Università degli Studi di Sassari

NRD – Nucelo Ricerca Desertificazione

International Conference on

Dryland ecosystem functioning and resilience: integrating biophysical assessment with socio-economic issues

Alghero (Italy), 6-8 July 2011

PRELIMINARY PROGRAMME

Wednesday 6 July 2011

09.00 – 09.30 **Opening Session**

Session 1: Climate sensitivity of desertification

09.30 – 10.00 Climate change and adaptation
10.00 – 10.30 Carbon, water, and energy exchange in drylands
10.30 – 11.00 Land use and hydrological cycle in arid zones
11.00 – 11.20 *Coffee Break*
11.20 – 11.50 Desertification and impact on surface albedo
11.50 – 12.20 Impact of desert aerosols on atmospheric properties
12.20 – 13.15 *General Discussion*

13.15 *Lunch*

Session 2 Dryland resilience: the role of geo-engineering and agroforestry systems

14.30 – 15.00 Increasing water harvesting for improved agroforestry systems
15.00 – 15.30 How to improve water use efficiency in cropping systems
15.30 – 16.00 Soil resilience and agroforestry production
16.00 – 16.30 *Coffee Break*
16.30 – 17.00 Integrating geo-engineering with land resource management
17.00 – 17.30 Remote Sensing based evaluation of carbon and water use efficiency (including the role of cell modeling)
17.30 – 18.00 *General Discussion*

Thursday 7 July 2011

Session 3: Integration of Bio-physical and Socio-Economic Issues – Generating Baseline Information for Desertification, Land Degradation and Drought (DLDD) Assessment

09.00 – 09.30 Implementation of novel scientific concepts to integrate bio-physical and socio-

economic issues in land degradation mapping

09.30 – 10.00 Existing options/experience to perform spatially economic cause effect scenarios and associated cost-benefit of changing land uses in drylands

10.00 – 10.30 Evaluating current extension, effectiveness and trend of sustainable land management practices in drylands at regional and gobal level

10.30 – 11.00 *Coffee Break*

11.00 – 11.30 Impact of SLM versus non SLM on vulnerability to climate change and food insecurity

11.30 – 12.30 *General Discussion*

12.30 *Lunch*

Session 4: Global Perspective on Current Status and Options: Food Security and Food Sovereignty in Drylands

14.00 – 14.30 Successful and failed institutional mechanisms and strategies

14.30 – 15.00 Recent food crises

15.00 – 15.30 The power of consumers and markets

15.30 – 16.00 *Coffee Break*

16.00 – 16.30 Climate vulnerability and food security

16.30 – 17.30 *General Discussion*

Friday 8 July 2011

Session 5: The economics of land degradation and sustainable land management

09.00 – 09.30 Analysis of existing valuation methods including monetary and non-monetary valuations

09.30 – 10.00 Review existing values of land management

10.00 – 10.30 Examine options for a comprehensive integrated economic assessment methodology Representative from Stockholm Environment Institute

10.30 – 11.20 *Coffee Break*

11.20 – 11.50 Define a road map to test integrated assessment methods, build the required capacity at national level and identify steps needed to mainstream comprehensive evaluations at national and international levels.

11.50 – 12.15 *General Discussion*

12.15 – 13.30 **Final Session: Conclusions and Recommendations**

13.30 *Lunch*

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NRD – Nucelo Ricerca Desertificazione

Conference Scientific Committee

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Rationale

Desertification is a result of a long-term failure to balance demand for and supply of ecosystem services in drylands (Millennium Ecosystem Assessment - Desertification Synthesis, 2005), which is likely to be exacerbated substantially by climate change and population growth. Drylands are currently home to about 38% of the human population and occupy nearly 45% of Earth's land surface, including the poorest nations on earth. About 10-20% of drylands are already degraded. Ongoing desertification threatens the world's poorest population, roughly 10% of the dryland people already live in desertified areas (i.e. about 250 million people in the developing world), and thus is a major impediment to meeting basic human needs in drylands. Furthermore, covering some 45% of Earth's land surface, drylands constitute the largest biome on the planet and play a major role on the climate system and on the atmospheric constituents. Thus, quantification of processes related to desertification, subtle and long-term changes, needs an integrated approach, because biophysical and socioeconomic features are fundamentally interwoven (i.e. "dryland syndrome") and result in nonlinear processes and cross-scale interactions. The drivers of desertification are especially operative at the landscape scale in terms of natural resource capital and ecosystems function. Equally important is to improve the knowledge about the impact of desertification on global climate change and vice versa. Thus, there is the need to effectively assess and quantify actions to combat desertification integrating biophysical measurements and valuations of ecosystem goods and services relative to users that are related to these ecosystems (local rural communities, regional, national, and global societies).

This wide range of implications (economic, societal, and climatic) must be addressed before rendering final judgment on the interaction between desertification and climate system. Moreover, it is becoming clear in the wide scientific community studying dry-lands functioning and resilience that we should improve the weaknesses and uncertainties in modeling the climatic responses, including precipitation patterns, to land cover change. In this respect, it must be underlined that land-use/land-cover change is still not generally recognized in international climate assessments as having a role on precipitation that is at least as large as that caused by the radiative effect of the human addition of greenhouse gases, as forest vegetation can amplify or dampen climate change arising from anthropogenic greenhouse gas emission through albedo, evapotranspiration, the carbon cycle, and other processes.

As also recommended by the LESC-ESF strategic science document, present-day research activities should tackle the crucial issue global change adaptation and mitigation of ecosystem degradation making full use of contributions from natural and physical sciences (for example, in geo-engineering or water management) as well as from social and human sciences (such as social anthropology and cognitive science)

The first objective of this Conference is, therefore, to relate a better understanding of the landscape-scale dynamics that lead to improvements in nutrient and water cycling, to their impacts on the climate sensitivity of desertification. This new knowledge is then set against the context of the complexity of increasing the resilience of dryland ecosystems particularly in relation to looming problems of food security and the expected costs and benefits to society of land degradation and sustainable land management respectively. The conference intends to play an important role as a platform to elaborate scientific issues and make proposals to be presented at the forthcoming COP10 of the UNCCD Convention on combating desertification.

Session 1: Climate sensitivity of desertification

The climate sensitivity of desertification processes is complex and not yet sufficiently understood for desertification may have contrasting effects on the climate system. On one hand, global warming increases evapotranspiration, thus adversely affecting ecosystems function leading to reduced primary production and nutrient cycling, biodiversity loss and increased soil erosion. These soil and vegetation losses result in reduced carbon sequestration and lower the so-called "biotic pump" of atmospheric moisture which in turn has a positive forcing on global warming. On the other hand, desertification increases the surface albedo and contribute significantly to the aerosol load associated to desert dust outbreaks (airborne PM_{10} and $PM_{2.5}$ in the form of desert sand has been tracked from Africa and Asia to North America) which have a negative radiative forcing on the Earth's climate. However, it should be considered that PM_{10} and $PM_{2.5}$ have harmful effects on human health and that the beneficial effect of increasing albedo may be offset by high additional energy costs and greenhouse gas emissions caused by progressive further land degradation, increased fossil fuel use, and a shift to intensive irrigation agriculture in drylands.

Session 2: Dryland resilience: the role of geo-engineering and agroforestry systems

In arid and semiarid areas, rainfall distribution and poor management aggravates water scarcity for crops, resulting in low rainwater use efficiency. Large water productivity gains could be achieved in rainfed areas by changing vapour flows through productive evapo-transpiration. This requires developing appropriate strategies that ensure augmentation of water resources through rainwater conservation and harvesting as well as improved crops and farming systems, including eco-physiological and molecular approaches.

Session 3: Integration of Bio-physical and Socio-Economic Issues – Generating Baseline Information for Desertification, Land Degradation and Drought (DLDD) Assessment:

Baseline information for global and regional desertification assessments needs to integrate socio-economic issues in order to really evidence the actual impact of land degradation on human well being as well as the benefit of preventive measures and counteraction, as expressed through land use and in particular sustainable land management (SLM).

Current initiatives towards a new World Atlas of Desertification strive at being a pragmatic exercise and illustration of applying at global and regional levels novel scientific concepts of Desertification, Land Degradation and Drought (DLDD) assessments that have been described in recent literature. They include the Millennium Ecosystem Assessment approaches, based on evaluation of ecosystem goods and services, the evaluation of complex Syndromes of global change and desertification proximate causes and pathways, having in common that they are integrating and addressing combined desertification issues in a structured but flexible way. However, besides aspects of tackling inherent problems of data availability/accessibility

and quality, these approaches require methodological extension to allow for more comprehensive expressions of socio-economic cost and benefits of mapped land degradation states and trends, as well as of the effectiveness of sustainable land management in counteracting desertification.

Though yet limited to regional pilots, existing initiatives are presented which aim to tackle the above mentioned issues considering human-ecosystem interaction and land use dynamics in land degradation prone drylands.

Session 4: Global Perspective on Current Status and Options: Food Security and Food Sovereignty in Drylands

Safeguarding human well-being is directly related to the secure and continued availability of and accessibility to good quality and nutritionally diverse food. Drylands have a natural variability (including droughts, fluctuating water availability and biomass production) which can pose extreme challenges in securing national food resources. The recent food crisis showed the extreme fragility of maintaining reliable access to food, especially in drylands. We assume that desertification, high demographic dynamics in dryland countries, energy requirements, changing consumer patterns and global market interactions will increase the demand for land and water resources in arid, semi-arid and dry sub-humid areas to produce food for the national and global market.

Session 5: The economics of land degradation and sustainable land management

The lack of sufficient data on both the costs of land degradation (LD) and the benefits of sustainable land management (SLM) are major limitations in the efforts to convince policy makers of the urgency to invest in the land. Calls have been made for a comprehensive study of the human, economic and environmental monetary and non-monetary costs of neglecting LD. Particular attention needs to be given to the poverty reduction potentials of SLM and impacts on food security. The recent food price increases and civil unrest in several dryland countries emphasize the urgency of the problem.

There is a need to harmonize and standardize methodological approaches to the measurement of these costs and benefits in order to inform policy making.

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