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Valuing Rangelands for the Ecosystem and Livelihood Services

CONTENTS

I. INTRODUCTION

1. The primary economic activity in the steppes areas is pastoralism and yet very little is known about its contribution to national economies. In West Africa and North Africa, rangelands amount to around 555 million hectares, representing 90 percent of the estimated degraded drylands[1] in those areas. They provide income for 120 million people, especially agro-pastoralists. Today, only 20 percent of the rangelands are considered to be suitable for permanent pasture with a reasonable potential for intensive production. Rangelands provide 5 percent of animal feed in Egypt, 15 percent in Syria and 30 percent in Morocco, compared with the 70–80 percent they represented in the 1960s[2].

2. The low living standards and extreme poverty of dryland populations, most of which are to be found in developing countries, is further exacerbated by high population growth rates (3.3 percent in the Near East in 1995)[3]. However, because of changes in the provision of ecosystem goods and services, there has been significant change in land use, with the result that agro-biodiversity has progressively replaced natural biodiversity. Repeated droughts, a variety of socio-economic factors, types of rangeland ownership, and excessive and uncontrolled grazing patterns all contribute to dryland degradation.

3. Range management and improvement methods and desertification control processes include rest periods, reseeding, forage shrub plantation and management of rehabilitated areas. But the unavailability of local plant species seeds often is a major constraint.

4. Over the last four decades, programmes of both the Consultative Group on International Agricultural Research and the National Agricultural Research Systems (NARS) have been strengthened. But in most countries, rangelands research and sustainable development are not top priorities, with the result that research funding does not reach the level set by international requirements, according to which such funding should amount to at least 2 percent of GDP[4].

5. There is insufficient documentation on the subject and this paper is an endeavour to put the problem in the right context.

6. This document deals with a number of ecosystem services provided by rangelands in addition to simple animal production, with a particular focus on the carbon sequestration potential of rangeland rehabilitation. It is designed to foster debate on the development of regional and national policies and regulations that will lead to the development of opportunities for Payment for Ecosystem Services (PES) from rangeland rehabilitation activities.

II. THE ECOSYSTEM PARADIGM

7. An ecosystem is usually defined as being “a natural unit comprising biotic factors”, that is a system made up of all the plants, animals and micro-organisms in an area that are functioning together

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[1] Dutilly-Diane, C., McCarthy, Nancy, Turkelboom, Francis *et al*. 2007. Could payments for environmental services improve rangeland management in Central Asia, West Asia and North Africa? CAPRi Working Paper No. 62, J anuary 2007. pp. 42

[2] Dutilly-Diane, C. 2007 Pastoral economics and marketing in North Africa: A literature review. Nomadic Peoples, Volume 11, Number 1, Summer 2007 , pp. 69-90 Berghahn Journals

[3] Mamdouh, N. 1999. Assessing Desertification and Water Harvesting in the Middle East and North Africa Policy Implications. ZEF – Discussion Papers On Development Policy. No. 10, Center for Development Research, Bonn, July **1999**, 59pp.

[4] IAASTD/CWANA Historical and current perspectives of AKST, Chapter 2 draft (2007) Kawther Latiri , Alia Gana, Kamel Shideed, Jean Albergel , Stefania Grando, Yalcin Kaya , Farzana Panhwar , Manzoor Qadir, Ayfer Tan, Selma Tozanli, Mohamed Annabi, Celine Dutilly-Diane, Gulcan Eraktan, Alessandra Galie, Lubna Qaryouti, Lokman Zaibet, Iftikhar Ahmad, Muna Hindiyeh Kazaleh

with all the abiotic, that is the non-living, physical factors of the environment. Ecosystem services generally refer to the benefits that people obtain from ecosystems. Basic services include: delivery of food, fresh water, fuel and medicine. Regulating services often are less tangible and harder to measure and include services such as carbon sequestration, climate regulation, erosion control, flood regulation and pollination. Cultural services include matters that fall into the realms of the recreational, the educational, the spiritual and of ecotourism. Finally, there are supporting services such as nutrient cycling, soil formation, and primary production. Agro-ecosystems both produce food and non-food goods and provide environmental services. These systems can be found both in individual production units and in large eco-regions and they cover around 30 percent of the world's area[5].

8. Potentially, both rangeland users as well as society at large can expect significant benefits from well-managed rangelands in dry areas; these include wind erosion reduction, biodiversity conservation, soil carbon sequestration and improved water productivity.

9. Pastoralists are managers of drylands, but they are often socially and politically marginalized. FAO should increase its technical and policy support to those current and projected activities designed to empower pastoralists and pastoral institutions so that they can influence related policies. In other words, if sustainable rangeland management options promoting the rehabilitation of degraded areas are to be had, pastoralists should be helped to encourage an ecosystem management approach promoting sustainable intensification of production along with the maintenance of ecosystem services, including that of carbon sequestration.

III. VALUING RANGELANDS IN THE ECO-SYSTEM

10. Among the causes of desertification and soil erosion are overgrazing, the collection of fuelwood for energy, overcultivation and inappropriate water harvesting techniques, especially in Sudan, Syria, Yemen and Jordan. Because of such bad practices, between the 1970s and the 1990s rangelands in this part of the world have suffered a drastic decrease in area (of as much as 10 percent in Morocco and Tunisia and 14 percent in Algeria)[6]. As to rangeland productivity, over the last 50 years the perennial phytomass of steppe vegetation has decreased from 1000–1500 kg Dry Matter (DM)/ha to 200–500 kg DM/ha[7]. The primary cost resulting from land degradation and its subsequent rehabilitation is the income lost due to land degradation; the second is the cost of restoring land that because of desertification has suffered significant losses in crop and livestock production.

11. The United Nations Environment Programme (UNEP) estimates that the annual average income lost in the Region because of desertification is US$1.98 billion[8]. For rangeland, this loss represents a US$7 reduction in income per ha/year; whereas for rainfed cropland and irrigated land it is US$38 and US$250 respectively. Another study, done over a 20-year period and based on 1990 prices, concluded

[5] Dutilly-Diane, C., N. McCarthy, F. Turkelboom, A. Bruggeman et al. 2006. Protection money: A new approach to rangeland management. ICARDA Caravan, 23:16-18

[6] Dutilly-Diane, C. 2007 Pastoral economics and marketing in North Africa: A literature review. Nomadic Peoples, Volume 11, Number 1, Summer 2007, pp. 69-90 Berghahn Journals.

[7] Dutilly-Diane, C., McCarthy N, Turkelboom F., Bruggeman A and Thomas R. 2007. Payments for Environmental Services as a Means to Combat Desertification? Reflection on the Case of the Rangelands in West Asia and North Africa, . In: C. King, H. Bigas, and Z. Adeel (ed.). Desertification and the international policy imperative. Proceeding of the joint international conference, Algiers, Algeria. 17-19 Dec 2006. p.72-82, UNU Desertification series. No.7., Canada UNU-INWEH.

[8] Mamdouh, N. 1999. Assessing Desertification and Water Harvesting in the Middle East and North Africa Policy Implications. ZEF – Discussion Papers On Development Policy. No. 10, Center for Development Research, Bonn, July **1999**, 59pp.

that the annual loss of income amounted to US$28 billion. In the case of desertified land for which rehabilitation would be worthwhile, the global cost would be about US$213 billion. [9]

12. About two thirds of ecosystem services are degraded and restoring the once rich biodiversity is very expensive and biologically difficult. But it is not impossible. Syria attempted this in 1995 by banning the cultivation of lands below the 200 mm isohyet and allowing natural vegetation, with its rich biodiversity, to restore itself naturally. After a decade of protecting rangeland from land cultivation and of implementing policies designed to promote better grazing practices, it became clear that it is possible to successfully improve rangeland.

13. The full rehabilitation of rangeland generally requires a period of at least 50 years. Costs of rangeland rehabilitation per hectare vary; but the amount of US$40/ha is thought reasonable for rangeland while costs rise to US$400 in the case of rainfed cropland and to US$2000 for irrigated land. Reclamation costs per hectare are 50 times greater for irrigated land than for rangeland. However, the returns from irrigated land are about 35 times greater than from rangeland[10].

14. Many dryland plant species used for medicinal and cosmetic products, as well as mushrooms and truffles, are endangered by the excessive exploitation of rangelands. Tunisia and Egypt have begun cataloguing these wild plants and identifying their economic value for drylands development. Furthermore, it should be remembered that all food chain components of the ecosystem are affected by degradation: This includes herbivore insects, large size mammals such as gazelle (*Gazella dama, Gazella subgutturosa marica*), Oryx (*Oryx dammah, Oryx leucoryx*), mountain goats (*Ammotragus lervia, Arabitragus jayakari, Capra ibex nubiana*) and birds. In the Syrian Badia, for example, only five adults birds of the Northern Bald Ibis (*Geronticus eremite*), an insectivorous bird, are still extant and since 2003, this bird has been listed as critically endangered by the International Union for the Conservation of Nature (IUCN). Most of the work done to protect ecosystem food chain components and ensure their long-term survival has been through the establishment of protected areas and, in some cases, the re-introduction of particular species. However, in general, information on plant and wildlife species remains sketchy as most of that which is available has been extrapolated from case studies and extrapolations from specific national situations.

15. Water in dryland is the single most important limiting factor for biological productivity and in this context water regulation is of utmost importance. Water harvesting and other conservation practices reduce run-off and erosion, measures designed to increase land productivity and conserve water supply for livestock drinking. Landscape management techniques such as terraces and small dams would improve water regulation. And although traditional local knowledge in this field is a real asset, there is an urgent need to develop new technologies along with equitable and sustainable policies to promote efficient water use.

16. Drylands also provide cultural ecosystem services such as cultural tourism, some examples of which are the Douz festival in Tunisia, the Dinka culture in Sudan and the Bedouin-style campsites in Jordan's Wadi Rum. Other examples of this type of tourism include the beautiful scenery of Douz (Tunisia) and animal-related tourism such as viewing gazelles and camel riding in Saudi Arabia and the United Arab Emirates. Tourism in dryland areas also could benefit from the sale of niche-products from the Beduin rangelands such as camel milk, truffles, sand-baked bread, hides and leather products, all of which could lead to the growth and diversification of pastoralist income.

17. Despite the low averages of organic carbon in rangeland soil, there is reason to believe that good grassland management has the potential to reverse long-standing carbon losses and to sequester substantial amounts of soil carbon. All in all, it is estimated that given the prices for CO_2, of US$20–50 per ton, 0.2–0.8 Gt CO_2/yr could be sequestered in grassland soils by 2030.

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[9] Dregne, H. E. & Nan-Ting, Chou. 1992. Global desertification dimensions and costs. In Harold E. Dregne, ed., Degradation and Restoration of Arid Lands. Lubbock, TX: Texas Tech University, pp.249–282).

[10] Dregne *et al* (as above).

18. Sustainable grazing management also can increase carbon inputs and carbon stocks without necessarily reducing forage production. Grazing management can also be used to restore the growth of forage species, while – at the same time – increasing carbon inputs and soil carbon stocks. Other practices that enhance production, for example the sowing of more productive species or the addition of adequate moisture and nutrients, can increase carbon uptake, ecosystem carbon stocks, and forage production (Box 1). New techniques and monitoring systems regarding management practices in different ecologies are likely to be required if they are to have a significant impact on sustainable rangeland rehabilitation and on climate change adaptation and mitigation.

19. Rangeland carbon management costs are estimated at around US$2.5–5/ton of carbon, including high initial outlays and payment incentives. However, since many traditional rangeland institutions have been destroyed, there is a need for new institutions (NGOs, herders' associations, etc) to aggregate individual households' carbon assets on these large areas and to provide technical support.

20. Support for the development of workable policies and incentives is sorely needed. The current rules for land use, land use change, and forestry projects derive from the Clean Development Mechanism adopted at the Seventh Conference of the Parties (COP7) in 2001; this produced an agreement that allows both afforestation and reforestation carbon-offset projects in developing countries, but sets complex monitoring and reporting requirements and excludes emissions from deforestation or credits for agricultural or grassland sequestration. Identifying and understanding those situations in which short-term interests (for example, in this year's harvest) may outweigh long-term interests in maintaining productive capacities should be a top priority. The development of technical solutions based on research and education and technical assistance in implementing sustainable practices must also be placed at the top of the agenda. A key challenge will be the needs of the large number of smallholders and pastoralists who are likely to be among those hardest hit by climate change. Thus, efforts to spread knowledge on sustainable grassland management practices will prove essential for ensuring their successful implementation.

21. The Clean Development Mechanism is one of the "flexibility mechanisms" defined in the Kyoto Protocol. It provides public and private entities in developed countries the opportunity to fulfill their emissions reduction obligations through investing in "clean development" projects in developing countries. In 2008, the European Commission launched a regional project called Euro-Mediterranean Energy Market Integration Project for 10 beneficiary countries; 7 are from the Near East Region (Egypt, Morocco, Tunisia, Algeria, Jordan, Lebanon and Syria).

IV. CONCLUSIONS

22. The value of grasslands and sylvopastoral systems and their importance for both food and nutrition security as well as for ecosystem health is widely recognized. In addition, the important role played by grassland managers in the creation and maintenance of sustainable food-producing landscapes and livelihoods is generally acknowledged.

To take advantage of the huge potential of grasslands in building ecosystem resilience, including the mitigation and adaptation to climate change while food and nutrition security nonetheless is improved, FAO is undertaking a five-year Global Grasslands and Rangeland Initiative (2010-2015); the aim of this project is that of promoting improvements in grasslands and sylvopastoral management on 10 percent or more of the Region's grasslands and rangeland areas. Looking further forward to 2030, the term target is the maintenance or improvement of a total of 75 percent of grasslands and sylvopastoral systems and of 15 percent of the rangelands' most fragile areas.

V. RECOMMENDATIONS

23. The goal of an on-the-ground change in grassland and sylvopastoral systems management reflects a commitgment to making sure there will be a practical outcome. But this means that key improvements must be made simultaneously in the domains of policy, research, extension systems and capacity development. Specific objectives include:

- **Informed policies** at national and international levels that promote good grasslands and sylvopastoral management and are viewed as instrumental to the agriculture-environment nexus.
- **Global awareness** must be raised about the importance that the economic, social and environmental importance of rangelands, grasslands and sylvopastoral systems and the role that they can play in meeting sustainable development priorities, especially that of climate change adaptation and mitigation.
- **Putting good management into practice.** Practitioners and those who work with them must be knowledgeable in good rangeland systems management.
- **Addressing knowledge gaps.** Research is needed in addressing the principal knowledge gaps associated with rangeland and grassland systems.

24. **FAO is thus called upon to:**

- Promote cooperation and integration among member countries for the creation of a database that provides state of the art knowledge on rangeland and grassland, including: agroforestry, carbon sequestration practices, interactions with climate change and costs of implementation.
- Provide technical assistance for developing land degradation monitoring and prediction tools and for setting up mitigation options that will operate as the key elements in action plans to combat desertification.
- Help member countries develop plans for making rangelands eligible for payments from the cap and trade programmes within the Kyoto Protocol's Clean Development Mechanism.
- Support pastoralists by favouring more targeted research on rangeland issues.

25. **Member countries are thus called upon to:**

- Give due attention and recognition to the important role played by rangelands in climate change mitigation and consequently to adapt their policy development strategies at the national, regional and international levels.
- Promote and set up pro-pastoral policies with greater emphasis on the services and goods provided by pastoral zones, particularly the ecological role of pastoralism and desert tourism.
- Foster collective action in organizing communities to manage the transaction costs associated with the implementation of Payments for Environmental Services (PES).
- Promote a sound and well-adapted eco-social system that protects the livelihoods of nomadic pastoralism through long-term response measures for controlling seasonal risks to scarce resources.

Box 1: Which grassland management practices increase carbon stocks?

1. Grazing management can be improved to reverse grazing practices that continually remove a very large proportion of aboveground biomass. Implementing a grazing management system that maximizes production, rather than offtake, can increase carbon inputs and sequester carbon.

2. Sowing improved species can lead to increased production through species that are better adapted to local climate, more resilient to grazing, more resistant to drought and able to enhance soil fertility (i.e. N-fixing crops). Enhancing production leads to greater carbon inputs and carbon sequestration.

3. Direct inputs of water, fertilizer or organic matter can enhance water and N balances, increasing plant productivity and carbon inputs and potentially sequestering carbon. Inputs of water, N and organic matter all tend to require energy and can each enhance fluxes of N2O, which are likely to offset carbon sequestration gains.

4. Restoring degraded lands enhances production in areas with low productivity, increasing carbon inputs and sequestering carbon.

5. Including grass in the rotation cycle on arable lands can increase production-return organic matter (when grazed as a forage crop) and reduce disturbance to the soil through tillage. Integrating grasses into crop rotations thus can enhance carbon inputs and reduce decomposition losses of carbon, both of which lead to improved carbon sequestration.