risk management system in el-Qaa area-Lebanon was shown. It revealed how the experiences that were previously followed in Syria and Jordan could be applied with positive results in controlling land degradation in the study area.

Further in this regard, the Regional Network on Drought Mitigation (FAO, ICARDA, CIHEAM and EC) focuses on information exchange, but it is neither visible nor actually giving tangible results among the concerned communities and decision makers. Several attempts were made by ACSAD with GTZ help to launch “ADMA”, the Arab Desertification Monitoring and Assessment network using remote sensing, but have not yet reached concrete results. Of course, the SRAP program and LADA initiatives, the IMPETUS in West Africa (on sustainable integrated use and management of water resources), together with bilateral cooperation in implementing National Action Programs (NAPs) to combat desertification, have progressed markedly on fronts relating to water, vegetation, land degradation and desertification. Also, FAO’s GLCN (Global landuse/ Cover Network) on land cover mapping is an important facilitator. On similar lines, UNESCO’s International Hydrological Program has contributed significantly to water resources and systems at risk. ACSAD and ICARDA have implemented several regional projects with excellent results on water, rangelands, vegetation, etc. Reference should be made here to the activities of The Global Mechanism (GM of the UNCCD) in encouraging and supporting Regional programs. This applies to the recent agreement formalized with the Spanish Government to finance an initiative, essentially a south-south cooperation, for fighting desertification. Also in this regard lies the SolArid program where south-south cooperation is believed to be an effective tool for mobilizing resources to respond to specific needs shared by neighboring countries, notably in the Saharan Region (Sahel and Sahara). This provides a strategic opportunity to jointly

face the common problems of land degradation and drought. SolArid brings together those countries aiming to highlight specific characteristics that must be considered when developing strategies to combat desertification and poverty. It also aims at establishing a permanent network to exchange experiences and other partner facilities. Similarly, the GM is proposing another program for the Arab Gulf Cooperating Council (GCC) and neighboring countries called SALAM: Sustainable Arid Land Management Partnership .The Program will address the socio-economic status and environmental conditions of those countries, reflecting on their different development trajectories, building on their momentum and forging a strong partnership in pursuit of a common vision of reversing the trends of land degradation and improving community conditions..).

In spite of the above, the problems and negative impacts of land degradation are increasing. Actual Regional cooperation projects on land degradation are still quite lacking, irregular and inefficient. This is why success stories for combating desertification, as recorded for some countries, are limited to small areas (Abahussain et al., 2002).

There are several challenges facing the different Arab countries that yet have to be resolved if cooperation on reversing land degradation is to be successful. They relate to how the different Arab countries approach the problem at hand. How do they administer and manage problems of this scale, as well as what are their capabilities in technical and know-how aspects. The first refers to the lack of proper collaboration and coordination between the neighboring countries affected by land degradation, as well as a lack of policies and regulations, controls, incentives, etc. within each country to foster a more flexible and stronger cooperation on facing natural disasters. The management problem is overwhelming indeed, it refers to deficient management approaches such as non-integration, non-participation, and lack of proper planning – especially during times of crisis, and lack of support to both technical centers and decision-making, as well as deficiencies in information delivery (type, time, extent). The technical aspects cover such things as an inadequate density of meteorological stations and networks, the sometimes outdated techniques, and the inadequate indices for detection, the inefficient monitoring and assessment systems, the lack of a functional early warning system and the lack of skilled technicians. Similarly, regarding the aspect on know-how, and in view of the above and lack of information sharing, stakeholders and officials in nearby areas are unaware of the extent that the land degradation phenomenon has reached, and of its spread into larger areas.

Training and capacity building are not strong enough, in many countries of the Region. This is further aggravated by the absence of credible historical land degradation databases, and this vicious circle makes it more difficult for Regional cooperation to succeed.

V. ENHANCING REGIONAL COOPERATION ON LAND DEGRADATION

Land degradation affects land resources and ecosystems (humans, animals and plants) across political boundaries, implying the need for holistic regional approaches, i.e. a systems approach (Hamdallah, 2005). Regional cooperation on land degradation indeed has a priority, as it will create a common methodological framework, better opportunities for effective impact assessment, and a common information system notably serving an early warning program. Such cooperation should address institutions, databases, training, monitoring, networking and exchange, which would support the NAPs. Aspects that are inherently significant in addressing the communities at large, affecting their well being, their socio-economic status and living should be given importance.

The preceding calls for establishing a Regional Steering Committee (RSC) or coordinating regional bodies (that will help in planning and early warning efforts) which, with the help of technical expertise, should review current methodologies, data sources and problems relating to hydrological, meteorological, agricultural and socio-economic impacts of land degradation. A significant theme is the economic cost of land degradation, and the cost/benefit analysis of a Regional Early Warning System. The RSC should be an efficient mechanism to help countries in the Region develop and implement appropriate strategies to face the problem. There is an urgency because time for effective action is running out in our Arab countries. The cost of remedial actions will increase with lagging time due to the increase in affected areas, communities and the market. Indirect impacts of land degradation and environmental deterioration will soon compete for funding sources, thus diverting finance to other issues.

In view of the preceding, enhancing Regional cooperation on land degradation should take place at . As mentioned before, the four basic challenges relate to the following: 1. Administrative features, 2. Managerial features, 3. Technical, and 4. Know-how.

A. COOPERATION BY COUNTRIES

More than 53% or an equivalent of 2400.000 km2 of lands in the ESCWA region are moderately and severely degraded (Ffliott et al., 2002). Among the root causes of land degradation, was overgrazing in the first place in all ESCWA member states except Egypt (Table 1). Agricultural activities occupied the second place among the causative factors of land degradation in Egypt, Iraq, Syria and UAE. Wind erosion was recognized as the first dominant and common type of land degradation in 75% of ESCWA countries, located in the arid and semi-arid belt, while water erosion was the most important pressure in Lebanon, Syria, Yemen, Jordan and Iraq. Soil salinity is one of the main types of chemical land degradation in Egypt, Iraq, Syria and UAE.

Table 1. Common causes and types of land degradation1 in the ESCWA Region

Country	Total area	Land degradation								Cause[1]	Type[2]
		Light		Moderate		Severe		Very Severe			
	'000 km²	'000 km²	%	'000 km²	%	'000 km²	%	'000 km²	%		
Egypt	998	272	27	26	3	66	7	19	2	A	C
Iraq	431	0	0	91	21	196	45	149	34	O,A	N,C,W,P
Jordan	90	0	0	62	65	14	14	16	17	O,D	N,W
Kuwait	17	0	0	24	98	0	0	1	2	O	N
Lebanon	10.4	7.2	69	0.6	6	2.6	25	0	0	O,D	W
Oman	312	76	28	46	17	107	39	0	0	O,D	W,N
Qatar	12	7	65	4	35	0	0	0	0	O	N
Saudi Arabia	1954	606	31	293	15	547	28	118	6	O	N
Syria	187	9	5	64	35	78	42	33	18	A,O	W,N,C
United Arab Emirates	79	0	0	58	77	3	4	0	0	O,A	N,C
Yemen	421	76	18	139	33	189	45	0	0	D,O	W,N
Total	**4511**	**1053**	**23**	**808**	**18**	**1203**	**27**	**336**	**7**		

Source: Adapted from Ffliotti et al., 2002.

1. Cause: A = agriculture; O = overgrazing; D = deforestation; I = industrialization; V = over exploitation of vegetation
2. Type: W = water erosion; N = wind erosion; C = chemical deterioration; P = physical deterioration

Any cooperation to mitigate land degradation at the country level must be based on root causes and common pressures, considering, when possible, the geographical location and the management of shared resources. The local population has the potential to provide accurate ecological knowledge, and the growth of alien plants at the account of native plants, scarcity of medicinal plants and migration of wild animals were recognized by the local population as indicators of forest degradation (Kalanda-Sabola, 2007). Management projects should consider local conditions, define national and regional stakeholders to integrate local ecological knowledge and indigenous skills in determining resource degradation, elaborate draft management plans and monitor the indicators of land degradation and land recovery.

It is understood that Lebanon, Syria, Jordan, Iraq and perhaps Saudi Arabia who are facing a common problem of overgrazing and recession of vegetation cover cooperate in the domain of rangeland degradation due to common border and free movement of flocks and herders across their boundaries. Climatic conditions predetermine herds movement in a search for green pasture, which create a problem of shifting overgrazing. Management of rangeland degradation must occupy a primary place in the national and regional policies and mobilization plans to combat desertification in the ESCWA Region. The importance of cooperation between governments arises from the fact that the dominant form of grazing in the Arab region is the traditional nomadic herd movement and animal feeding (mainly small ruminants) on common and sometimes private lands.

In the steppe and Badia regions the wet season is characterized by an overstocking of herds on pasture lands. In many cases, grazing pattern and density exceed land carrying capacity. Not only

overgrazing negatively affects the natural productivity and biodiversity of pasture land but also the expansion of agriculture and replacement of field crops by other cropping patterns such as greenhouses, fruit trees. Both factors have reduced the available grazing lands, and the available post harvest plant residues and have changed the grazing pattern from nomadic to static, thus putting more pressure on fragile land. Pasture lands were replaced by fruit trees. Intensively cultivating the highly fragile rangelands accelerated rangeland degradation instead of keeping them for controlled grazing, wildlife and biodiversity conservation (Abdel-Kader and Yacoub, 2004). Weak soil structure and light texture beside the cultivation of rangelands and mountain lands boosted wind and water soil erosion (Waad, 2004). The introduction of no tillage practices in the Badia contributed to land and vegetation recovery where Normalized Difference Vegetation Index (NDVI) data shows significant recent improvement (Khawlie et al., 2005).

Reduced pasture area yielded a shift from the mobile grazing system that used to suit the range capability to static grazing thus deteriorating the soils of drylands in the ESCWA region and exposing them to wind and water erosion. In this regard, cooperation between the remote sensing centers and the MoA of Iraq, Jordan, Syria and Lebanon using remote sensing data and GIS can provide powerful tools for assessing grazing lands productivity and monitoring the Normalized Difference Vegetation Index (NDVI) and herds movement (Darwish and Faour, 2006). Changes in the NDVI derived from Advanced Very High Resolution Radiometer (AVHRR) data are usually indicative of changes in the surface conditions, most predominantly changes in vegetation. Monitoring vegetation productivity in Egypt, Iraq and occupied Palestinian Territory showed the significant role of governmental policies in the management of local land use practices (Nielsen and Adriansen, 2005)

In Syria, integrating conventional land evaluation methods and farmers indigenous suitability assessment proved useful to promote the adoption of new landuse systems (Cools et al., 2003). Farmers' perception of soil quality was helpful to model land degradation and elaborate successful mitigation plans in semi-arid Lebanon (Zurayk et al., 2001). The participatory land evaluation revealed through better farmers' understanding of the impact of local microclimatic variations on crop productivity, thus, showed the overriding weight of socio-economic constraints over biophysical opportunities. National and regional policies and stakeholders active participation are two interacting factors that can promote or hinder the cooperation of neighboring countries with similar land degradation problems and obstruct the efforts to combat desertification in the ESCWA region.

Salinity problems might constitute a major topic of cooperation between Egypt, Syria, Jordan, Iraq, UAE and Yemen. Regional results showed severe situations exist in these Arab countries given the steady increase of the extent of saline soils and the deterioration of water quality in the coastal aquifers due to excess pumping as a reaction to surface water scarcity (ACSAD, 2004). Shared water and forest resources between Lebanon, Syria and Jordan can represent a good ground for bilateral and multilateral cooperation. Treated water can safely be used for irrigation of suitable, salinity tolerant crops. In severely water stressed countries, wastewater, drainage water and saline groundwater can be used for water augmentation to achieve food security (Qadir et al., 2007). Models like The sustainable strategies for irrigation in salt-prone Mediterranean areas (SALTMED) were developed as decision support tools for the management of saline water to irrigate different crops based on soil, water and market related considerations (Flowers et al., 2005). Using halophytic or salinity resistant plants to phytoremediate, saline Egyptian soils opened up soil permeability and lowered soil pH beside the increase of soil fertility and biological activity. This approach provided shade and habitat for other small plants and fauna and stopped erosion, conserved moisture and improved the general ecology and environment (Soliman, 2006).

B. LESSONS LEARNED FROM REGIONAL COOPERATION AND SUCCESSFUL WATERSHED MANAGEMENT

Water scarcity reflects not only on eco-systems degradation, but also on land and human health. There is a need for regional cooperation among ESCWA countries in such issues like the balancing of water supplies and demands, exploiting the potential of water conservation measures and re-use to meet new demands and developing new water supplies as well (Moore and Seckler, 1993). Watershed management through the analysis of renewable water and current land cover/use versus alternative more suitable landuse patterns can secure a solid ground for the sustainable use of land and water resources. The application of remote sensing (RS) for providing basic data for environmental decision-making is growing rapidly. Whilst such application is becoming more of a routine within national boundaries, there is greater difficulty in bilateral or multi-national policy formulation and management interventions for inter-related environmental issues. For example, the El Kabir River Basin is shared between Lebanon and Syria. The natural and anthropogenic fabric of the watershed was provided by RS and GIS, which can contribute to improved water quality by securing information for managing land effectively. It is clear that management and conservation should relate to land use practices and policies to assure sustainability. The impact on the basin communities implies that these communities be a part of both evaluation and decision-making. This explains the approach which integrates institutional, spatially referenced information and public participation aspects.

The Al Arish (Sinai) watershed development studies based on hydrology, soil capacity and local population, water harvesting and cultivation practices as well as the green belt of North African countries are examples of integrated watershed development in the region (Khawlie, 1990). Al-Hammad Watershed Project represents a grazing and integrated environmental unit (Badia) shared between Syria, Iraq, Jordan and Saudi Arabia. Development of hydrological and soil works started in the nineties, but progress made in every country has not been going in parallel due to national economic problems. In Syria, the Badia development project rehabilitated 3 million ha of pasture lands, while the development of Jabal Al-Hoss consisted of poverty eradication by extending the cultivated lands through rock removal from bare eroded lands, water harvesting, cultivation of fodder crops and increase in the productivity of cultivable lands. A total of 22000 ha were de-rocked and the extension service was hastened with a special focus on rural women and on involving stakeholders in the participatory decision-making process (Waad, 2005). The improvement of agricultural productivity in arid and semi-arid zones of Jordan (JAZPP) project improved land productivity at small drainage catchments, through the development of tested, economically viable and socially accepted technical packages, which included small-scale water harvesting (Hattar, 2004). Coordinating national efforts can promote the execution of the project in order to achieve synchronized measures to conserve rangeland in the region. Badia water benchmark sites represent a subject of regional watershed cooperation to develop community-based optimization of the management of scarce water resources in agriculture in West Asia and North Africa (Sartawi et al., 2007). No tillage system, artificial regeneration and temporary fencing were followed to recover the grazing areas in Jordan (Al-Qudah, 2004), Iraq (Fayad and Sharif, 2006) beside the participatory land system management in Syria (Loulou, 2005). Management of shared natural resources involved satellite data for the investigation of soil, pasture grazing patterns and renewable water resources.

Several regional projects joining countries from the Mediterranean region like Resmanmed, Medcoastland focused on improving the monitoring of land degradation and the management of scarce water resources. The Kabir river project aimed at the assessment of water quality and management of the shared Kabir River between Syria and Lebanon (IDRC, CNRS-CRS and GORS, 2002). Similarly, a highly significant cooperation took place between Lebanon and Syria in the EC-supported Project 'CoLD" on coastal land degradation and monitoring (Khawlie et al., 2004). The Medcoastland project (2003-2007)

joined partners from the Mediterranean and ESCWA region like Egypt, Syria, Lebanon, Palestine and Jordan representing researchers, farmers associations and decision makers. It aimed at promoting regional cooperation to mitigate and reverse land degradation through participatory income generating activities appropriate legislations and dissemination of data on successful stories. A memorandum of understanding was signed during the Medcoastland international conference held in Beirut in 2006 aiming at strengthening regional cooperation and inaugurating a regional office for soil monitoring (ROSOM) to combat desertification (http://medcoastland.iamb.it).

C. DROUGHT MITIGATION

Recurrent drought is worsened by a poor performance of agricultural production and irrigated agriculture. The misallocation of water and low irrigation techniques and skills, notably in the dry ESCWA regions, causes secondary soil salinization, which multiplies the negative impacts of drought. More efficient agricultural water use systems and pricing of water to encourage demand reduction and adaptation of water-saving technologies are some of the proposed techniques for more efficient water use (Seckler et al., 2003).

There are several regional shortcomings to face land degradation such as the lack of proper collaboration and coordination between neighboring countries affected by drought and lack of policies and regulations, controls, and incentives. The policy within each country is usually reactive and not proactive beside the deficient management approaches such as non-integration, non-participation, lack of proper planning (especially during times of crisis), and lack of support to decision-making, as well as deficiencies in information delivery (type, time, extent). There is a need to overcome the technical, institutional, socio-economic, and financial constraints hampering the full implementation of the National Action Plans (NAP) to combat desertification. For many countries, environmental issues, including desertification and sustainable land management, are not a priority (MoA, UNDP, 2007). Institutional responsibilities and lack of clarity are leading to overlaps, conflicts, and inefficiency in the management of natural resources. An institutional unit dedicated to following up on the activities in combating desertification and sustainable land management has yet to be established. Up till now, the only established institutional units in the Arab world are located in Rabat- Morocco and Beirut, Lebanon. In Rabat it is the Department of Desertification Control and Nature Protection affiliated to the High Commissariat for Water, Forest and Combating Desertification (HCEFLCD) (Badraoui, 2006 Personal communication). A small similar unit was created in Lebanon supported by the MoA and UNDP.

The West Asian countries are developing preliminary proposals for several networks to implement the UNCCD, including a Network on Drought Preparedness and Mitigation of the Effects of Drought as part of the Sub-Regional Action Programme (SRAP) to Combat Desertification and Drought in Western Asia. With active support from ACSAD these activities cover a Thematic Network on Water Management in Lebanon and Jordan and another Thematic Network on Vegetation Cover in Syria and Yemen (Loulou, 2005). Two major activities are underway: the Inventory Studies on Water Resources in West Asia and the Pilot Areas Project. A document presenting a framework for the selection of representative pilot project sites in the different member countries of the UNCCD Sub Regional Action Program (SRAP) has been finalized. The West Asian countries have developed their own SRAPs to strengthen cooperation at sub-regional level. Using an integrated natural resource management approach, the pilot areas will serve as sites for the participatory implementation of successful measures to combat land degradation as well as for the monitoring of land degradation and rehabilitation. The Project Document will cover three thematic areas: (1) Mountain Agriculture (Lebanon, Oman, and Yemen), (2) Salt-Affected Areas (Bahrain, Kuwait, Syria, and the United Arab Emirates), and (3) Rangelands (Jordan, Palestine, Syria, and Saudi Arabia). The sustainable management of vegetation cover network will provide catalytic support to member countries to develop and

implement national strategies for sustainable management of their land and vegetation cover to increase the income and food security. Activities will promote institutional mechanisms to deal with issues related to the development and management of rangeland, cropland and mountainous areas. Technical and institutional innovation for the management of land resources will be developed and tested. As a result, support and assistance will be provided to selected programs and partnership with all stakeholders will be built. A successful implementation of UNCCD supposes complementary of activities implemented within the SRAP framework and sharing of information and technical expertise.

D. COOPERATION BY REGIONAL INSTITUTIONS

As noted above, there are deficiencies in certain aspects, within the countries of the ESCWA Region, that need to be overcome in order to improve cooperation. The Regional institutions must cooperate, within an agreed program, to help those countries overcome their deficiencies, thus be able to cooperate in confronting land degradation. As a first feature, there should be emphasis on enhancing capabilities for government institutions to collaborate and coordinate their activities better than before. Proper approaches to land degradation require integration of inter-sectoral needs and inputs. Thist will certainly also require assessment of the relevant policies and regulations of the countries currently enforced. Their comparative analysis would lead to suggesting some changes to gain more uniformity among the different countries, hence a closer functional structure for their institutions to work cooperatively together.

The 2nd feature to consider is financing as it is of course, a significant issue for any institution. As stated above coordinated efforts shall secure both funding and cost effectiveness. This is crucial because the market is a highly competitive entity, and there are lots of opportunities, but only those that are cost effective will be funded. There is a value added when the financing is co-shared. It implies that institutions that are ready to commit themselves by contributing to the budget of the proposed program/project, will stand better chances of securing external funds.Institutional regional cooperation will be effective only proper planning. Thus providing information (to make better judgments), ensuring participation of relevant stakeholders, and integration of implementation regulatory mechanisms for the Region, policies and strategies, should be assessed within a context. As it exists now, even though land degradation processes are taking place across the common borders of some countries, their implementation – regulatory mechanisms may not conform with each other. That may not only lead to non or ineffective cooperation, but to further deterioration. This is why another management function for institutional regional cooperation is needed, namely, crisis management. The crisis may not result only from the unnoticed spread of the land degradation process, but from its exponentially increased impacts along border areas, if coordinated management efforts are not enforced quickly enough due to non-conformable regulatory mechanisms.

The 3rd feature to work on for enhancing institutional cooperation is the technical side. The roles vary according to the nature of the institutions, some play an executive role, some an implementation role, and some may take other roles. However, it should be ascertained (whether through the RSC or other bodies) that the Region should be linked in a functional common network (with local and Regional nodes or focal points) that will quickly assure information outreach. That requires the presence of a Regional land degradation monitoring system whose operation, standards, threshold values and indices are agreed upon. It is envisaged that ESCWA could play a pivotal role in capacity building, with the help of ACSAD (Arab Center for Study of Arid and Dry Lands) as an implementation agency of the monitoring network The necessity of a holistic approach can not be undermined. Certainly, this is a long-term continuous operation that needs proper funding. Coordination, integration and cross-boundary problems indeed call for the holistic approach. The nature of such cooperation, by necessity, allows facilitating exchange of expertise and other levels of technical needs. It is expected that the elements of those needs may be available to various extents

in different areas, i.e. some may provide soil scientists, some may provide hydrologists, or climatologists, or geologists, or agronomists, or technicians, etc.

The last major feature in enhancing Regional institutional cooperation must consider the general level of knowledge. There are several loopholes of relevant know-how on land degradation in the area. To begin with, is the level and extent of environmental awareness, both at government agencies and at the public adequate capacity building, training and awareness campaigns within a common land degradation program at regional level can be very effective in making different communities (especially across adjacent borders) to exchange experience The resultant uniform approaches, notably in areas sharing same borders and problems, will lead to more effective mitigation outcomes. Know-how is very crucial at different levels, and must be disseminated within the different hierarchy of the social structure. If managers, decision-makers and the community, each at his own pace, do not get the right information and realize the gravity of the situation, they will not act in response to what the experts are recommending. Spreading the know-how on land degradation to understand its causes, to face its consequences, monitor its status, and mitigate its effects could be the most crucial of the four basic features for an effective regional cooperation to last on the long run.

VI. RECOMMENDATIONS

A. PREAMBLE

It has to be acknowledged with appreciation that initiatives on land degradation such as assessment, mitigation and reversal, have been implemented with some success in the region. Investments have been made by countries and Regional/International institutions for the implementation of projects to assess the status of Land degradation and to implement policies to prevent and mitigate it.

Yet, concerns are increasing that countries of the Region are still being affected by the negative impacts of land degradation implying the persistence of the problem on a large scale. Hence, the issue must be dealt with through coordination and cooperation by institutions within countries and at the regional level by regional organizations.

Lessons learned from the impact of land degradation is not adequately disseminated. The proper dissemination of these lessons will contribute to the design of focused and coherent intervention strategies to prevent Land Degradation.

Land degradation is an on-going process and its recurring conditions are affecting all countries of the Region. As such, there is a strong justification for the design of joint programs and scientific, social and managerial partnerships in order to mitigate and prevent land degradation.

Accordingly, the following recommendations are proposed:

B. RECOMMENDATIONS FOR COUNTRIES

(1) Member countries shall support regional cooperation and the formation of a Regional Steering Committee on land degradation (RSC – LD)

(2) Countries who shall benefit and gain new knowledge through integrated programs or projects on regional cooperation in reversing land degradation will be in a position to share and exchange such knowledge with concerned institutions within and among other countries.

(3) Countries shall invest to construct standardized database and hazard maps and share them with cooperating partners.

(4) Countries shall take necessary steps to build local capacity for forecasting, predicting and early warning on various causes of land degradation.

C. RECOMMENDATIONS FOR REGIONAL INSTITUTIONS

(1) Representatives of the countries and Regional/International institutions shall be requested to form a Regional Steering Committee on land degradation (RSC – LD)

(2) The secretariats of RSC could be structured to function as follows:

- To have a directing Board of selected Ministers (rotating) and high-ranking representatives of Regional/International institutions would choose a rotating chair. The RSC will set a

strategy of work, guide Regional cooperation activities on land degradation, secure international support and ensure sustainability.

- The Secretariat of the RSC shall also follow up on logistics, necessary operations, plus the initiation and maintenance of a Regional Land Degradation Network (RLDN).

- Within each country, a National Land Degradation Committee with representatives from selective Ministries (Agriculture – as focal point- Environment, Water, Municipalities, Social Work, Planning, and Public Works and land use) and relevant important research centers shall be formed.

(3) A Regional Land Degradation Program (RLD) with long, medium and short-term goals shall be designed with the objectives to implement the above "Recommendations for Countries", and promote regional cooperation, and the designer(s) of the program will exert efforts to:

- Secure Regional Land Degradation Fund for the Program

- Prepare a set of Guidelines for studying, mitigating, monitoring and assessing land degradation causes, and ensuring standardization of approaches and data

- Implement a set of regional projects that identify causes of land degradation, focusing on themes according to priorities of the region, within a timeframe that will serve the objectives of RLD

- Design a public awareness campaign in the region about the causes of Land Degradation and availability of remedial measures.

- Agree on a set of performance and achievement indicators, tied to the time frame of the RLD Program, to monitor and evaluate any positive impact resulting from the Regional cooperation.

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