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SUSTAINABLE LAND MANAGEMENT IN THE ESCWA REGION

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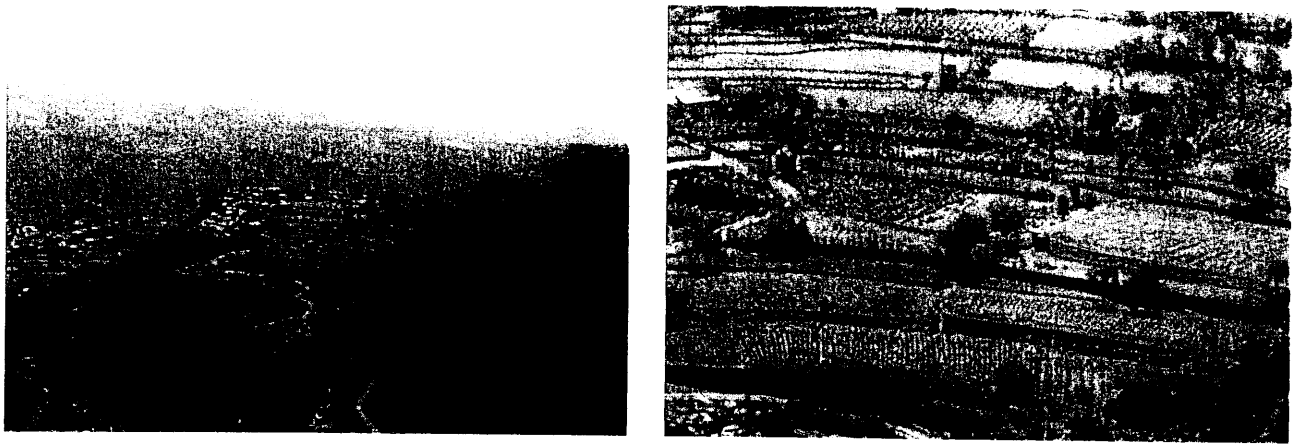
Sustainable Land Management in the ESCWA Region
(Draft Paper)



Terraces in the Ibb mountains, Yemeni highlands

Participatory planning of sustainable land management in Yemen

Prepared by

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March 2009

List of Acronyms

%	Percent
AUB	American University of Beirut
BRDC	Badia Research and Development Center
ESCWA	Economic and Social Commission for Western Asia
FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
GEF	Global Environment Facility
GEO4	Global Environment Outlook
GIS	Geographical Information System
ha	Hectares
ICARDA	International Center for Agricultural Research in the Dry Areas
MDG	Millennium Development Goal
MEAs	Multilateral Environmental Agreements
NR	Natural Resource
ODI	Overseas Development Institute
SLM	Sustainable Land Management
SWC	Soil and Water Conservation
UN	United Nations
UNCBD	United Nations Convention of Biological Diversity
UNCCD	United Nations Convention on Combating Desertification
UNFCCC	United Nations Framework Convention on Climate Change
WB	World Bank

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EXECUTIVE SUMMARY

(To be completed after Review)

I. INTRODUCTION

The sustainable land management (SLM) approach integrates land, water, biodiversity, and environmental management to meet rising food and fiber demands while sustaining ecosystem services and livelihoods and assuring the long term potential of these resources (WB, 2006). The term "sustainable" is here conceptualized in its various dimensions, specifically the economic, social, institutional, political and ecological dimensions. The concept of "land" refers to spatial units of terrestrial ecosystems defined by ownership, resource availability, boundary conditions and the policy and economic environments. Management is understood to refer to the set of decisions and actions needed to achieve a predefined goal.

Within the context of land, sustainable management is here understood to refer to a set of actions anchored in appropriate technologies, policies, and activities implemented in specific land use systems (Hurni, 1997). Appropriate technology is built on five pillars of sustainability, namely, 1) ecologically protective of the natural resources and preventive of the degradation of soil and water quality, 2) socially acceptable, 3) economically productive, 4) economically viable, and 5) risk minimizing (Dumanski and Pieri, 2001 and Hurni,1997).

A. OVERVIEW OF SLM IMPORTANCE

According to a recent World Bank report (WB, 2008), 75 percent (%) of the world's poor live in rural areas where they are mostly involved in farming. Driven partly by the need to produce food and fiber and to acquire natural resources humans are constantly clearing new tropical forests, practicing environmentally damaging agriculture, and intensifying farmland production. In addition, the ever expanding urban centers are contributing to changing the world's landscapes. While the food crisis of 2008 has reminded the word that agriculture remains fundamental to economic growth, poverty alleviation, and environmental sustainability, issues such as improper land management continue to plague agriculture and to impinge on economic development, rural livelihoods and environmental services

The relevance of SLM, which prevents and reduces land degradation, is made more acute by the land management approaches commonly practiced in small and large scale farming. These have been widely shown to degrade land and decrease its productivity. They also significantly contribute to the breakdown of precious services offered by the ecosystem, such as biodiversity niches, as well as the hydrology and carbon sequestration functions of watersheds and landscapes (WB, 2006). SLM has also a regenerative function, and it can be used to restore damaged land and optimally uses land resources for the benefit of present and future generations (FAO, 2008). SLM can be used to work around limitations caused by topography and landform, as it can preserve and enhance the productive capabilities of upland, downslope, flat and bottom lands in cropped and grazed areas, sustain productive forest areas and potentially commercial and noncommercial forest reserves (WB, 2006). Furthermore, SLM will positively affect socio-economic conditions of local communities; contribute to national growth and development, to the successful implementation of long-term strategies, and to the compliance by international commitments and conventions, such as the United Nations Framework Convention on Climate Change (UNFCCC), the UN Convention of Biological Diversity (UNCBD), and the UN Convention on Combating Desertification (UNCCD) (WB, 2003).

Poverty reduction and SLM are highly relevant interlinked strategic goals. Over 43% of the ESCWA population lives in rural areas with 27% falling below the poverty line (Saadi, 2001 and Shaar, 2004). Land degradation in the region contributes to the stagnation or decline of agricultural productivity, critically affecting the main source of income of the rural population. Land degradation could seriously threaten the progress of economic growth and poverty reduction in the ESCWA region. A clear understanding of the poverty-land degradation linkages is fundamental to the design of relevant policies to achieve the sustainability. This is, nonetheless, a challenging task due to the complexity, resource and context specificity of this relationship. Empirical evidence to demonstrate their linkage has been limited Nkonya *et al.*, (2008).

B. IMPORTANCE OF SLM IN THE ECONOMIC AND SOCIAL COMMISSION FOR WESTERN ASIA (ESCWA)/ARAB REGION

Land degradation is a worldwide environmental problem. The term "degradation" is defined here as the "reduction of resource potential by one or a combination of processes (e.g., water and wind erosion and sedimentation, long-term reduction in amount and diversity of natural vegetation and animals, and salinization" (Lal 2001).

Land degradation is a major problem in the ESCWA regions, represented by 14 countries in West Asia (Bahrain, Iraq, Jordan, Kuwait, Lebanon, Oman, Palestine, Qatar, Saudi Arabia, the Syrian Arab Republic, the United Arab Emirates and Yemen) and in North Africa (Egypt and Sudan) (ESCWA, 2009) (Fig.1), where freshwater renewable resources are extremely limited and represent only 0.4% of the global renewable water resources (Aboul Hosn, 2005). This is especially true in those countries where the share of agricultural gross domestic product (GDP) in the economy is higher or equal to 10 % such as in Egypt, Lebanon, the Syrian Arab Republic and Yemen.

Desertification, defined herein as "land degradation in arid, semi-arid and dry sub-humid areas resulting from various factors including climatic variations and human activities" (UNESCO 1979; UNEP 1992; UNCED 1992, in Lal, 2001)", is affecting large areas of the ESCWA region, particularly in Iraq, Jordan, the Syrian Arab Republic, and most countries on the Arabian Peninsula. Many of these countries already have deserts, ranging from 10% in the Syrian Arab Republic to close to 100% in Bahrain, Kuwait, Qatar and the United Arab Emirates. Some 15.3 million hectares (ha) of the region's cropped lands are affected by land degradation; 42% are slightly degraded and 12% are severely to very severely degraded (UN, 2007). Degradation destroyed 34% of irrigated agricultural land in the ESCWA region leading to an annual cost of US$5 billion of agricultural revenue per year because of desertification (Sawahel, 2009).

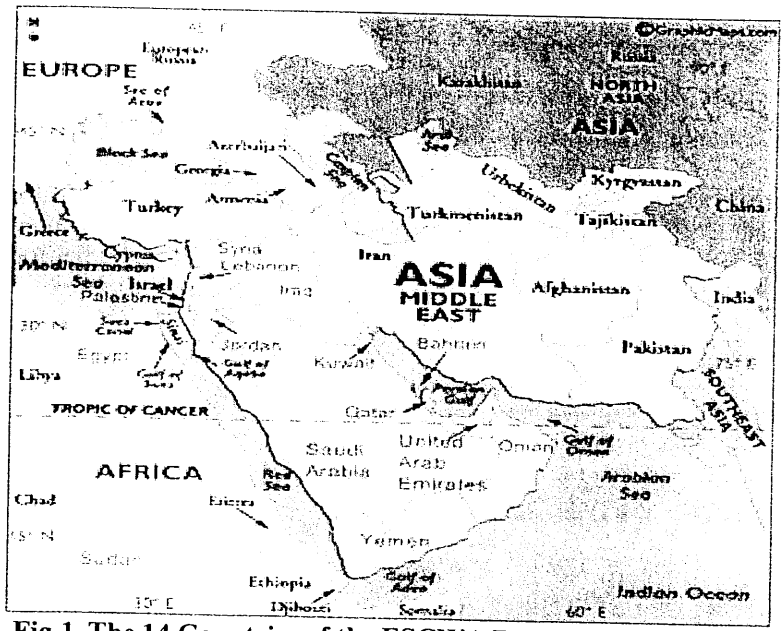

Fig.1. The 14 Countries of the ESCWA Region shown in Green
(The Lemley Letter, 2009)

The major type of land degradation in the region is soil erosion caused by wind and or water. Other major problems caused by inappropriate practices and the depletion of aquifers are salinization, waterlogging and

seawater intrusion particularly in irrigated areas and coastal plains. In natural habitats, the degradation of rangeland vegetation, especially trees and grazed species is also a major problem (UN, 2007). These different forms of land degradation constitute a serious threat to food production systems and to rural livelihoods. This is especially critical in light of the predicted increase in drought occurrence and severity resulting from global climatic changes. Therefore, the need for integrated land and water management to sustain the ecosystem of drylands and adapt agricultural production to the impacts of climatic change is increasingly recognized in the ESCWA region (Appelgren, 2008).

C. SLM AND SUSTAINABLE RURAL LIVELIHOODS

The relationship between rural livelihoods and the integrity of terrestrial ecosystem is clearly explicated in the sustainable livelihoods framework, where land constitute one of the capital assets required to construct livelihoods (Scoones, 1998). The sustainable rural livelihood approach offers a framework of analysis pertinent to local people and capable of generating the knowledge needed to enhance their livelihoods. The main value of this approach is that it provides an analysis of the vulnerability context in which rural people draw upon capital assets to build their livelihoods. Capital assets are natural (environmental services, land, water, vegetation, biodiversity, etc.), social (resources: networks, groups, trust, social relations, etc.), human (skills, knowledge, good health and ability to labor), physical (basic infrastructure: transport, shelter, communication, energy), and financial (resources: savings, access to credit, bank loans, remittances, pensions, etc.). This approach also helps develop an understanding of the structures (organizations, from layers of government through to the private sector), processes (policies, laws, rules and incentives) and institutions (regularized patterns of behavior structured by the rules and norms of society) which define livelihood options for the people (Boyd and Turton, 2000 and Zurayk, 2006). Three general rural livelihood options have been identified: agricultural intensification and extensification, livelihood diversification, and migration. The priority that people attach to each of these different approaches is a major determinant of investment in SLM.

Livelihood outcomes resulting from the selection of one or the other livelihood option vary greatly at all levels (household, community, region, etc.). Common livelihood outcomes might include: more income, increased well-being, reduced vulnerability, improved food security, and more sustainable use of the natural resource (NR) base. At the household level, investment in SWC is based on projected benefits.

Boyd and Turton (2000) investigated the relationship between soil and water conservation (SWC), an essential component of SLM, to sustainable livelihoods in semi-arid areas of Sub-Saharan Africa, and attempted to elucidate why households choose to invest in soil and water conservation. They found that the decision to invest in SWC depended on issues intrinsic and extrinsic to the households. Intrinsically, assets availability and the selection of agricultural intensification as a livelihood strategy was an important determinant. Wider policy and institutional issues were extrinsic determinants beyond the immediate control of households (Tables 1 and 2).

Table 1- Potential contribution of SWC to a sustainable livelihood (Boyd and Turton, 2000)

Outcome	Possible contribution of SWC
More income	Increase in water availability allows production of cash crops
Reduced vulnerability	Reduces risks associated with low and erratic rainfall
Improved food security	Improved soil and water management leads to higher yields
Increased well-being	Group approaches to SWC allow development of social and human capital
More sustainable use of the NR base	On-site and off-site benefits

Table 2- Reasons of why communities adopt and invest or not in SWC methods (Boyd and Turton, 2000)

Reasons for Adoption and Investment	Constraints for Adoption and Investment
Reduction of water and soil loss thus improving soil fertility	Lack of SWC knowledge
Improvement of crop harvest (higher yields)	Lack of tools and implements
Increase in sources of wood and timber	Lack of labor
Reduction of pest prevalence	Lack of oxen
Reduction of risk of crop failure	No presence of erosion problems
Prevention of wind and attraction of rainfall	Restriction by neighbors and livestock
Increase in food available at home	

The authors conclude that "it is essential to recognize that SWC measures impose opportunity costs through their demands on labor, often at times of peak labor demand. It is often assumed that investing in SWC is automatically beneficial, without looking in detail at the costs and benefits, and particularly the on-farm versus off-farm costs of soil degradation." These issues are pivotal to understanding why people opt or not to engage in SLM (Box 1).

Box 1- Using the Sustainable Livelihood Framework to understand land use dynamic in Arsaal, Lebanon (Hamadeh *et al.*, 2006)

The sustainable rural livelihood framework was first used in Lebanon in the late 1990s. The livelihood choices of the community of Arsaal were strongly natural resources-based: fruit tree growing, quarrying in addition to the traditional agropastoralism. But there was also a significant off-farm component. Investing in multiple options helps the household to confront various uncertainties coming from sociopolitical, economic or ecological conditions. It was found that local people used the outcome from off-farm employment to invest in land management. Major issues remain unresolved like the fact that the sustainability of rural livelihoods does not necessarily imply the sustainability of all the ecological systems that make up these livelihoods. For example, the rapid increase in quarrying, while being an important contributor to the stabilization of livelihoods, has had a serious negative impact on the natural capital of the community. However, the livelihood analysis showed that, without quarrying, the livelihood of many Arsaali would break down, and so would the agroecological system. In the macro- and meso-economic systems (national and global), the Arsaal community has a limited number of available options. This brings out the other problem of the sustainable livelihood framework, which is that it addresses the dryland issue in developing countries largely at the micro, sometimes at the meso levels while the macro level remains outside the scope of analysis.

D. SLM AND LAND USE PLANNING

Land use planning (LUP) refers here to the process of evaluation of options and subsequent decision-making which precedes management actions. Sustainability, or the use of land for the optimal prosperity of human and ecological benefits for present and future times, constitutes one of the main principles of modern land use planning. Other principles include optimization and equity, which attempt to balance prosperity with care for the poorer, harmony and multifunctionality. It is on these premises that Sastrowihardjo (2000) linked the process

of land use planning to SLM in Indonesia. He identified the four orders of land management as: legal, administrative, utilization and maintenance and preservation. One of the objectives of LUP is to establish these four orders, including land maintenance and preservation, which are at the basis of SLM.

This approach echoes the land use planning approach of the FAO (1995) which identifies sustainable land use management as a system of land use management which covers planning, implementing, and controlling the utilization of land for the goal of sustainable development and human well being.

E. SLM AND COMMUNITY PARTICIPATION

Community participation is essential to the implementation of SLM. Communities should sense the importance of conserving their environment if SLM is to be successful. Community stakeholders represent grass roots communities whose livelihoods are threatened by land degradation. In the ESCWA region they are principally composed of local people, non-governmental organizations and civil society groups. NGOs have been shown to play a positive one in advocacy, awareness raising, and in implementing projects for desertification and land management. Local exchange of lessons and experiences will contribute to improving the understanding of SLM issues (TerrAfrica, 2008).

To ensure the success of SLM, active participation should compel towards the future development strategy starting from project initiation, planning, elaboration, implementation, monitoring & evaluation (M&E), selecting users and new locations, and identifying new areas of work (Gachanja, 1999). This implies the use of a "community-based participatory approach" by technical personnel working with farmers and building mutual trust and confidence. Ideally, projects should be implemented upon the request of local people (existing community institutions like cooperatives and associations, and village development committees), and should recognize the potential indigenous capacity. Participatory projects empower women by prioritizing their development concerns and ambitions, and involving them in the decision making process. In addition, users should contribute with labor and thus gain a sense of ownership. This approach has been adopted by most SLM projects that have taken place in regions of ESCWA and that are reported in this paper.

Resistance to participation may sometimes emerge from policy makers and project managers who believe that a participatory approach is not cost-effective and not the most appropriate choice. However, several successful projects have shown that the participatory approach to SLM can ensure a higher degree of success than top-down approaches (UN, 2007).

F. SLM AND INDIGENOUS KNOWLEDGE

"Some traditional lifestyles are threatened with virtual extinction by insensitive development over which the indigenous people have no participation. Their traditional rights should be recognized and they should be given a more decisive voice in formulating policies about resource development in their areas (particularly in complex rain forest, mountain and dryland ecosystems)." (Lalonde, 1993)

Communities around the world have practiced SLM with success for millennia. Indigenous knowledge of the local ecosystem that has been accumulated over time and passed on through generations can play a positive role in the formulation and implementation of sustainable development policies and projects. Local knowledge and skills related to soil taxonomies, potential use of local plants and forest products, animal husbandry, wildlife,

integrated pest management, soil erosion control, soil fertility management, crop rotation can form the basis of successful SLM plans and actions. Acquisition of this knowledge may be of great use to scientists and planners involved in SLM (Table 3 and Boxes 2, 3 and 4).

Table 3- Comparison of indigenous knowledge and western scientific knowledge (Uitto and Ono, 1996 and Lalonde, 1993)

Comparison	**Indigenous Knowledge (*techne*)**	**Western Scientific Knowledge (*episteme*)**
Relationship	Subordinate	Dominant
Dominant mode of thinking	Intuitive (holistic)	Analytical (reductionist)
Communication	Oral (storytelling, subjective experiential)	Literate/didactic (academic, objective, positivist)
Data creation	Slow/inconclusive	Fast/selective
Prediction	Short-term cycles (recognize the onset of long-term cycles)	Short-term linear (poor long- term analysis)
Explanation	Spiritual (the inexplicable)	Scientific inquiry (hypothesis, laws)
Biological classification	Ecological (inconclusive, internally differentiating)	Genetic and hierarchical (differentiating)

Box 2- Hima in Syria and Saudi Arabia
(Kilani *et al.*, 2007)

"There shall be no hima except for God and His Messenger". With this hadeeth, Muhammad, the prophet of Islam, eliminated the pre-Islamic practice of making hima exclusively for people with high authority. Practiced in the Arabian Peninsula for more than 1400 years, hima or protected area signifies the idea of a piece of land abandoned seasonally to allow regeneration. The hima secures sustainable use of natural renewable resources for the subsistence of the locals' livelihood.

According to Othman Llewllyn "The Hima is the most widespread and longstanding indigenous / traditional protected area institution in the Middle East, and perhaps on Earth". A revival of the Hima, under the form of tribal control restoration on grazing, took place in Syria and Saudi Arabia. In Syria, a new regulation included the expansion of grazing through cooperative himas. However political changes in Syria reoriented the program towards other projects and the initiative thus failed. On the other hand, the initiative turned to be a success in Saudi Arabia where a revised protected area system plan revived 7 traditional himas as community conserved areas. In addition, a consultative framework ensures that main stakeholders from the public and private sectors, owners of palm groves, wells and livestock, representatives of the local communities participate in the planning and management of the himas.

Box 3- Land Degradation and Mitigation in the Lebanese Mountains
(Zurayk and El Moubayid, 1994)

Lebanon is a Mediterranean mountainous ecosystem disturbed by naturally occurring land degradation for more than 6000 years BC. Factors intensifying the degradation process are socio-economic and political, in addition to the contribution of rapid onset (landslides, flash floods, forest fires), and slow onset hazards (droughts, soil degradation, land marginalization). Mitigation measures to prevent and reduce degradation and conserve natural resources are structural (terraces, waterways, forest lands), and non-structural (customs and traditions like the protection of the wilderness or the equitable distribution of water by a guard). The *Kfarselwan* watershed was selected as a case study to analyze the causes and effects of abandoning traditional land degradation strategies. The study revealed that the alteration of the agricultural priorities led to shrinkages in the agriculture land, and to the abandonment of terrace maintenance. However the customary rules governing the use of forested lands were still in place, and included a rotational felling-protection cycle.

Box 4- The Arsaal Case Study, Lebanon
(Zurayk, 2001)

A land use study aimed at supporting SLM took place in Arsaal, a Lebanese village extending on 36,000 ha of semi-arid mountainous land. A participatory rural assessment was conducted to describe the indigenous agroecological zoning and local soil classification. Geographical information system (GIS) technologies were used to produce a land capability classification map and to analyze the current land use. Indigenous knowledge was used as one of the information sources for the land capability classification. Findings revealed that the combination of these methods provided a satisfactory understanding of the physical and biological land management constraints in Arsaal, encouraged interaction between stakeholders, and created opportunities for the identification of SLM options.

G. OVERVIEW AND THE WAY FORWARD

The millennium development goals (MDG) set policies that promote pro-poor agricultural growth. The UN Convention to Combat Desertification (UNCCD) came as a response to land degradation and adopted a Plan of Action to Combat Desertification (PACD) (UNCCD, 2009). An essential component of these policies is SLM which will help to maintain the productivity of agriculture, forestry and rangelands, and contribute to the preservation of the biological and hydrological services provided by terrestrial ecosystem. The food crisis of 2008, which was caused by a "perfect storm" of increased biofuel production, droughts, low yields, commodities speculations, increased demand in emerging countries and high oil prices is expected to trigger rapid expansion and intensification of agricultural land use. This will, in turn, raise the level of pressure on the natural resource base. Small farmers, impoverished by the breakdown of small scale farming caused by decades of dumping of subsidized commodities by rich nations, are currently unable to invest in SLM. They are being rapidly pushed out of the food system and replaced by large corporate operators who may practice an exhaustive land use in order to maximize short term returns with minimal investments in order to keep prices low and profit margins high. These developments will be at the core of the challenges of implementing SLM in the world and in ESCWA.

Countries of the ESCWA region have potential for economic agricultural activity in emerging markets and dryland products such as aloe or Arabic gum. Chamay *et al.*, (2007) have identified the opportunities and challenges of linking trade with SLM in the drylands. They conclude that there is a need for a regulatory framework providing an enabling environment for increasing investment in the sustainable use and management of land and natural resources. They call for positive interactions between international trade regimes such as multilateral environmental agreements (MEAs) and local stakeholders, as these interactions can directly or indirectly affect the resilience of arid land ecosystems.

In the remainder of this paper, we will focus on innovations for SLM applicable to the ESCWA region. We will discuss the concept of SLM, the challenges to its implementation, review the good practices and the lessons learned over decades of research and development action. We will conclude by addressing incentive mechanisms and adequate policies and interventions to meet sustainable development objectives.

II. SLM

A. EVOLUTION OF THE CONCEPT OF SLM

The late 1980's and the early 1990's constitute major turning points in modern environmental history. It is around this period that the concept of sustainability was popularized, primarily following the publication of the Bruntland report by the World Commission on Environment and Development (WCED) in 1987 (WB, 2008). The sustainability of agriculture was one of the main issues addressed by the report. Researchers later identified components of sustainability, such as Smyth and Dumanski (1993) and the World Bank SLM sourcebook (2008) which identified 4 pillars of sustainability: a) productivity, b) stability of production, c) soil and water quality and d) socioeconomic feasibility.

It is around the time of the Bruntland Report that the concept of SLM was fully expressed during the "workshop on Evaluation for SLM in the Developing World", organized by the International Society of Soil Science (ISSS), which took place in September 1991 in Chiang Mai, Thailand (Bosch, 1991). An international working group was created and tasked with refining, defining and operationalizing the concept by recommending a procedure to monitor and evaluate progress towards sustainable land use systems. The need for the development of indicators as instruments for monitoring and evaluation (M&E) of SLM was emphasized during a second workshop held in Lethbridge, Canada in 1993. The 15th Congress of Soil Science held in Acapulco, Mexico in 1994 provided the venue to compile and integrate the results of these experiences. The definition of indicators of land quality and sustainability has since become central to the interest of researchers and development specialists. These efforts underscored some of the major technical difficulties facing the implementation of SLM, which include the large amount of data needed in the development and use of indicators, and the complexity of addressing strongly interdependent parameters and processes (WB, 2008). A third workshop, organized by the International Institute for Aerospace Survey and Earth Sciences (ITC), was held at Enschede in the Netherlands during August 1997. This conference led the way to a new phase in the development and application of SLM (Dumanski, 1997). These next steps offer solutions that go beyond technologic recommendations by including aspects of social participation and policy dialogue (Hurni, 1997).

B. SLM OBJECTIVES

SLM aims for the synchronization of complimentary goals. These goals provide environmental, economical, and social opportunities to meet the needs of present and future generations without compromising the quality of the land resources. Key objectives are the development of sustainable agricultural, the conservation of natural resources, and the promotion of sustainable livelihoods. Achieving objectives of SLM include: identification of policy, institutional, and incentive reform options, and the articulation of priorities for investment in SLM and natural resource management (NRM). Improvement of productivity and addressing issues relevant to the poor can accelerate the adoption of SLM, and the assessment of the possible use of experiences acquired elsewhere is crucial in successfully designing and implementing intervention programs for combating and preventing land degradation.

C. DIMENSIONS OF SLM

Rural communities in the ESCWA countries are still engaged in land-based productive activities such as agriculture, forestry, and livestock productions. Land represents an important capital asset that determines livelihoods options. Economic and social development of the rural areas is therefore directly linked to the quality of the communities' lands and resources. For such rural societies, SLM constitutes the foundation of sustainable development. It has now become widely recognized that SLM is best approached through 4 dimensions of sustainability: economic, socio-cultural, institutional, and ecological. These serve as a checklist for evaluating the sustainability of rural development (Table 4 and Box 5) (CDE, 2008).

Table 4 – The 4 sustainable dimensions of SLM (CDE, 2008)

Sustainable Land Management - Fields of Observation

Level	**Dimensions of Sustainability**			
	Institutional	**Socio-cultural**	**Economic**	**Ecological**
Household (including farm plot level)	• Education and knowledge • Access to natural resources • Household strategies		• Household income, assets and consumption • Labour and worklo ad • Land management and farming system	• State of natural resources
Community	• Local leadership • Local institutions • Producer and self-help organizations	• Gender issues • Conflict management • Innovation	• Markets, prices and credit • Public property	• Land use • Water resources
		• Social & economic disparties		
	• Education, training and extension • Land and water rights, tenure	• Change in social values	• Employment opportunities/ migration • Infrastructure	• Land cover • Off-site effects

Box 5- SLM in a rural development project
(CDE, 2008)

Land management becomes more sustainable if progress can be made in all dimensions and at several levels at the same time. The goods and services provided must be compatible with local social structures (social and institutional dimensions: adaptability), the livelihoods of stakeholders must be ensured (economic dimension: viability), and resource degradation processes must be minimized (ecological dimension: protection). As long as there is movement towards unsustainability in any of the four dimensions, development cannot be considered sustainable.

"On the field" SLM requires an integrated and synergistic technical approach that is primarily based on the following options:

- Enhancing soil organic matter content in order to optimize water and nutrient dynamics and maximizing carbon sequestration.
- Adopting integrated nutrient management using local sources and cost-effective combinations.
- Selecting seeds and plant species adapted to local conditions, as well as crop management technique that promote biodiversity and soil conservation.
- Managing soils, landform and rainwater to enhance infiltration and concentration of moisture in the root zone.
- Prevention and reclamation of damaged soils and degraded lands by biological means when possible.
- Reducing the occurrence of compacted soil layers through the adoption of conservation farming and reduced tillage techniques.

D. SLM AND EXISTING LAND MANAGEMENT PRACTICES

Before the concept of SLM was coined; individuals and communities involved in NRM were engaged in a set of activities aimed at producing a yield from natural resources, while maintaining their productivity for the years to come. The practice of crop rotation, for instance, goes back to Roman times, and is known to improve soil fertility and water holding capacity. Yields of these farming systems were deemed insufficient to cater for the food and fiber needs of an expanding population, and their productivity did not provide sufficient profits to commercial operators. Industrial agriculture, born in the wake of the industrial revolution, contributed to increasing yields of the main food crops, but also resulted in increased land degradation due to soil and water mining and to the adoption of environmentally damaging practices. As a result of the realization of the dangers these practices pose on the ambient ecological system and on the food system, the past two decades have witnessed a burgeoning of land management practices aiming at preventing the further escalation of the damage. These include watershed management, ecosystem management, organic agriculture and conservation agriculture, which may all be considered as an integral part of SLM. What are these management practices, how do they overlap, how do they differ?

Watershed management *"is the process of organizing and guiding the use of land and natural resources on a watershed to provide desired goods and services without adversely affecting soil and water resources."* Watershed management is a dynamic and continually readjusting process that relies on a set of practices carried out on a watershed to achieve a set of pre-defined objectives mainly aimed at water resources management. These practices include changes in land use, in vegetative cover as well as other structural and nonstructural actions such as policies, incentives and regulations. The land management component of watershed management comes usually as an outcome of practices focusing on developing and conserving water quality and quantity (USEPA, 2008).

Ecosystem management is *"a process that integrates ecological, socio-economic, and institutional factors into comprehensive analysis and action in order to sustain and enhance the quality of the ecosystem to meet current and future needs"* (IUCN, 2008). Its five goals, according to Grumbine (1994) who was among the

first to use the term, are to maintain a viable population of all native species in situ, manage over periods of time the evolution of species and ecosystems, sustain evolutionary and ecological processes (i.e., disturbance regimes, hydrological processes, nutrient cycles, etc.), represent all native ecosystem types across their natural range of variation, and accommodate human use and occupancy within these constraints. The approach has been promoted by a number of international bodies involved in environmental conservation as a strategy for the integrated management of land that promotes conservation and sustainable use of natural resources in an efficient and equitable way (IUCN, 2008). Ecosystem management, however, appears to place more weight on achieving between biological species than between social classes. And while SLM may be perceived as a subset of ecosystem management, it may also be argued that successful ecosystem management is one of the pre-requisite of SLM that satisfies mainly the ecological dimension of sustainability, while SLM addresses also economic, social, cultural and institutional dimensions.

Organic farming has been recently redefined by the International Federation of Organic Agriculture Movements (IFOAM) as: *"a production system that sustains the health of soils, ecosystems and people. It relies on ecological processes, biodiversity and cycles adapted to local conditions, rather than the use of inputs with adverse effects. Organic agriculture combines tradition, innovation and science to benefit the shared environment and promote fair relationships and a good quality of life for all involved* (IFOAM, 2008)." Organic agriculture is therefore one, possibly of many, production systems that have regenerative functions. It mimics natural ecological cycles in order to minimize the potential damaging impacts of farming. The recent definition of organic agriculture also includes equity dimensions. Organic agriculture is one way of operationalizing the concept of multi-functionality of land and of biodiversity conservation. Combined with other management and production systems, it can be an effective component of SLM, especially in regions where there are sufficient organic nutrient sources to restore impoverished land and to prevent further degradation. While its use is always shrouded by controversy around the presumed lower productivity and higher costs of organically produced crops, organic agriculture has been found to be a significant contributor to sustainable rural development and to the development of agriculture and food security (IUCN, 2008).

Conservation Agriculture (CA) is defined as *"a concept for resource-saving agricultural crop production that strives to achieve acceptable profits, high and sustained production levels while concurrently conserving the environment. CA is based on enhancing natural biological processes above and below the ground"* (Friedrich and Kienzle, 2007) It involves planting crops and pastures directly into land which is protected by a mulch or a permanent organic soil cover, using minimum or no-tillage techniques. Conservation agriculture is currently strongly promoted to improve the water, nutrient and carbon economy of soils in the drylands. It has also been found to improve rural livelihoods, especially those of small, poor farmers and vulnerable households, mainly due to the improvement in profitability and the stabilization of yields. Limitations of the management aspects of conservation farming include: 1) conservation farming will not always result in higher yields especially in seasons where rainfall is ample and well distributed and extra costs may be incurred in the initial years, 2) the need for longer term planning, management, and commitment to sustainability, 3) skills in mulch management, weed control and herbicide use, soil nutrient and pest management that are not always available, 4) commitment to learning and developing a management system, 5) understanding soil, plant and animal interactions, 6) rotations and integrating crops, pastures and livestock, and 7) requires specialized or modified planting machinery (NTG, 2009). Belloum (2008) listed another set of constraints specifically relevant to the Arab region. They echo the generic difficulties facing adoptions presented above and include: 1) The delay in recovery of costs by farmers or associations, 2) the pressure on biomass-rich areas caused by the underdevelopment of the forage market in these chronically dry areas, and 3) the lack of appreciation of the long term environmental impact by farmers who are concerned with their short term livelihood priorities. However, and in spite of these constraints, CA is considered to be one of the main technological tools of SLM.

Box 6 - Industrial farming (UCS, 2007).

"Industrial farming or agriculture views the farm as a factory with inputs (such as pesticides, feed, fertilizer, and fuel) and outputs (such as corn, chickens, etc.) having one goal: increase the yield and decrease the costs of production". The benefits this land management system are low food prices for consumers, cheap feed for animal factory farms, a potential energy source to replace foreign oil, and substantial exports to foreign markets. However, environmental costs of this approach are considerable: reliance on heavy doses of insecticides, pesticides, and herbicides, soil depletion, and increase in the need for fertilizers. In addition, concentrated livestock operations render animals more susceptible to disease, creating a large market and a great expense of developing pesticides, antibiotics, medications, and vaccines.

E. SCOPE AND LIMITATIONS OF SLM

No land management system can on its own provide a complete solution to the problems of the degradation of natural resources. While SLM provides a flexible concept that can be adapted to specific cases, the approach suffers from its own set of limitations.

At the global level, SLM aims to address the key limiting factors threatening natural resources and the sustainability of life support systems. These limiting factors occur in virtually all socio-cultural and economic contexts and include primarily: soil degradation, the availability of water and the loss of biodiversity (Hurni, [illegible]97).

At the developing countries scale, additional limitations could be the breakdown of local food systems, the loss of indigenous technologies and know how, exacerbation of rural poverty, and frequent regional famines with increasing food aid dependence (Appelgren, 2008).

The widespread adoption of SLM faces a number of challenges which include: (Huyton, 2007):

1- Growing demand for food
2- Urban development
3- Climate change
   a- Changing cropping patterns
   b- Increased water stress
   c- Extreme weather events
   d- Flood management

The limitations of SLM may be expressed at the **policy** level, at the **technical** level, and at the **community** level. Limitations are associated with the absence of appropriate policies legislations and incentives, as well as with the failure to mainstream SLM in land use planning and in rural development. The need to invest in new technologies and to approach resource management as a system rather than as a series of discrete actions may also limit the effectiveness of SLM. The paucity of data, especially in countries of the developing world, and the large amount of data needed to monitor and evaluate SLM was also found to be a significant problem (World Bank, 2008). Avoiding knowledge gaps by relying on local knowledge was found to be a key element of success. At the community level, the relevance of SLM may not always be apparent, especially to poor communities who live on a day-by-day basis and cannot always afford to invest in long term planning.

Moreover, development projects who have attempted to promote and implement SLM in developing nations have, paradoxically, sometimes resulted in driving people away from SLM. This has been due to 2 main reasons: first, the difficulty of scaling-up and replicating experiences based on external technical and financial interventions, and second, the often unrealistic expectation-building discourse held by projects wishing to promote community engagement and participation.

The experiences gained from the work of specialists who have sought to promote SLM indicate a considerable rate of failure in the achievement of the intended objectives of controlling and reversing problems of land degradation. If land users, governments and donors are to be convinced that they should continue investing in SLM activities, it is important to determine why the used field level technologies and development approaches have not achieved the desired environmental and socio-economic impacts. Recently, the World Overview of Conservation Approaches and Technologies (WOCAT) program initiated an evaluation process to assess the main issues that have limited the implementation of SLM. Among the key elements identified that may have led to project failure were **preconceptions, biases** and **wishful thinking** and the insufficient use of **common sense (Box 7)** (Liniger, 2004).

Box 7- Example of insufficient use of common sense
(Liniger, 2004)

Over-reliance on assumptions when identifying area specific problems, textbook-driven decisions, and the anticipation of benefits were shown to be major causes of failure of SLM. Designers of a soil conservation project in Tanzania declared that the activities they recommended will lead to doubling yields. Given that livestock had been excluded from the area, farmers could not afford to replace previously available animal manure with purchased fertilizer, and the project offered no alternative fertility enhancing practices. The project resulted in a decline in yield. If present, common sense should have raised the following questions: How is it possible to achieve and sustain such a yield increase? How and why does it or not work? Under which conditions? What is the reasoning of the land user and the SWC specialist? All aspects involved in SWC need to be questioned critically. Often obvious contradictions which could not be explained (or did not make sense) were found.

III. CHALLENGES

A. FACTORS LIMITING THE IMPLEMENTATION OF SLM IN ESCWA

Without an integrated, knowledge-based approach to the challenges currently facing the food and fiber systems of the ESCWA region, the current rates of land degradation cannot be reversed nor can the region socio-economic development targets be met. SLM is a framework that addresses the root causes of the problems, thus providing a means by which the challenges of land degradation become a core component of development thinking. Factors limiting the adoption and implementation of SLM as a development priority have been identified and associated solutions have been suggested. A summary of these problems and their solutions is presented in the next section (GEF, 2005 and WB, 2008):

1-Insufficient sharing of knowledge and technology:

In ESCWA countries, most farmers live and work in isolation, without access to data and information that are essential for choosing the right crop variety, estimating the right amount of irrigation water, and preparing for potential severe drought periods or natural disasters. Inadequate sharing of experiences at the local, national and regional levels has hindered the adoption and implementation of SLM. This is taking place in spite of the wealth of information available on successful SLM technologies and approaches. At the local level, the knowledge of stakeholders about SLM practices is often restricted to traditional techniques and knowledge that has been transferred through generations. This knowledge is extremely precious and can form a solid basis on which to build a knowledge evolution process based on cross fertilization of indigenous know-how with modern, appropriate, adapted, cost-effective, affordable technologies. Knowledge on how to use new technologies and information in order to adapt traditional technologies to the new challenges is a key priority (Box 8).

Solution: Improving the access to clear and easily understandable land management techniques, small credit schemes for farmers, information on new and more resilient crop varieties, access to early warning systems, and data trends on the local climate. Such access to information will help local farmers make knowledgeable decisions on how to use their land in the best way. Link farmers to regional and national research centers, activate farm extension and create synergies with universities. Most importantly, this know how should be available in the Arabic and format accessible to the local socio-cultural conditions. Moreover, the process of transferring knowledge and skill must be adapted, collaborative and based on learning-by-doing in order to foster ownership. Here, the recent initiative by the Lebanese Ministry of Agriculture to set up early warning system and monitoring unit must be commended, but one has yet to see how will this unit function and serve farmers.

2- Inadequate policies and weak institutional governance:

Land degradation and SLM issues are not yet fully understood, internalized, mainstreamed and prioritized in country poverty reduction strategies, public expenditure frameworks and sectoral development policies. The poor policy framework results in unclear land property rights and in the absence of policy incentives to invest in dry areas, and in the lack of markets and market information that can promote SLM in the drylands (Boxes 8 and 9).

Solution: Strengthen decentralized management and participatory governance of natural resources. Here, the drive by the Yemeni government to decentralize water management must be mentioned appreciatively: revise policies and legislations and align with SLM principles, mainstream SLM in public expenditure and development programs, and institutionalize SLM as an integral part of the environmental management plans and of agriculture policy.

Box 8- The Situation in Developing Countries and in most ESCWA countries
(GEF, 2005)

Developing countries that commit to combat land degradation are frequently undermined by limited individual, institutions, and systemic capacity. Their governmental institutions and ministries often lack personnel with technical and/or policy skills. Their extension services suffer from budgetary cuts and low capacities, which affect their ability to provide the necessary services to the land users. In addition, their inter-institutional coordination and cooperation mechanisms generally compete against each others for funds or recognition. They may sometimes be nonexistent. Their agricultural and rural development infrastructures are often divided by sectors. Some of these developing countries control regulations that rely on compliance and enforcement and legislation is based on top-down command. In others, governments are unable to enforce the law properly, which often leads to anarchic land uses that can often be very damaging. In many cases, laws and regulations are often poorly understood, ineffectively enforced, and subject to varying interpretations. Thus, land degradation issues are not appropriately incorporated in decision making.

3- Economic and financial limitations:

Available financial resources for SLM do not match the scale of the problem. Many ESCWA countries lack the financial resources (or the political will to allocate those resources) to turn land management policies into practices. With insufficient budgetary allocations, the goal of SLM remains elusive. SLM may also overlap with priorities related to poverty reduction, epidemics, peacekeeping, and economic growth, which may add to difficulties in implementation (Box 9).

Solution: Mainstreaming of environmental concerns into production program, policies, and cross-cutting sectors (agriculture, planning, and water management). Allocate sector budgets on the basis of long term planning and not of utilitarian short term profit. This will result in promoting environmentally sound management of the natural resources and the enhancement of marginal rural livelihoods.

4- Social and behavioral motivation:

When healthy, politically motivated, and economically communities are empowered to care for their land, locals are major asset when it comes to reverse land degradation. The example of the tremendous efforts deployed to carve the soil and water conservation stone walled terraces in Lebanon and Yemen stands witness to the capacity of committed communities. Poverty and illiteracy are major causes of land and environmental degradation, and it has now become clear that the improvement of the social capital assets of households can translate into enhanced investments in the sustainable management of natural resources. Literacy and rural education programs provide opportunities to introduce linkages among population dynamics, land use change, and environmental impact.

Solution: Rural literacy and education, especially environmental education, must be supported and promoted as a priority in achieving sustainable development goals. At all levels, professionals need capacity building and regular training on most recent scientific and technical data and information in order to achieve improvement of services.

Box 9- The Jordanian Case (GEF, 2008)

Jordan has only about 5% of arable land and has a high water deficiency. Its limited natural resources are a major challenge altering its agricultural productivity. This challenge is being aggravated by 22% of land degradation due to overpopulation. Therefore, promotion of SLM is essential for agricultural purposes. However, the following barriers obstruct the mainstreaming of SLM.

1- Lack of effective knowledge information and management

Collection, storage, analysis and dissemination of result of interventions that:

- promote the optimum use of financial resources for land degradation
- is useful for awareness raising and capacity building
- allow the participation of all possible stakeholders
- facilitate the work to tackle commitments to conventions (UNCCD, UNFCCC, UNCBD) dealing with natural resources nor facilitate an integrated work to deal with the common areas of interest of these conventions
- provide linkages between research, extension, and land users and empowerment of rural communities to participate in the sustainable use of natural resources
- facilitate investment where it is most needed (training for land users, outreach programs and indigenous knowledge reclamation)
- allow for M&E of different projects addressing land degradation and SLM issues

2- Institutional and Governance Barrier

Achievements for Jordan include key strategies, policies and legal framework of a good quality. This framework should integrate sustainable management of resources and poverty alleviation efforts. However, its implementation is still developing and limited to pilot experiences leading to serious issues of sustainability of investments in large areas of Jordan where this coordination does not take place. These experiences show that LUP for the community (watersheds and/or delineated ecosystems) can be a very effective tool to implement such integration. Therefore, the adoption of a fully integrated LUP approach such as the integrated ecosystem approach in national programs to combat land degradation needs modification. For biodiversity conservation of the Jordan Rift Valley, another intervention is proposed to mainstream biodiversity conservation into the LUP process. However, for the purpose of addressing land degradation issues and supporting SLM, additional efforts are required to provide effectiveness to the current inter/intra-institutional coordination framework.

A factor limiting institutional capacity, highly related to the knowledge barrier: the public extension service do not address land degradation issues due to the perception that preventing land degradation and/or implementing SLM are not the farmer's primary priorities. However, the private sector, particularly NGOs, is better equipped in knowledge regarding NRM (some organizations share their findings: some may be found for example on the website http://www.rscn.org.jo of the Royal Society for the Conservation of Nature (RSCN)).

3- Economic and Financial Barrier

The main barrier is the inadequacy of financial resources allocation. There are lacks of incentives that allow for alternative livelihoods, exit strategies, and compensation mechanisms to cover costs when implementing SLM practices. Financing fiscal leverages (e.g. tax holidays) raise the interest of the private sector and solve the weakness of combating land degradation and desertification issues in the field. Finally, the economic and social costs of land degradation need to be understood though an improved valuation system. Furthermore, poverty obliges farmers to opt for short term survival strategies instead of long term investments in land and resources.

An ESCWA specific limitation than cross cuts the 4 issues presented above is the link between the high population growth rates and the shrinkage in size of the landholdings. Even with an improvement in land productivity, the total possible income from land will be too small to sustain a household, and will cause a decline in investments in land, increased poverty and out-migration.

Another ESCWA-specific issue relates to war, conflicts, occupation and their impacts on SLM. In Palestine, local civil society groups such as the Palestinian Agricultural Relief Committees have launched several initiatives to popularize SLM. However, the implementation of these programs is severely hindered by the continuous occupation and the resulting violence that can range from the systematic uprooting of trees to the destruction of whole farms. In Lebanon, unexploded ordinance and mines cause a major problem and curtail farmer's motivation to adopt SLM. In Iraq, war and continuous occupation has resulted in the destruction of the local farming systems and in its replacement with a more industrialized agriculture that favors the intensive use of machinery and agrochemical and that endangers the land and water resources.

B. COMPETING SYSTEMS AND THEIR IMPACTS

Over the course of human civilization, people have manipulated the resources available to them in order to construct their livelihoods. They planted crops, cut down forests, reared animals, and constructed road and cities in order to increase their well being. In the process, they have transformed the landscapes that surrounded them. Landscapes are the Rosetta stone of people's livelihoods: they reveal how they live and how they obtain their food.

Production landscapes result from the interaction and the competition of various production systems on the same geographic space. These production systems may vary in terms of the pressure they impose on land. A SLM strategy must take into account the optimization of the interventions in order to satisfy the basic conditions of sustainability: the enhancement of human and environmental well being.

An excellent case study of the impacts of competing system on the decision-making process for SLM was offered by Thomas et al (WB, 2008) who discussed options for integrated natural resource management in the valley of Khanasser, in Northern Syria.

The valley, with a population of 37,000, extends for over 450 square kilometers. The authors categorized the households into 3 main categories:

- Agriculturalists who grow crops, rear sheep and work as wage laborers. (40%)
- Semi-landless laborers who rely mostly on seasonal farm work and occasional migration. (50%)
- Extensive herders who use the state lands to practice pastoralism and occasionally engage into lamb fattening. (10%)

The poorest households belonged to the laborer and the pastoralist category, while the most intensive land users were the pastoralists. However, most of the food was produced by the agriculturalists. As the purpose of the study was to identify livelihood-enhancing options that would reduce poverty and sustain the natural resource base, the group was faced with a difficult targeting and prioritization task: to protect land, the priority must be placed on working with the pastoralists. To alleviate poverty, the project must address the laborers and the pastoralists first, while to increase food production, the primary target population must be the agriculturalists. This case offers a good example of the complexity of implementing SLM programs in overlapping and competing systems. The authors recommend the establishment of multi-stakeholders platforms for knowledge sharing and for the development of intervention priorities based on a common agenda.

In some cases, competition between land use systems can create situations than impede the implementation of SLM. Hamadeh et al (2006) illustrate this situation for the case of a mountainous village of the Lebanese drylands. In the Lebanese village of 'Arsal, in the Northern Bekaa valley, the traditional extensive agro-pastoral system has been, over the past 50 years, overtaken by the emergence of a rainfed horticultural system based on the cultivation of stone fruits in the mountainous highlands of the village. The two systems have clashed over access and use of land, as the creation of orchards has relegated the small ruminant herds to the marginal hill top summit land, which has resulted in overgrazing and land degradation. Moreover, the livelihoods of the pastoralists were threatened because of the impoverishment of the rangelands. Simultaneously, a flurry of quarrying projects were initiated and encroached on both the rangelands and the orchards. Conflict emerged between the two groups, a situation that is not conducive to the implementation of SLM.

A multi stakeholder platform, the Local Users Network (LUN) was created to resolve the conflict. A local development agenda was developed. All user groups in the community approved the agenda: the municipality, NGO's, cooperatives and sectorial representatives. Donors and policy makers also agreed to coordinate their efforts through the natural resource management platform to deal with issues in the agenda. Moreover, a municipal delegation met with the Prime Minister to urge the government to help in clarifying the legal discrepancy of the users' rights issue; yet, the answer was disappointing as the issue was delayed.

A participatory land management process was initiated and resulted in land use planning and land zoning for grazing and quarrying activities in the village. A range management and rehabilitation program was started and included the establishment of a nursery for forage shrub production, range protection, rehabilitation agreements with the municipality and intercropping vetch under the fruit trees in orchards. Rainwater and snowmelt harvesting techniques were developed and introduced and are currently being tested in several locations.

The project has been, to an extent, successful in initiating a conflict resolution process among the Arsaali land user groups. Yet, the conflict has not been completely eliminated. In fact, a major lesson learnt from this experience, which is at the same time the reason why this intervention succeeded partially is that land tenure issues are, normally, governed, protected, and solved by legal instruments. Thus, external powers and factors and not local user groups and institutions are involved in the formulation of land tenure systems. And since legal instruments are discussed and enacted on the governmental level, a national intervention alone is adequate to control and resolve such conflicts resulting over discrepancies in law interpretations.

C. RESOURCE ALLOCATION AND COMPETITION

Implementation of SLM by land users often requires them to allocate resources to that end. These resources, be they labor, land or capital, will usually be displaced from other investments that may offer a higher return, at least in the short term.

Land users may adopt SLM practices due to regulatory pressures, or because they perceive the right incentive. The economic options, such as the proper resource allocation, and the political strategies (e.g. secured land rights, tax abatements), are as crucial in this process as the technical options (e.g. relay cropping, irrigation, soil and water conservation).

The success of the SLM options depends on the conditions imposed by the natural environment. It must also, however, optimize inputs and provide better returns on investment and labor. The discount rates on agricultural activities favor short term commercial benefits over costs that may occur in the longer term. It may

sometimes be in the land manager's interest to adopt land-damaging practices in the short term, and invest precious resources elsewhere. The final choice of options as to where resources must be allocated will depend on individual skills, experience and knowledge, but also policies, control over resources and the economics of the operation. Thus, availability and cost effectiveness is an important determinant of resource allocation to SLM. In this context, one must recognize the excessive importance that market plays in this process, especially in countries where the economy is liberalized, which is the case in most if not all ESCWA countries.

Rolfe and Mallawaarachchi (2003) have evaluated market-based instruments that governments may use in order to promote resource allocation to SLM. These include: education and awareness raising, amending land tenure and property rights to encourage investment in SLM, manipulating taxes and charges, and enforcing planning regulations. These actions must, however, provide a large degree of equity and fairness if they are not to be rejected. New opportunities to promote resource allocation to SLM include natural resource trading models, which are market-based transactions that offer incentives for appropriate resource use. The success of these approaches lies in the ability to create scarcity value for sustainably managed land, which would encourage allocation of resources in SLM.

D. KNOWLEDGE MANAGEMENT

Knowledge about SLM needs to be identified, documented and assessed via a systematic review process that involves the joint efforts of land users, technical specialists and researchers. The billions of dollars annually spent on implementation justify combined efforts to regulate documentation and evaluation of technologies and approaches. Once documented, experiences with SLM need to be made widely accessible so that land users, advisors and planners can review available options. New SLM efforts should build on existing knowledge from within a location itself or, alternatively, from similar conditions and environments elsewhere. Similarly to the WOCAT tools (mentioned earlier in section II.d. Scope and Limitations of SLM), there is need for a standardized methodology to facilitate comprehensive data collection, knowledge management and dissemination (Schwilch, 2007). In the ESCWA region, it is imperative that these resources are available in Arabic. The Integrated Natural Resources Management website (http://www.icarda.org/INRMsite/index.htm) designed by ICARDA is a step in the right direction, but requires an Arabic version imperatively.

Access and use of knowledge is a key issue that needs to be further explored in the context of SLM in ESCWA. The exponential expansion of knowledge effectively means the creation of a knowledge gap between societies with a poor initial knowledge capacity and societies with an initial strong knowledge base. Expressed as a human development indicator, this knowledge gap is associated with global peace, inequity, environmental degradation and enduring poverty (Ojha et al, 2007).

The large number of stakeholders involved in SLM effectively means that knowledge of these different actors must be pooled and shared. In ESCWA, we can identify at least five different but overlapping systems of knowledge. These are: the local knowledge of indigenous people, the knowledge system of development agencies, the knowledge system of scientific and research institutions, the knowledge system of politicians and the knowledge system of bureaucrats. These knowledge systems must be brought together in a positively interacting mechanism in order to enable optimal decision making. One way in which this can be achieved is through the establishment of multi-stakeholder platforms.

A ***multi-level stakeholder approach to SLM*** has been developed for finding feasible, acceptable, viable and ecologically sound solutions at local scales (Fig. 2 and Box 10). The main questions are: for whom will SLM be realized, for what, by what means, and with what impact? When adopting the *multi-level stakeholder approach to SLM*, the various dimensions of sustainability have to be weighed against one another in a participatory approach that does not discriminate against particular actor categories (Box 11) (Hurni, 1997).

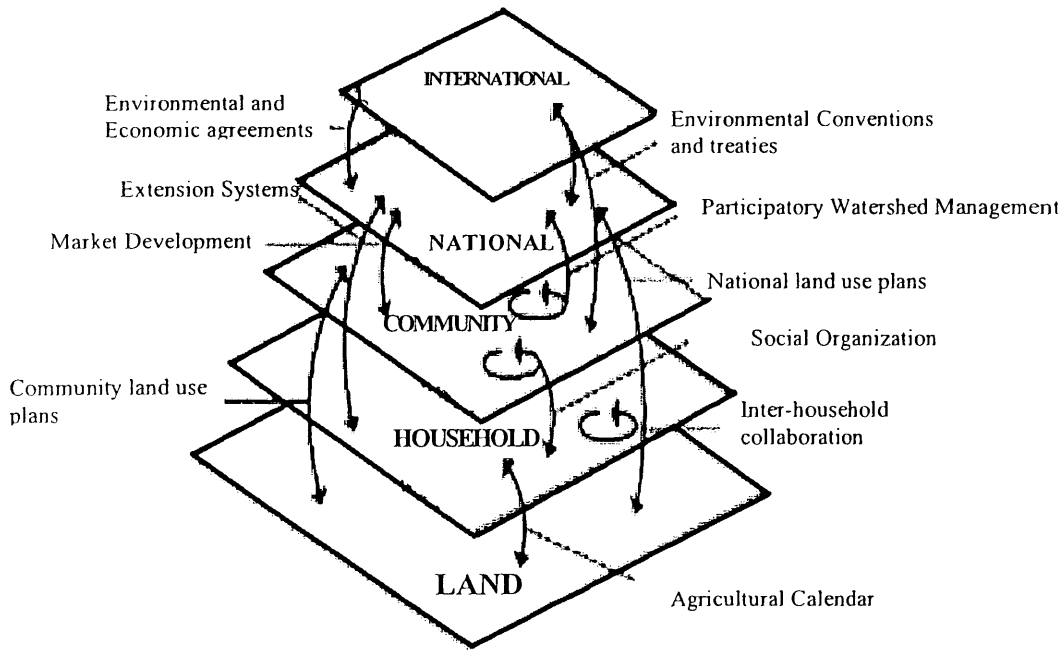

Fig.2. Intervention levels and activities in a multi-level stakeholder approach to SLM (Hurni,1997)

Box 10- Adopting the Multi-level Stakeholder Approach to SLM
(Hurni,1997)

Negotiation processes should involve both scientific information and indigenous knowledge in the decision making. An appropriate tool to facilitate communication in negotiation processes would be ***geoinformation***. Experience worldwide has already demonstrated the multi-level dimensions that have to be considered in order to attain long lasting solutions. The approach's strength offers a framework and a procedure for working towards a common point of view and defining the next steps to take.

Box 11- Creating a Local Users Network (LUN)
(Hamadeh *et al.*, 2006)

LUN is an innovative participatory development policy between communities, researchers, decision makers, and other development actors. The American University of Beirut (AUB) team researched on sustainable agricultural practices in the northeastern highlands of Lebanon, in particular the village of 'Arsal. The AUB team worked with the community, local leaders, and a local NGO (the Arsaal Rural Development Association (ARDA)) to establish a LUN. The team used technical knowledge to improve orchards and livestock rearing, and engaged herders, orchardists, NGOs and local leaders in discussions to solve resource management problems. The LUN revealed to be a success especially when it facilitated communication between pastoralists and orchard growers. In addition, it managed to initiate two cooperatives: livestock herders' cooperative, the first of its kind in Lebanon, and a food processing and crafts cooperative run by women.

Multi-level indicates that stakeholders could be farmers, administrators, researchers and international organizations. Stakeholders share a common interest in a piece of land, an individual plot, the territory of a community, and/or a national conservation area.

E. OTHER ISSUES (CLIMATE CHANGE, DESERTIFICATION, CHANGING POLICIES, FUNDING, ETC.)

Natural and human induced disasters like earthquakes, tsunamis, hurricanes, volcanic activity, and climate change may harm resources in unpredictable ways (WB, 2006). In their assessment report in 2007, the Intergovernmental Panel on Climate Change (IPCC) revealed that semiarid regions are the most vulnerable to rainfall shortages and regions worldwide will experience water stress as a result of elevated surface temperatures, aridity, and increased rainfall variability. On the long term, rainfall variability can reduce the global amount of land available for agriculture and regions that are highly dependent on farming are vulnerable to changes in water availability due to climate change.

Climate change has the potential to impact sustainable agricultural land, soil, and water management directly through amplifying drought and flood cycles; increasing wind and rain intensity; shifting the spatial and temporal distribution of rainfall; affecting soil function leading to soil erosion, watershed hydrology, and vegetation; and indirectly through stimulating changes in land use practices, and expanding agricultural invasive pests and diseases. These impacts experience seasonal and interannual climate variability. In High Latitude Zones (HLZ) an increase in productivity would occur from warmer temperatures, while Low Latitude Zones (LLZ) would undergo land degradation, especially where global change is combined with poverty and weak institutional capacity. Furthermore, global warming may decrease soil organic matter and result in weakened structures of agricultural soil causing erosion and associated declines in crop productivity. Brown and Lal (2006) indicate that shocks from climate change combined stress factors (rainfall, high temperatures, and poor soil fertility) can intensify the vulnerability of small producers leading to impoverishment at the local level and degradation in economical growth at the national level (WB, 2008).

With time, communities' maladaptation to climate change might increase and thus affect their future development plans. Therefore, linking management to policies, enforcement capabilities, and incentives is a necessity for the creation of a favorable environment for land improvement.

Good climate risk management recommendations developed for SLM are:

- water conservation practice on a wider scale
- understand and support of local coping strategies
- resolving production holdups (ex: access to seed)
- give local communities more authority in resource management decisions
- share seasonal climate knowledge with local decision makers

Moreover, soil fertility improvements and soil water management can double and triple yields in highly risk farming environments through

- good enhancement of water captivity and storage for supplemental irrigation
- practices that reduce runoff
- linking soil fertility to seasonal rainfall retention to reduce drought impact on plants at vulnerable stages of growth

IV. OPTIONS AVAILABLE

A. RESOLVING THE ISSUE OF UNSUSTAINABILITY (COMPLEX OF RELATED PROCESSES LEADING TO DEGRADATION)

Two general approaches may be used to approach SLM: The unsustainability approach and the land user choice of options approach. Both approaches are built on the understanding that SLM actions need to address complexes of related processes leading to resource degradation, including land management practices, and the inter-linkages of social, economic and political frameworks. This section (IV) will address the unsustainability issue while section (V) will focus on the choice of options available to land user. It is worth noting that the outcome of both approaches is similar: the implementation of SLM.

Researchers and development planners had long sought to understand the processes leading to the adoption and implementation of unsustainable land use practices leading to land degradation. The design of corrective activities requires the identification of land degradation processes along with the elucidation of the underlying reasons. One of the most commonly used analytical models to that end is the Pressure-State-Response model developed by the OECD and popularized for use in monitoring land degradation by the FAO in the late 1990's. The framework provides a structural model of the issues, elements and processes leading to unsustainability. This model, adapted for SLM is shown in Box 12. It embodies the dilemma posed by the apparent conflict between land use practices essential for the provision of food, fibers and environmental services for humanity, and the fact that these practices often end up degrading these same resources. Resolving unsustainability consists in finding and striking the delicate balance between satisfying human need and regenerating ecosystems (Fig.3).

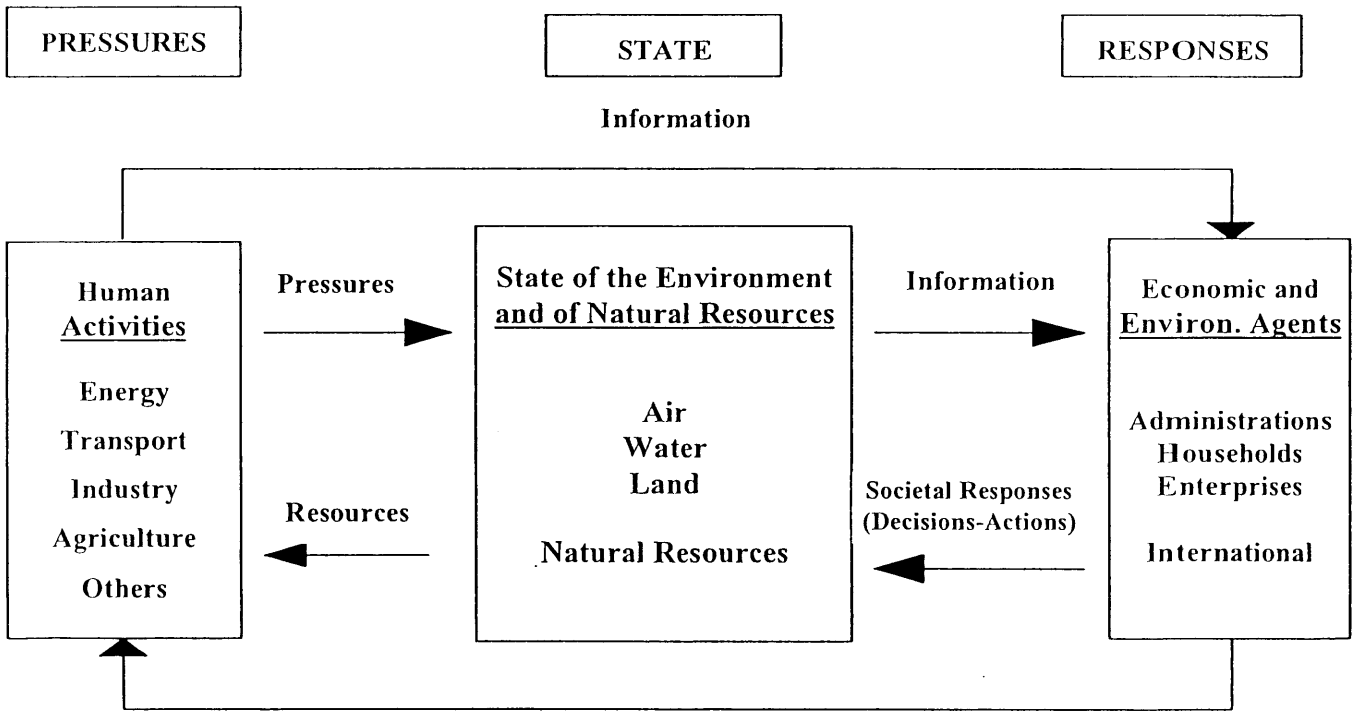

Fig.3. The Pressure-State-Response Model

A newer version of the model, using the additional notion of Driving Forces has also been used. The model helps providing a check list of indicators of sustainability (or unsustainability), and help identify points of entry for resolving the issue of unsustainability.

Box 12- "DPSR indicators applied to SLM". After World Bank, 2008

1. Driving forces include population pressure, economic growth, and urbanization; policy failures or distortions (such as stagnant technology and delayed intensification); imperfect markets (including lack of markets and poor market access); transaction costs and imperfect information (including limited access to information about market opportunities); social inequity and poverty; and political and social instability.

2. *Pressure indicators*. These indicators include changes in cropping techniques, financial position of holdings, fuelwood and charcoal consumption, use of crop residues, use of animal dung for fuel, and price of fuelwood and charcoal.

3. *State indicators*. These indicators include rate of deforestation, rate of soil erosion, degree of salinization, soil crusting and compaction, crop productivity, livestock productivity, and nutrient balance (onfarm organic matter recycling).

4. *Response indicators*. These indicators include legislative change, investment, tree planting, state conservation programs, farmer conservation groups, and farmer adoption of tree planting and soil and water conservation.

Box 13- Addressing the unsustainability of agrobiodiversity in the drylands (Amri *et al.*, 2003)

Dryland ecosystems are experiencing alarming rates of habitat destruction and natural resources degradation. Results of studies showed that 70% of arable land in the world and 90% in the ESCWA (West Asia and North Africa) region are affected by desertification and 10 to 15% of plant species are endangered. Soil loss in the area is estimated at 10-60 kg/ha under normal vegetation cover, at 200-550 kg/ha in burned forest areas and at 3280 kg/ha in cultivated areas. Groundwater is being heavily depleted due to over-exploitation and it is estimated that by the year 2010 rangelands in West Asia will decrease by 22%, cropped areas by 21%, and forest areas by 30%.

Major threats affecting the sustainability of the *agrobiodiversity of drylands* include:

1- High population growth rates placing unsustainable pressure on natural resources

2- Land reclamation, destruction of natural habitats, deforestation, and cultivation of marginal land and rangelands

3- Overexploitation and overgrazing

4- Non-sustainable agricultural practices, based on excessive use of inputs including high yielding, narrow genetic base cultivars and introduced species

5- Less adapted legislation and policies

6- Loss of related indigenous knowledge on resource use and little interest of youth in agriculture

Major reasons behind the degradation of *rangeland of drylands* include:

1- Overgrazing coupled with frequent droughts leads to a decline in productivity of rangelands (containing wild plants of herbaceous and woody crops) and to a decrease in species richness, resulting in predominance of non-palatable species

2- Expansion of cultivation into previously non-cultivated and marginal areas

3- Breakdown of the traditional systems and mechanisms for sustainable management of shared resources

4- Absence of clear and appropriate land tenure arrangements

5- Increased sedentary life style of pastoral communities (decrease in transhumance and nomadic way of life, sinking wells, subsidized feeds, etc.)

It is clear from the study of the PSR model that the many of the triggers of land degradation are related to a poorly adapted policy framework. Table 5 provides a brief summary of the main triggers and of the recommended corrective actions.

Table 5- Corrective actions to resolve the issue of unsustainability (SRDIS, 2009)

Triggers of environmental degradation	**Starting points for corrective action**
Land users are unaware of the consequences of land use activities	Provide information through extension services
Land insecurity prevents investment in SLM	Land Reforms
Poverty prevents investment in SLM	Policies for poverty reduction along with redistribution of resources; Agricultural and economic development
Rapid population growth leads to cultivation of marginal land	Speed up the pace of innovation and intensification; Promote trade and create off-farm labor demand; Improve education
Rapid population decline leads to neglect in maintaining protective practices	Provide information and technical assistance to the remaining land users
Policy failures create market imperfections, poverty, and degradation	Structural adjustment programs; Remove market price distortions; Promote or secure trade

B. OPTIONS AVAILABLE TO LAND USERS (CHOICE OF APPROPRIATE MANAGEMENT PRACTICES AND INCENTIVES TO IMPROVE ADOPTION)

The options available to policy makers (Table 5) include economic options (e.g. proper resource allocation, off-farm income), political strategies (e.g. secured land rights, tax abatements). Land users will need

to rely mostly on the adoption of practices that favor sustainability, such as integrated nutrient management, integrated pest management, organic farming, and conservation agriculture. The choice of options made by land users depends on 1) individual skills, 2) gender specific experience, 3) knowledge, 4) cultural norms and values, 5) the economic framework, and 6) policies regulating access to and the control over natural resources and 7) incentives to promote the adoption of these practices. Any improvement in land management options must be within the limits of the natural environment, but it must also optimize inputs and provide better returns on investment and labor (SRDIS, 2009).

Researchers and development organizations have been identifying, designing, selecting and testing options for SLM for at least 3 decades. Practical actions to promote SLM can be deployed at the plot, farm, village or district levels. Their number is ever increasing, especially as indigenous knowledge is re-discovered and included among the array of possible activities. However, the applicability and success of the options for SLM are strongly dependent on the farming system and the socio-economic status of the land user. Some of these options are presented in Table 6. Specific information concerning their implementation aspects is widely available in source books and technical manuals.

If such approaches, involving different stakeholders, indigenous experience and external knowledge, can form possibilities for enhancing SLM, then they should be used according to preferences and needs of projects. Starting points for corrective action can be found from the field/plot to the district or national level. Project activities that have a positive impact on SLM, should not only consider technological options but also activities that create awareness, improve knowledge, land management skills and local planning procedures, support training and education, enhance institutional development, and tackle important policy issues (Table 6) (SRDIS, 2009).

Table 6- SM options available to land users (adapted from SRDIS, 2009)

Levels	Technology	Human Resources	Institutions	Policy
Field/Plot	• Integrated Nutrient Management • Integrated Water Management • Integrated Pest Management • Permaculture • Conservation agriculture • Organic agriculture • Rotations • Agroforestry,	• Capacity building		
Farm	• Whole farm planning • Labor saving technologies • Access to adapted seeds and ability to save own seeds • Improved storage and processing of grains to reduce post harvest losses • Energy-saving and renewable energies • Certification and quality control schemes • Markets and entrepreneurship	• Empowerment • Awareness creation • Capacity building		

Levels	Technology	Human Resources	Institutions	Policy
Community	• Pasture carrying capacity • Hima and protected rangelands	• Education and training • Communication • Infrastructure • Governance • Basic services (health) • Access to credit	• Adaptive research • Participatory research • On-farm trials • Indigenous knowledge • Capacity building • Dissemination of information	
District	• Drought planning management			• Secure land rights • Equal access and control over resources for both women and men • SLM enhancing legislation • Improvement of infrastructure

C. INNOVATIVE APPROACHES

While definite headway has been made in the control of land degradation worldwide, there is definite room for more advances in the adoption and implementation of SLM. One of the main problems may be the fact that SLM options are often presented as piece-meal activities, without clear systematic linkage. Novel, innovative approaches adopting a systems approach have recently come to light, and the initial evaluation of their feasibility and impact is promising. Three of these approaches that have been tested in the drylands of the ESCWA region, are presented in this section. One must note here that these approaches must be perceived as being complementary rather than alternative.

A. Farming systems-based approaches

This approach has been promoted by the World Bank (2008) and ICARDA. It addresses farm systems that have broadly similar characters with respects to the resource base, enterprise patterns and household livelihoods. Interventions for SLM at the level of the farming systems can be identified and implemented as they impact one or more component of the system (WB, 2008). For example, Turkelboom et al (2008) identified the following options in order to promote SLM in the marginal drylands of Syria.

1- Options that strengthen the traditional farming system:

a- New barley varieties selected by using a participatory breeding approach
b- Barley production with application of phosphogypsum to improve soil fertility and to increase and stabilize production in dry years
c- Dairy products from sheep for consumption or sale
d- Seed priming of barley seeds with nutrient solutions to improve crop establishment

2- Diversification options:

a- Barley intercropped with Atriplex shrubs to stabilize forage production, increase biomass during dry years, and enhance protein content in sheep diets.
b- Improved vetch production by selection of drought tolerant varieties to reduce production risks.
c- Improved management of rainfed cumin (a new cash crop) to stabilize and increase production and improve its marketing value.
d- Olive orchards, using water harvesting and cultivating on foothill slopes, to increase production and reduce summer irrigation by groundwater.

3- Intensification options: Improved lamb fattening by using lower cost feeds.

4- Institutional options: Traditional dairy institutions for sharing knowledge and for providing informal credit; and village saving and credit associations.

These interventions that were jointly identified by a group of researchers and stakeholders were effective because they impacted the farming systems at various points of entry, and addressed issues relevant to land management within the broader context of livelihoods.

B. Livelihoods-based approaches

"A livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural resource base" (Carney, 1998). Rennie and Singh (1996) argue that "predominantly the poor of the world depend directly on natural resources, through cultivation, herding, collecting or hunting for their livelihoods. Therefore, for the livelihoods to be sustainable, the natural resources must be sustained". The concept of livelihoods and livelihood assets was presented in the first part of this paper. People's livelihoods are deployed in a vulnerability context. They make livelihood choices depending on their livelihood capital assets, which include natural resources, and on the policy and legal environment. These livelihood choices result in a number of livelihood outcomes that may include an improvement in the sustainability of the natural resource base. This people-centered model clarifies the linkages that exist between the different components of a livelihood and can indicate the most effective point of entry in order to achieve a positive livelihood outcome, including sustainable land resources.

This approach was used in Lebanon in order to enhance the sustainability of land resources in Arsaal, a village of the dry northern Bekaa. Analysis of livelihood showed that only 30% of the household still relied fully on agriculture, while 70% adopted diversified livelihoods based on off-farm employment. Pastoralism and fruit tree cultivation were clashing land uses and were resulting in land degradation. Interventions were conducted at the technical levels, with the introduction of rainwater harvesting, feed blocks for the flocks and intercropping vetch with fruit trees. Other interventions were conducted at the institutional levels, with the creation of a herder's cooperative, a women's cooperative and with the introduction of organic certification to the fruit tree cultivators. Livelihood assets were enhanced as a result of improved land management practices, which resulted in their wider adoption (Hamadeh *et al.*, 2006)

C. Value chain-based approaches

This approach relies on the creation of efficient value chains to enhance the trade of products originating from sustainable management of lands prone to degradation, such as the drylands of ESCWA. The logic is that

increased financial income will entice the land users to invest more in SLM. A recent extensive study by the International Center for Trade and Sustainable Development and the Global Mechanism of the UNCCD examined the linkages between trade, livelihoods and SLM in the drylands (ICTSD, 2007). The authors underscore the potential of trade to impact the livelihoods of dryland communities that depend on degraded areas. Trade can both act as an incentive or as a barrier to sustainable development. Trade can foster development and have systemic results on the sustainability of land. The context in which trade is used for SLM favors small producers as opposed to large-scale-export oriented production that can often have deleterious effects on land and environment. It recognizes that industrial, capital intensive farming leads to land degradation as poor farmer are pushed onto marginal lands where they practice unsustainable land use.

The promotion of products originating from sustainably managed lands and resources may offer an opportunity for sustaining the livelihood of the poor and promote SLM.

This market however still lacks structure and recognition which still limits its use. A regulatory framework that will result in the fair allocation of profits along the value chain also needs to be established in order to prevent the control of resources by a small group to the detriment of those who have produced the goods.

A couple of projects in Lebanon are using this approach in order to promote SLM. One of them, the SLM program for livelihood development, implemented by the UNDP is in its early stages, and proposes to introduce industrial hemp to the Bekaa region. Another project implemented by the Ministry of Agriculture with support from the Drylands Development Center of the UN is in the process of supporting small producers in the production of traditional products for export through the fair trade channels. It is still difficult, however, to evaluate the impact the project has achieved on the adoption and implementation of SLM.

Innovative approaches help remove institutional and governance, economic and financial, social and behavioral, and technological and knowledge barriers to adopt SLM. These activities include developing institutional and human resource capacity, strengthening policy and regulatory environments, developing economic incentives, and disseminating best practices and lessons learned (GEF, 2005). As these approaches are still in the early stage of development and implementation, more time is needed to assess their true contribution to SLM.

D. Coordination among sectors and actors and knowledge sharing

Knowledge sharing and increased public awareness of land degradation are required to facilitate closer cooperation among the stakeholders involved in SLM (Table 7). As a result of closer integration among all stakeholders, a set of options can be developed that are relevant, appropriate and achievable. The options may be targeted at the various sectors of the population, each with different access to natural, physical, human, and financial capital. Although income generation is the first priority of the land users, most of the technological options also contribute to more sustainable management of the land. These options demonstrated to government researchers, extension agents, and land users the value of collaboration. Consequently, plans are under way to replicate these options in similar areas of the ESCWA region.

1- Harmonize planning procedures and improve coordination among line agencies to improve cross-sectoral reviews of proposed investments and environmentally friendly alternatives

2- Expand the participation of local governments and other stakeholders (private sector and local residents) in decentralized natural resource planning and management

3- Provide access to information on proposed activities, and ensure full involvement in the environmental review process

4- Set up an environmental information and monitoring system

5- Identify hazard-prone and environmentally risky areas as well as alternative sites that are more suitable for proposed development investments

6- Identify and manage the risks of planned and unplanned development

7- Assess, identify, and promote SLM options and technologies through local practice, adaptation, experimentation, and dissemination

Table 7- Institutions of ESCWA involved in SLM

Institution	**Description**	**Source**
Arab Center for the Studies of Arid Zones and Dry Lands (ACSAD)	ACSAD was established in Damascus, Syria in 1968. It is a specialized Arab organization working within the framework of the League of Arab States with the objective of unifying the Arab efforts. This objective aims to develop the scientific agricultural research in arid and semi-arid areas, help in the exchange of information, experiences, and make use of the scientific progress and the modern agricultural techniques in order to increase the agricultural production.	http://www.acsad.org
Arab Forest and Range Institute (AFRI)	AFRI was established in 1959 in Syria, with an initiative from FAO Commission on Forests (COFO) as Near East Forest Rangers School. In 1969 the Institute was transferred to the League of Arab States. Since 1976, the Institute has been supervised and financed by the Arab Organization for Agricultural Development (AOAD). It helps students and on-job trainees develop science-based knowledge, field expertise, extension skills, and professional ethics in understanding and managing forest, range resources and biodiversity issues within the context of sustainable management of renewable natural resources.	http://www.afri-edu.org
Arabian Gulf University (AGU)	AGU is located in Bahrain and has three objectives cultural, political, and developmental. It contributes to the revival of the Arabic and Islamic civilizations, assembles the youth of the Gulf Cooperation Council (GCC) countries through joint programs, and relates to the comprehensive development making the human being its ultimate tool and goal.	http://www.agu.edu.bh

Institution	Description	Source
Arab Organization for Agricultural Development (AOAD)	AOAD was established in 1970 when Arab countries recognized the need for coordination between their different policies in agriculture, natural and human resources, and economic development. AOAD goals are to enhance respective agricultural sectors of member countries and achieve a fully integrated Arab economy union and food self-sufficiency.	http://www.aoad.org
Arab Planning Institute (API)	API is a non-profit regional organization in Kuwait with a mission to advance the cause of economic and social development in the Arab countries through training, research, consultancy, expert-group meetings and publication.	http://www.arab-api.org
American University of Beirut (AUB)	AUB is an institution of higher learning founded to provide excellence in education, participate in the advancement of knowledge through research, and serve the peoples of the Middle East and beyond. Licensed in New York State in 1863, the university bases its educational philosophy, standards, and practices on the American liberal arts model of higher education.	http://www.aub.edu.lb
Badia Research and Development Center (BRDC)	BRDC, founded in 1993, is a unique center of research, integrated management, community development and environmental conservation of the Jordanian semi-arid area of Badia. BRDC is a product of a partnership between the Higher Council of Science and Technology in Jordan, and the Royal Geographical Society in the UK and Durham University.	http://www.badia.gov.jo
Center for Environment and Development for the Arab Region and Europe (CEDARE)	CEDARE was established in 1992 as an international inter-governmental organization with diplomatic status .This was in response to the convention adopted by the Council of Arab Ministers Responsible For the Environment (CAMRE) in 1991 and upon the initiative of the Arab Republic of Egypt, the United Nations Development Program (UNDP) and the Arab fund for Economic and Social Development (AFESD). CEDARE believes that addressing environmental problems contributes to eliminating many obstacles related to development.	http://www.cedare.int

Institution	Description	Source
Environment Agency – Abu Dhabi (EAD)	EAD is a governmental agency that was established in 1996 with the overall function of protecting and conserving the environment and promoting sustainable development in the Abu Dhabi, United Arab Emirates (UAE). The Agency is responsible for assisting the Federal Environmental Agency (FEA) and the UAE Ministry of Environment and Water in implementing environmental laws and putting regulation orders in the capital.	http://www.ead.ae
International Center for Agricultural Research in the Dry Areas (ICARDA)	ICARDA was established in 1977, and is one of the 15 centers located all over the world and supported by the Consultative Group on International Agricultural Research (CGIAR). With its main research station and offices based in Aleppo-Syria, ICARDA works through a network of partnerships with national, regional and international institutions, universities, non-governmental organizations and ministries in the developing world, and with advanced research institutes in industrialized countries.	http://www.icarda.org
Kuwait Institute for Scientific Research (KISR)	KISR was established in 1967 by the Arabian Oil Company Limited (Japan) in fulfillment of its obligations under the oil concession agreement with the Government of Kuwait. KISR was established to carry out applied scientific research in three fields: petroleum, desert agriculture and marine biology.	http://www.kisr.edu.kw
United Nations Economic and Social Commission for Western Asia (UN-ESCWA)	ESCWA, one of the five regional commissions, was created in 1973 by the United Nations in order to fulfill the economic and social goals set out in the United Nations Charter by promoting cooperation and integration between the countries in each region of the world.	http://www.escwa.un.org

V. BEST PRACTICES AND LESSONS LEARNED

A. REVIEW OF BEST PRACTICES

Although there is, in the ESCWA countries, a general commitment to the concept of SLM, there have been few projects or programs that have adopted a **fully integrated SLM approach** involving the implementation of SLM practices towards the achievement of SLM goals, including its livelihoods dimensions. Among these few projects one could list ICARDA's INRM program, Jordan's Badia project, and AUB's Arsaal project (Thomas *et al.*, 2005, BRDC, 2009 and Hamadeh *et al.*, 2006) for the sustainable management of marginal land's. There is, however, in the region, an increasing evidence of **SLM practices** implemented with reasonable success in an environment which is often described as difficult, marginal, and scientifically challenging.

For example, there are numerous success stories in Arab countries under the general heading of soil and water conservation. In Egypt alone there is over 60 years of varied expertise and success stories (JCEDAR, 2007). Several projects have sought to optimize soil productivity and crop yields through proper reclamation techniques and appropriate cropping patterns and rotations. These have included **integrated plant nutrition programs** which promote the use of natural organic composts and agricultural residues and rational use of integrated chemical fertilizers. Much work has also been done on developing irrigation techniques appropriate to the regional climatic conditions; efficient irrigation scheduling and techniques that curtail excessive water losses through evaporation and deep percolation. Several institutions are specialized in addressing issues of soil an d water pollution, especially through fertilizers residues and salt accumulation.

Agroforestry has also been promoted as one key element of SLM. The forestry department in Syria rehabilitated the mountainous areas of Lattakia province by reforesting with landraces and wild relative of native species (apricot, crateagus, pear, figs, olives, zyziphus, apples, etc.). These sites also serve for in-situ conservation and as a field genebank of local agrobiodiversity. A field gene bank was also created at Bouka Research Center in Lattakia to conserve 48 varieties and wild relatives of fruit trees collected from the region. Moreover, the region has witnessed significant **afforestation and forest conservation** efforts. Success stories are available in several Arab Countries. In Jordan, for instance, despite the loss of 15% of private forests and more than 500 ha of public forests since 1961, afforestation programs increased the forested area by 20% during the 1980s and 1990s.

Resource management specialists in ESCWA have also built on the indigenous practices of **water harvesting** in order to develop SLM options. These traditional systems include s the stone-walled terraces of the Eastern Mediterranean and Yemen which provides minicatchments of a few square meters on which productive farming can take place.

The Institutions listed in Section d above have been pivotal in taking the lead on the implementation of these practices, often hand in hand with concerned international partners such as IDRC or GTZ. ESCWA has published a number of case studies that provide a good insight on the implementation of SLM programs in Egypt, Jordan, Syria, and Saudi Arabia (UN, 2007). In the following review of policies and practices for sustainable agriculture, we describe a number of resource conserving technologies, many of which were either discovered by farmers or developed in partnership between agricultural research and local people.

B. LESSONS LEARNED

Case studies

1. New crops and cropping technologies

Case Study: Alley cropping technologies that enhance fodder quality and quantity, and therefore reduce pressure on the rangelands were developed by ICARDA and national partners in Morocco and Tunisia. These were combined with guidance on integrated crop–livestock production. In Tunisia, the project partnered with the local community and introduced *Opuntia* (spineless cactus) as an alley crop, which can provide cash returns. The program had to address the complexity of activities at farm and community level, the individual technical and socioeconomic constraints that limit or condition adoption, and the universal constraints due to social or economic factors.

Lessons learned: Due to yield and returns variability, the adoption of new technologies in marginal lands is often low. Insecure land tenure added to the low adoption problem. However, the inclusion of *Opuntia* production provided a cash-based incentive for farmers to adopt the whole package (CGIAR, 2006).

2. Integrated pest management

This approach is an integral part of sustainable agriculture and has become widely used in industrialized countries. Local knowledge on resistant varieties, natural pest control and rotations can form a solid basis for the wider use of IPM in ESCWA.

Case Study: Through a bilateral Jordanian-German technical cooperation project, integrated pest management is being introduced to Jordanian farmers. Scientists from the University of Jordan have been researching soil solarization as a preplant treatment to control soilborne pathogens of greenhouse and open field vegetables in the Jordan Valley. This method is being implemented because it was shown to be an economically and ecologically viable technology. Pests and soilborne diseases controlled include *Meloidogyne*, *Fusarium oxysporum*, *Pythium*, *Sclerotinia*, *Verticillium*, white grub, weeds, and *Orobanche* (USDA, 2002).

Lessons learned: While IPM has been shown repeatedly to be successful in reducing the quantity and cost of pesticides and in preserving biological diversity, its adoption is still limited in ESCWA countries, especially among small farmers. One problem lies in the relatively advanced knowledge level required, which includes understanding pests life cycles and accepting economical threshold of losses. Another issue has to do with the conflict between IPM and the gains of private companies that sell pesticides. A third issue lies in the absence of an IPM certification, and therefore in the difficulty of identifying the product for marketing purposes.

3. Organic Agriculture

Since 1990 the market for organic products has grown at a rapid pace, averaging 20-25 % per year to reach $33 billion in 2005. This demand has driven a similar increase in organically managed farmland (Wikipedia, 2009). Although the Mediterranean region has seen a vigorous growth in organically managed lands, this farming approach still constitutes a tiny fraction of the total arable land area. Two types of organic farming approaches have emerged: the export-oriented organic production, such as the SEKEM project in Egypt, and the small producers' oriented approach, such as the Healthy Basket project in Lebanon.

Case Study 1: SEKEM is a private business and social development initiative contracting farmers in Egypt to grow organic products, mostly cotton and herbs, in the Gharbia region in the Nile Delta, covering 5000

acres. The project is extremely successful, and although owned by one large investor, it appears to contribute to the sustainability of local livelihoods. It has also been instrumental in creating sustainable agriculture entrepreneurship in Egypt (Crucefix, 1998).

Case Study 2: "Healthy Basket (HB)", the Organic Lebanese Experience (Zurayk and Touma, 2006)

HB is a "socially sustainable responsible business" that maintains ecosystem and human health by encouraging small farmers to shift from conventional to organic agriculture and by linking them to high-value markets. Certification of organic farmers is obtained according to the EU regulations on Organic Agriculture (OA).

Lessons learned: Organic agriculture, while very promising, suffers from a problem of scale of adoption. Several internationally funded projects have been adopted in the ESCWA region, but many organic farmers revert to conventional production after the projects end. The main reason is the absence of incentives to accept the lower yields usually associated with organic production. Another problem is the breakdown of the value chain and the inability of small farmers to capture the value added of organic production. While large investors appear to be able to flourish due to their access to foreign markets, most small producers, who represent the bulk of the ESCWA farmers, are still unable to see the benefit of organic farming.

4. Rangeland rehabilitation

Conserving rangelands productivity through rotational grazing, rest periods and rehabilitation techniques were demonstrated by several Arab countries adopting the proper range carrying capacity of range animals. These efforts covered 2.8% of degraded lands in the Arabian Peninsula (countries of Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, the UAE, and Yemen) and 13.6 % in the Mashriq (countries of Iraq, Jordan, Lebanon, Syria, and Palestine) (UNEP, 2002 and UNEP, 2007).

Case Study: Since 1993, ACSAD, the General Organization of Remote Sensing [GORS] and GTZ, have implemented the Bishri Mountain project for the rehabilitation of Syrian Steppe. The project aimed at setting up remote sensing (RS) and geographic information system (GIS) facilities at ACSAD and developing strategies for combating desertification in Bishri Mountain. The project raised awareness among national stakeholders to enable them to take the necessary and adequate decisions on interventions.

Lessons learned from the Bishri mountain project were transferred to Jordan and applied on Jordanian steppe. In cooperation with the Ministry of Agriculture, ACSAD implemented activities in two pilot areas; Sabha and Sophia. Five years of rangeland rehabilitation in Sabha increased the total dry matter production at the site from 0.2 tons per hectare (t/ha) in the control area to 0.9 t/ha in the fenced and implanted areas (Fig.4) (Sattout *et al.*, 2008).

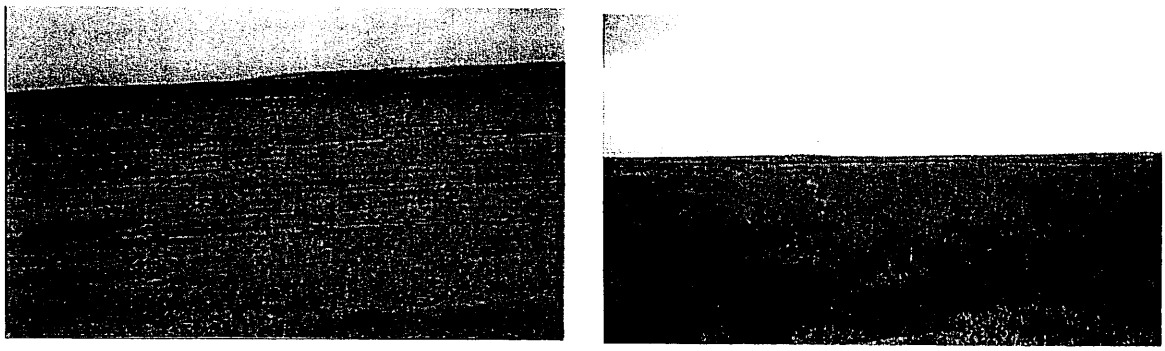

Fig.4. Rehabilitation (right picture) of degraded rangeland (left picture) at Sabha in Jordan

5. Conservation Agriculture

As one of the pillars of SLM, conservation agriculture (CA) aims to achieve sustainable and profitable agriculture and subsequently aims at improved livelihoods of farmers through the application of the three CA principles: minimal soil disturbance, permanent soil cover and crop rotations. Its adoption is perhaps most urgently required by smallholder farmers, especially those facing acute labor shortages. It is a way to combine profitable agricultural production with environmental concerns and sustainability and it has been proven to work in a variety of agroecological zones (FAO, 2008).

Case Study: Zero tillage areas worldwide have increased from 20 million ha in 1992 to 70 million ha in 2002, almost reaching 100 million ha in 2006. Although the area only represents 5% of the total cultivated area, this agricultural practice is effective under different climatic conditions and in different types of soil. The high population growth rate in the Arab countries together with the low agricultural productivity, especially in the rainfed zones, increases regional food insecurity. Sustainable agricultural practices that use modern technologies to achieve the optimum use of natural resources are one of the most important tools to this end. In spite of the advantages of CA, it is not widespread enough in the ESCWA region due to the lack of information, education and awareness and motivation. At present, the total area of CA covers approximately 550 ha in Lebanon and over 1000 ha in Syria. The implementation is carried out on-farm and on-the-station in Syria and in Lebanon jointly with the Syrian extension service, American University of Beirut [AUB], Lebanese Agricultural Research Institute [LARI] and approximately 65 farmers in Lebanon (Sattout *et al.*, 2008).

Lessons learned: The technical success of practices at the level of demonstration plots is not sufficient to ensure widespread adoption. The introduction of new practices should be coupled with a concomitant investment in communication, information, awareness raising, and the identification of non-market distorting incentives.

6. Watershed Management

Watershed management is the process of organizing and using land within a watershed in order to optimize their sustainable use for the benefit of local communities. This involves managing land, soil, vegetation and water.

Case Study: El-Qa'a area, located in the North East of Lebanon, regularly suffers from a combination of torrential rainfall and flash floods. These affect village and agricultural crops and can result in major losses to farmers' livelihoods. The major reasons for these flash floods are the rainfall intensity, the unsustainable land use practices, including the uncontrolled grazing and the absence of land management. The flash floods increase the risk of desertification in this very dry zone. The project, led by ACSAD and GTZ established flood control structures in an 18 km^2 pilot catchment for the purpose of alleviating land degradation through flood control and the improvement of the green cover (Sattout *et al.*, 2008).

Lessons learned: While the initial results have been encouraging, and have attracted the attention of other donors such UNDP and the Spanish embassy, there is still a lack of political commitment from the government to invest cash capital into the construction of flood control measures. This is in spite of the fact that the costs involved are a small fraction of the estimated losses from one single flood in one season. Municipalities are also reluctant to invest in this type of projects as they lack the finances and consider this to be a governmental responsibility. Similarly, the local community, which is the primary beneficiary, has also been reticent to be involved in the project, leaving funding to donors and to international NGOs.

Box 14- General lessons learned

Experience gained from the projects presented in this section and similar project implemented in ESCWA and elsewhere allow the identification of a number of general lessons learned. These can serve as guidelines for project implementation.

1. Food security and sovereignty are issues of local, national, regional and global concerns. They can only be achieved sustainably in stable ecosystems.

2. It is difficult or impossible to achieve sustainability in the absence of collective efforts. These require policy interventions that facilitate and encourage the local governance of land resources.

3. Economic and environmental interests must be integrated with other livelihood concerns. Here, the importance of off-farm income to support SLM must be recognized.

4. Agriculture is gaining renewed prominence as an important part of the solution of environmental degradation and rural poverty. SLM is required more than ever.

5. There is a need for rigorous monitoring of the effectiveness of SLM. Reliable land quality indicators are required for guidance.

6. Farming must strike a balance between the need to increase productivity, needed by farmers and society, and the need to sustain ecosystems. This may be achieved through improved management methods rather than through the adoption of high input crop varieties and the associated technological package.

7. An enabling policy environment that empowers farmers and land managers remains essential. Governance and decentralization of resource management must be achieved.

8. SLM should address the multifunctionality of rural landscape rather than just farming and food productions. Land managers are truly the stewards of the rural landscape, and their contribution has to be recognized at the environmental, economic and cultural levels.

VI. CONCLUSIONS AND POLICY RECOMMENDATIONS

A. SOUND CONCLUSIONS

On March 3, 2009, the Arab Forum for Environment and Development (AFED) launched its report, 'Arab Environment: Future Challenges', in Beirut, Lebanon (Sawahel, 2009). The report addresses a range of current and future environmental issues in the region, from water scarcity to land degradation. According to the latest figures, land degradation has destroyed 34 per cent of irrigated agricultural land in the region. Desertification currently results in US$5 billion in annual losses of agricultural revenue. The loss of productive land and of income increases poverty, reduces productivity, disrupts vital ecosystem functions, negatively affects biodiversity and water resources, and increases vulnerability to climate change. Moreover, land degradation and poverty drive rural people to migrate to urban areas. This results in the breakdown of rural society caused by the loss of social structure and cultural heritage.

Because it is a slow onset problem, land degradation may not be perceived as a pressing issue by local populations. Yet it is a process that threatens long term environmental, economical and social integrity of the ESCWA region. Therefore, investments are needed to maintain the ecosystem, society and economy of the rural areas of the ESCWA region.

Currently available SLM technologies can effectively combat land degradation and restore damaged land. While still insufficiently spread in the region, SLM techniques have been successful in improving watershed management, reducing soil erosion and preserving biodiversity and biological productivity.

Efforts to approach SLM in integrated fashion, through the social as well as the economic entry points have not been met with the same degree of success as technical interventions. Livelihood-based approaches are still sparse, in spite of the fact that SLM helps improve food security and reduce poverty and enhance local society and preserve cultural heritage.

The economic pay backs from SLM can be significant, although the return on investments may be slow to materialize. One problem resides in the question of who must make these investments. Is it land users, who are the primary beneficiaries? Is it rural communities, who may not all be directly benefiting from the outcomes of SLM? Or is it governments, who are ultimately responsible for the well being of nature and citizen?

It is precisely to answer these questions and to guide all the stakeholders that SLM must move from being anchored in techniques and technologies to becoming an integral part of economic and social policies. This can be best achieved by the adoption of an integrative, livelihood-centered approach that rely on a good comprehension of contextual conditions and on the existing policies framework, as it does on technology and knowledge. This way, SLM can become a significant contributor to the achievement of the MDGs, in particular MDG 1 (*Eradicate Extreme Poverty and Hunger*) and MDG 7 (*Ensure Environmental Sustainability*).

B. ACTION ORIENTED POLICY RECOMMENDATIONS

Review of recent experience by the World Bank indicates that the success of land and resource management programs has been associated with the following contributing factors: (a) local community participation in all aspects of the program, (b) public support for private investment in soil and water

conservation, (c) improvement and maintenance of infrastructure, (d) sound macroeconomic management that does not discriminate against agriculture and natural resources, (e) robust local capacity building by nongovernmental organizations and other cooperative-type projects, and (f) consistent efforts over at least a decade by concerned governments to increase not only land productivity but also awareness of environmental problems and possible solutions at local levels (WB, 2006).

Moreover, the recent AFED report pointed in its conclusion to the need for "long-term environmental management strategies; powerful and effective environmental agencies; clear political and legislative mandates; and environmental research, education and media input." The means to achieve this, according to the UNESCO regional expert in land and water conservation is through "exchange of experiences, success stories and dissemination of the best management practices".

These interventions by researchers, policy analysts and civil society representatives confirm the four main strategic axes to a successful sustainable land and natural resource management approach.

- Policy and sector work
- Research and technology development
- Knowledge sharing and extension
- Providing incentives, expenditure priorities, and modes of financing (WB, 2006).

Several **policy recommendations** may be extracted from these strategic goals:

1. Institutionalize collaboration between land users, technical experts and policy makers for the purpose of identifying, monitoring and addressing resource degradation. These can take the form of users' networks.
2. Make SLM a local concern and a national responsibility through mainstreaming in poverty reduction and rural development strategies.
3. Approach SLM as an integrated development plan rather than as a series of technical options.
4. Intensify locally-based research in order to improve the understanding of the ecological, social and economic causes of degradation.
5. Promote the development of appropriate technologies that are responsive to change.
6. Regularly evaluate the progress of SLM projects and programs through the development of locally relevant indicators and M&E processes.
7. Encourage long term commitment to SLM by research and development institutions.
8. Investigate and adapt local innovations and indigenous knowledge in SLM.
9. Prioritize prevention and mitigation as essential components of SLM technical programs.
10. Develop locally appropriate methods for the social, cultural and economic valuation of land and ecosystems. Use to promote SLM with policy makers and policy advisors.
11. Create an enabling environment for SLM by addressing issues of market opportunities, legislation and security of land use rights.
12. Develop an appropriate, non-market distorting incentive scheme to promote SLM in regions where poverty is a barrier to investment in SLM.
13. Foster knowledge-sharing platforms between local, regional and global actors for the exchange of good practices and of lessons learned.

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