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Combating desertification/land degradation and drought for poverty reduction and sustainable development: the contribution of science, technology, traditional knowledge and practices

Combating desertification/land degradation and drought for poverty reduction and sustainable development: the contribution of science, technology, traditional knowledge and practices (Agenda item 2)

Submitted by the Chair of the Committee on Science and Technology

I. UNCCD 3rd Scientific Conference

1. The UNCCD 3rd Scientific Conference aimed at producing sound scientific outputs that could inform policy formulation and dialogue at the Conference of the Parties (COP). The following key scientific findings and policy-oriented implications which emerged from the conference will be transmitted to the twelfth session of the Committee on Science and Technology (CST 12) as contained in the final report of CST S-4. Pursuant to the provisions in decision 21/COP.11, the Bureau of the CST, in conjunction with the Science-Policy Interface and in consultation with Parties and regional groups, will review the outcomes of the conference prior to CST 12. A report on the organization and outcomes, including policy-oriented recommendations, of the UNCCD 3rd Scientific Conference will be before the Committee at its twelfth session for consideration and appropriate decisions by the COP, in conformity with the provisions of the Convention.

II. Key scientific findings

2. Land degradation is occurring in drylands today in response to stresses associated with demographic pressure, unsustainable land management practices and climate change. These stresses are increasing the vulnerability of not only ecosystems, but also the humans

who depend upon them. The links that exist between climate change, land degradation, and the vulnerability of ecosystems and human populations include biophysical and human drivers, impacts and responses. Three factors influence the vulnerability of biophysical and social systems to land degradation and climate change: (1) exposure to these stresses; (2) sensitivity, or the extent to which social systems and ecosystems are likely to be modified; and (3) adaptability, or the extent to which system functionality can change such that ecosystem services and livelihoods can be maintained. The conference used a novel, participatory approach to explore links between biophysical and social systems, with an emphasis on vulnerability. Scientific presentations and exchanges were accordingly grouped into three sessions: (1) Diagnosis of constraints; (2) Responses; and (3) Monitoring and assessment. For each session, participants were asked to focus on salient questions raised in the Impulse Report[1] and make specific scientific and operational recommendations to achieve impact.

A. Diagnosis of constraints

3. Much is known about processes of land degradation and climate change on ecosystem provisioning of food, fodder, energy and other goods. Less is understood about feedback and feedforward links between these two processes. There are an increasing number of biophysical indices for land degradation that can be estimated cost-effectively through remote-sensing. Moreover, the economic value of ecosystem services and their loss through degradation can be estimated with greater accuracy. More progress is needed, however, in the development of qualitative indices for services that cannot be easily monetized, such as cultural and spiritual indices, for these are highly relevant to such key issues as food security and sustainable land use. There is increased recognition of the importance of local and traditional knowledge in developing sustainable land management (SLM) practices to reduce vulnerability, but there is a need for operational indicators that integrate both scientific and local knowledge and allow for a better understanding of adaptive capacities. Knowledge generated from such research will allow us to better anticipate complex interactions between biophysical and social systems in specific settings. For example, climate change and land degradation will in many areas affect the presence of trees and water sources, which in many traditional societies determine who has access to land resources. Often, this access is gender-linked.

4. Greater compatibility among methods to diagnose constraints would improve our ability to share knowledge and enhance response. This includes methodologies for mapping vulnerabilities related to land degradation and climate change. Greater compatibility would facilitate downscaling of climate change scenarios to local contexts and outscaling from local to wider contexts.

B. Responses

5. There are several technological response options available to communities to reduce vulnerability, including better adapted crops and animals, improved integration of crop/livestock/forest systems, and more efficient use of limited resources such as water and nutrients. But to take these to scale and facilitate adoption, the perceptions of farmers must

[1] Mark S. Reed and Lindsay C. Stringer (with the contribution of an international panel of experts), *Impulse Report – Climate change and desertification: Anticipating, assessing & adapting to future change in drylands* (Montpellier, France, Agropolis International, 2015). Presented at the UNCCD 3rd UNCCD Scientific Conference.

be recognized and correlated with scientific data. Farmers and other stakeholders must be involved in the identification of research problems and solutions, including best practices. Scientists and indeed policymakers must recognize that cultural and socioeconomic factors influence adaptation options. Better research and communication methodologies are needed that integrate social, economic and biophysical information, including indigenous knowledge and farmers' experiences. An up-to-date "wiki" inventory of techniques and tools for land restoration could support such efforts. An environment of co-learning that places value on "hybrid knowledge" needs to be fostered in research. Capacity development, community participation and, for some technologies, provenance trials can enhance response mechanisms. As regards market incentives, additional research is needed to assess their social, economic and environmental impacts with a special focus on institutional aspects, such as transaction costs and power relations, to assess their effectiveness in reducing vulnerability.

6. Many research and development institutions can to varying degrees identify and promote response options at different scales and for different settings. But because response options are site-specific and demand-driven, mechanisms must be sought that allow scientists and stakeholders to co-evaluate and jointly communicate success. Systems analysis, including value chain and market analyses, is needed to identify incentives and barriers to sustainable responses, including lacks of traditional and local knowledge, poor access to capital or technology, language barriers, gender inequities, property rights structures and policy environments. Regional cooperation and communication will be needed to address the links between land degradation and natural disasters such as flooding and landslides.

7. Much more research is needed on knowledge systems. Knowledge transfer, whether based on traditional knowledge, modern science, or both, is of critical importance for land management and rural development, and knowledge is dynamic, context-specific, culturally embedded, and constantly evolving. Improved and more efficient models of knowledge transfer are needed; modern Internet or cell phone technologies offer new opportunities in this regard. Better knowledge management approaches would also help develop improved methodologies for assessing adaptive capacity or the ability of local communities and societies to generate genuine resources from their interaction with their environment. This is true especially for pastoral systems. Integrated and multidisciplinary studies on the links between climate change and land degradation processes are essential.

C. Monitoring and assessment

8. To be meaningful within the context of achieving land degradation neutrality, monitoring and evaluation (M&E) needs to have clear objectives that are of value to all stakeholders. M&E indicators that are of value to biophysical scientists or policymakers may not be meaningful to farmers or other land users who rely more on traditional knowledge or indicators. While tremendous advances are being made in the use of remote-sensing, these do not yet sufficiently benefit practitioners on the ground. If we are indeed to use "hybrid knowledge" that draws upon both modern science and traditional or local knowledge, then a long-term perspective is required that uses indicators useful to all stakeholders.

9. Research should continue to move from relatively narrow indicators, such as vegetation indices and population dynamics, to a more coherent integrated framework that uses indicators to characterize vulnerability. Such frameworks could be used to generate information relevant to policy. More effort is needed to distinguish indicators for the state of land degradation and climate change from indicators for drivers.

10. There are many exciting developments in the field of remote-sensing that include increasingly accessible, high-resolution satellite images, inexpensive drone-mounted sensors, and crowd-sourcing using various smartphone applications. Research should aim to consolidate these developments such that monitoring and evaluation can be done at different scales and by different stakeholders. This will include continued review, testing and assessment of methodologies to best use these new types of data. It will also require new and innovative approaches to managing and combining large sets of heterogeneous data such that they are meaningful not only to scientists but also to engaged communities working to achieve land degradation neutrality. However, further efforts are needed to scientifically underpin the concept of land degradation neutrality.

D. Conclusions

11. Human activities are recognized as a main driver of the processes of drought, land degradation, and desertification and a contributor to climate change. Society must therefore mitigate or reverse these stresses through innovative approaches to attain land degradation neutrality. The very best modern science and technology will be needed, but ultimately we must change human behavior and attitudes regarding the use of land and other natural resources.

III. Policy-oriented implications

12. Declines in productivity and other benefits from land due to climate change are accelerating and driving land degradation and desertification. As outlined in the Impulse Report, climate change makes land mismanagement visible more quickly worldwide and limits populations' abilities to generate a livelihood, particularly in the drylands. Drylands are characterized by high rainfall variability and unpredictable droughts. This has led to the development of land-use systems, governance structures and processes which reflect and respond to these uncertainties through flexibility and mobility in the use of the natural capital. In the context of globalized markets, impacts of land degradation and climate change on drylands have wider impacts across other climatic and ecological systems through migration, markets, insecurity and conflict. Policy consequently requires data on the indirect drivers of desertification.

13. Climate change is a key direct driver of land degradation. Desertification can be attributed to changing rainfall patterns and to increases in climate change-induced drought frequencies and intensities. Where land users are exposed and sensitive to changes and able to adapt, resilience can be built. When they cannot adapt, land users become vulnerable.

A. Diagnosis of constraints

14. Intergovernmental Panel on Climate Change projections indicate the possible states of land under future climate scenarios. Correlating losses of natural capital with climate change is just as important as the detection of impacts on land that can be directly related to human activities. Investments and more evidence-based decision making over the short, medium and long-term which differentiate between direct and indirect climate change and human drivers can guide land-based adaptations options. These options can be informed by models, participatory tools and scenarios that provide evidence to policymakers and other stakeholders in useable and accessible ways.

15. Appropriate governance structures, institutions and processes are required to enable effective use of this knowledge. As land users are not necessarily land owners, property

rights can limit the effectiveness of adaptation incentives. This is especially the case for small-scale land users that are already under acute pressure from food price volatility and climate variability.

B. Responses

16. Appropriate future governance styles at levels from the local to the international will not only have to take into account land degradation and desertification triggered by the severe exploitation of natural capital, but also the impacts of climate change. Appropriate governance, enabling the implementation of SLM at different scales, can ensure that public-private tools such as product certifications and other market-based incentives will reach their target with reduced transaction costs and stimulate behavioural changes for SLM. Science plays an important role in identifying alternative livelihood options that can foster SLM, supporting awareness-raising on the need for indices for the monetary and non-monetary values of ecosystem services. It is further important to recognize and consider traditional and local knowledge, which draw on long histories of experiences and lessons learned under variable climates and can effectively inform wider land-based adaptations. Civil society organizations and extension services need to support social learning using appropriate language and information and communication technologies. They can help build trust and understanding while reconciling the needs of local communities, consumer demands, research communities and political agendas, enabling concerted action between relevant stakeholders, and reducing the time-lag between knowledge generation and application. Involving stakeholders in the joint identification of area-specific land-based adaptations and in the co-production of knowledge with scientists is more effective than conventional top-down approaches.

17. A lack of resources is an important barrier to SLM. Land-based adaptation offers one way to harness greater financial support and make progress towards the sustainable development goals. There nevertheless remains a need to clarify how funding can be diverted into these activities, what resources are available at which scales, and for which stakeholders. The coordination of diverse stakeholder actions on the ground also requires effective governance and institutions to help ensure human well-being and justice.

18. The cross-sectoral nature of climate change, land degradation and desertification means that these combined challenges are already impacting on the nexus of food security, health, livelihood losses and poverty. This demands systems and integrated landscape approaches in the development of responses, the mainstreaming of land, climate and biodiversity to harness multiple wins, and the development of stakeholder knowledge brokering systems to share best practices.

19. Responses are needed urgently and must be informed by robust total economic valuations that include the economics of land degradation and climate change, considering the costs of action and inaction and non-monetary values. There is an important role for incentives and disincentives in avoiding maladaptations. The impacts of system transformations also bear a social cost, resulting in ‘winners’ and ‘losers’. This is especially visible in light of increased speculation on land and large-scale land acquisitions, which will have huge social consequences from the international to the local scale, altering both access to and use of natural resources, and the land’s capacity to deliver benefits to support human well-being.

C. Monitoring and assessment

20. Satellite data offer information on change at multiple spatial scales, allowing identification of key areas for urgent, targeted interventions and providing a basis for assessing the effectiveness of SLM. Satellite data must be integrated with and validated by ground observations, using technologies such as mobile phones to engage citizens, including women and the youth, in participatory monitoring. Capacity-building targeting the short, medium and long-term is needed to facilitate multi-stakeholder engagement in monitoring SLM.

21. Indicators for monitoring land degradation neutrality and SLM can particularly effectively assess adaptation options. A common framework assessment across the three Rio conventions would facilitate the more balanced monitoring of multiple ecosystem services and provide insight into the multiple benefits from SLM.

D. Conclusions

22. There is not an option to do nothing. To have a fighting chance of securing communities and ecosystems and moving towards land degradation neutrality, we must enable land-based adaptation through effective multi-stakeholder partnerships and collaboration. These policy-related implications emerging from the 3rd UNCCD Scientific Conference will be provided to the Science-Policy Interface so it can prepare a policy brief for the consideration of the COP at its twelfth session.