

INSTITUT DE LA FRANCOPHONIE POUR LE DÉVELOPPEMENT DURABLE

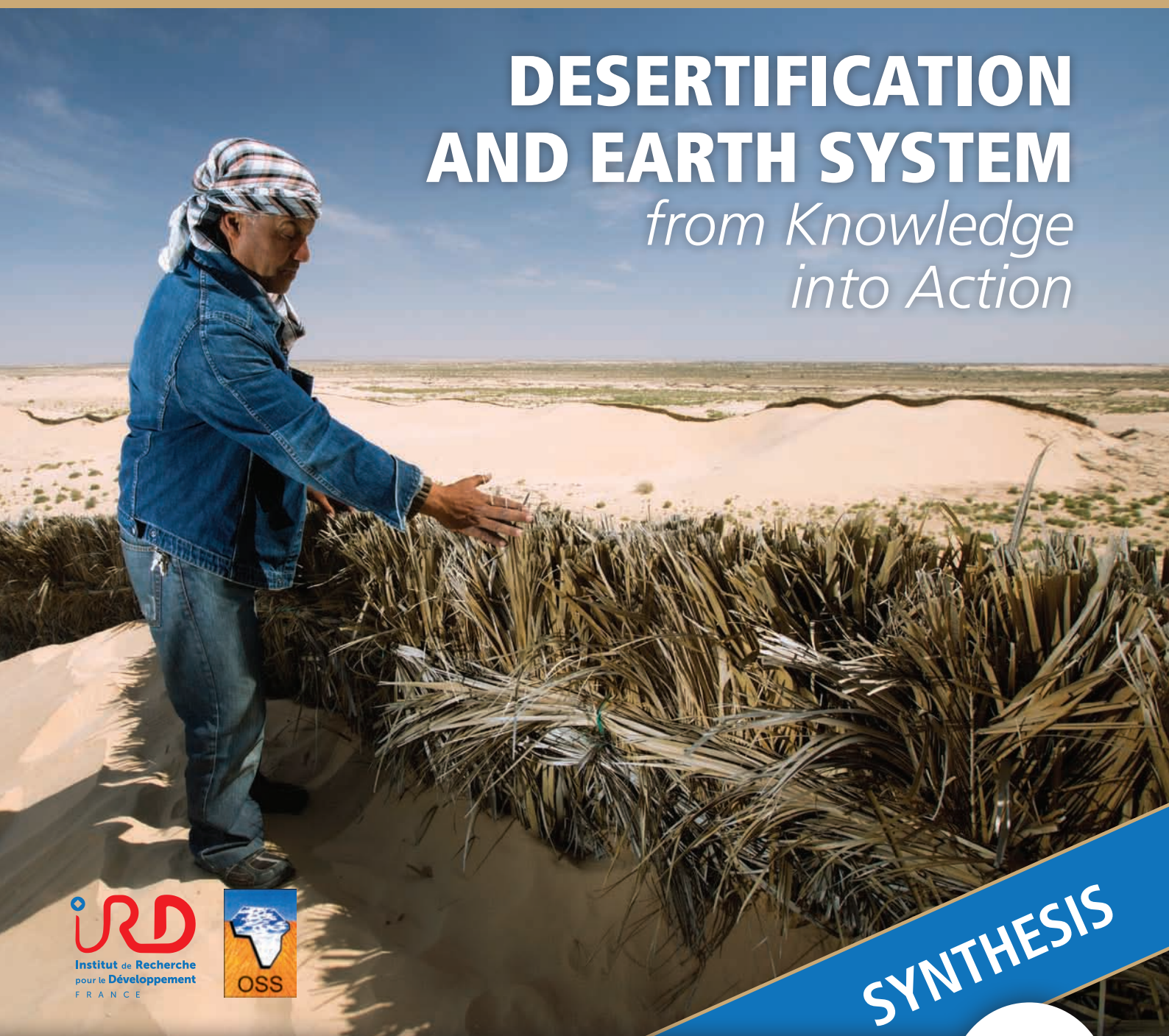
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DESERTIFICATION AND EARTH SYSTEM

*from Knowledge
into Action*



SYNTHESIS



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This booklet proposes a synthesis of the original French version of Liaison Énergie-Francophonie (LEF), number 105, available at:
www.ifdd.francophonie.org/LEF-desertification

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Jean-Pierre NDOUTOUM

Director of the Institut
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Message from the director

Experts estimate that around 24% of the planet's useable land has been degraded. By 2025, nearly 1.8 billion people could be living in countries or regions in absolute water scarcity. Combating desertification and the related issues such as drought and food security are therefore far from being outdated challenges.

The member countries of the *Organisation internationale de la Francophonie*, covering all the French-speaking zone in the world, are also suffering from the effects of land degradation and drought issues and are heavily involved in combating desertification. Many Member States of la Francophonie concerned are, effectively, Stakeholders in the United Nations Convention on Combating Desertification negotiation and implementation process.

Two years ago, at the 12th session of the Conference of the Parties to the Convention (COP 12) held in Ankara in Turkey, with the support of the **Institut de la Francophonie pour le développement durable** (Francophone Institute for sustainable development), IFDD and its partners, the Francophone States Parties pulled off the coup of organising a discussion on the concept of land degradation neutrality and the resources for implementing the Convention within the francophone area. It also seems important to me to highlight that during the high-level segment of the COP 12 in Ankara, all the Parties present debated important topics (from international debate to local initiatives; adapting to drought; adapting to climate change based on land management), with the aim of boosting the participation of all the stakeholders in the Convention implementation process.

The scientific community, international organisations and civil society must not remain on the sidelines of this process. Moving forward, action needs to be stepped up to emphasise the scientific knowledge to the francophone public, guide decision-makers and representatives of francophone civil society in bringing real sustainable land management action, managing the consequences of land degradation and solidifying the concept of land degradation neutrality.

This latter concept is defined as a state whereby the amount of sound and productive land resources remains stable or even increases. This calls us to avoid land degradation while restoring the land that is already degraded, within the specified time frames and ecosystems. It also guided the wording of the Sustainable Development Goal (SDG) on land degradation neutrality (goal 15 and target 15.3). It is an asset in our fight.

Besides the available tools for the benefit of participants in the Conference of the Parties (Negotiations Guide, Summary of the Decision-Makers' Intentions), the IFDD, together with its partners the IRD and the Sahara and Sahel Observatory (OSS), developed an edition of the LEF journal specifically dedicated to desertification and land degradation. The main objective of this special edition is to involve the scientific community and all the stakeholders committed to combating desertification, particularly in the *Francophonie*.

I would like to take this opportunity to thank all the contributors to this edition of LEF (the Secretariat to the Convention, regional organisations and



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civil society representatives, researchers and partners) for all the very pertinent and enriching articles that make up this edition.

In the run-up to the 13th session of the Conference of the Parties to the Convention, planned for the 6 - 16 September in Ordos (China), we hope that this new tool that the IFDD, in partnership with OSS and IRD, has made available will be useful for the francophone audience and beyond. 🌻

Happy reading.



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Complete biographies
available in French at:
[www.ifdd.francophonie.org/
LEF-desertification](http://www.ifdd.francophonie.org/LEF-desertification)

Message from the executives of IRD and OSS

There is a strong consensus within the scientific community on the importance of a sustainable planet to provide populations with the resources they need.

At the 1992 Earth Summit in Rio de Janeiro, the United Nations Convention to Combat Desertification (UNCCD) had to recognize the urgency to deal with this question, having for many years stuck to the letter of its mandate; to combat desertification and alleviate the effects of drought. During negotiations on the Convention, the African nations tried hard to promote a view of desertification focused on the local population lifestyle, the constraints related to their food and energy security, job creation and productivity, but they were barely heard. It needed 20 years for the International Community to recognize that land, including the soil, is a key element in development and is particularly associated with questions of poverty and equality. Desertification now affects almost 2 billion people on nearly half of the world's surface. Beyond Africa (North and Sub-Saharan regions included) South Asia, Central Asia and China, the Middle East and Mediterranean countries, North America and Latin America, Australia and the Pacific islands are also dramatically impacted by the desertification effects.

The inclusion of the concept of neutrality in land degradation (Goal 15.3) in the Sustainable Development Goals (SDGs) adds further legitimacy to the socio-economic dimensions of this problem. The new strategy for the 2018–2030 period that the Convention Parties are set to adopt during their 13th conference deliberately coincides with the end of the Millennium Development Goals (MDGs) and should give new political impetus to collectively develop fair and effective tools for combatting land degradation.

This new strategy demonstrates the different science-policy interfaces that have emerged in the last ten years as well as in the preparation of the 2018 Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES) land degradation and restoration report. It also reattributes responsibilities to scientists, including multidisciplinary analysis of the environmental and socio-economic dynamics around land degradation, generating further data to precisely predict migratory phenomena and their links with global change. In this aim, effective diagnostic tools on land should be developed to properly evaluate and monitor the state of the land but also to develop models and scenarios of global changes at local and regional levels to predict their impact and offer coping strategies.

To do this, it is important to develop effective diagnostic tools on soils that allow us to integrate the new risks linked to global changes. This remains a methodological challenge that needs to be carried out notably via climate risk management tools such as climate services.

Scientists are also accountable in supporting public and private stakeholders in the implementation of proven scientific policies and actions, especially in partnership with the stakeholders, primarily with local communities. The 4 per 1000 initiative seems to be a good example of where scientists and public and private stakeholders organise themselves to experiment, analyse and document practices to promote their development.

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Lastly, scientists have a responsibility in training current and future generations and sharing knowledge on the difference between scientific expertise and natural resources management decision-making. The transfer of land monitoring and evaluation data through innovative methods such as smartphones or remote sensing data-processing software is an element to be integrated earlier into research programs. Similarly, the development of tools to raise awareness on global changes that rely on observation tools (weather stations or satellite data) should also be integrated to promote the transfer of knowledge and capacity building of the local populations.

Trying to eradicate poverty, reduce inequalities and manage the land in a sustainable way while global changes involve building resilience capacities in populations and ecosystems is a daring task. Predicting long-term global changes is a major challenge that involves reinforcing long-term multidisciplinary observations. The IRD and

the OSS have been collaborating for 25 years on long-term environmental monitoring observatories deployed in arid, semi-arid and dry sub-humid areas in Africa. However, despite the continuous support of the main stakeholders to use efficient and multifactorial diagnostic tools on the land and soil, the technical and financial perpetuation of this type of observatory is still at stake. Keen to promote the emergence and further independence of scientific communities in developing countries while fostering decision-making based on the best scientific knowledge available, the IRD and the OSS bear these many responsibilities and are committed to a reliable interdisciplinary scientific research with partners from North and South in close association within the framework for the SDGs. This edition of LEF aims to demonstrate the diversity of the challenges we are facing and to enlighten decision-makers by making the latest scientific results available and easy to access. 🌻



Photo credit: IRD – Christian Lamontagne

Editorial



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Maud LOIREAU (IRD)
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Complete biographies
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The rises and falls of empires and civilisations often correlate to climate events and the effects that stem from them in terms of extreme poverty, famine and migration to new homelands. This is evidenced by the fall of the Roman Empire in the 3rd century and a period characterized by prolonged droughts¹, and the migrations of the first humans with the deterioration of the climate or the Bantu expansion in the Sahel over more than 5,000 years.

The current juncture of climate change and demographic growth, which is very high in some countries and on continents such as Africa, leads to new homelands becoming rare, particularly arable lands, and an increase in pressure on the lands already being farmed. Arid, semi-arid and dry sub-humid areas are particularly affected given their intrinsic bio-physical constraints. The land (soil, water and plants) degrades more quickly than new balances and community-environment regulations can be found.

In this context, the droughts that took hold in the 1970s were terrifying and the images of their impact are still engraved in mankind's collective memory. They were a determining factor in organising the United Nations Conference on Desertification in Nairobi in 1977. Moving beyond the subject's first entry onto the international agenda, since the Earth Summit in Rio in 1992, *society* has clearly been asking the question of how to understand and evaluate desertification, *i.e.* land degradation in arid, semi-arid and dry sub-humid areas owing to various factors, including climate

1 Ulf Büntgen et al, 2011, "2500 Years of European Climate Variability and Human Susceptibility". *Science* 13th Jan 2011. 1197175



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variations and human activity². Society needs answers to give itself the means to combat desertification and its negative impacts on food security, poverty, climate and biodiversity. Otherwise its life plan risks being curtailed. The question is being asked in all the world's dry regions, but it is being discussed by sub-region. The Africa sub-region (appendix I of the UNCCD³), and particularly the Sahel-Sahara area, has been recognised as a priority. With the threat of climate change marching on, the global nature and the societal dimension of desertification are increasingly being recognised. Among the 17 Sustainable Development Goals (SDGs) adopted by the International Community in 2015, 15 define targets linked to sustainably managing the Earth's resources, with goal 15, "Life on Land", highlighting land degradation neutrality (target 15.3) as a result to be reached by 2030 to avoid degradation and massively step up the rehabilitation of degraded land and soil.

In the run-up to the 13th Conference of the Parties at Ordos in China in September 2017, this special edition sums up the global and systematic dimension of the desertification process (and the mechanisms for combatting it), given the challenges to the viability of our Land System. It demonstrates the many and growing stakeholder movements in this fight (Political, Scientific and civil society organisations). [cf. Part 1]

By mobilising scientists from various disciplines (plant ecology, soil ecology, health ecology, pedology, geography, economics, sociology, pastoralism, agronomy, forestry, animal husbandry, climatology, environmental

law, political science, hydrology, biochemistry, microbiology, physical chemistry of the atmosphere, rural development, remote sensing, physics and information science and techniques), this edition demonstrates the diversity of viewpoints on the causes, mechanisms and consequences of desertification. It also demonstrates the infinite interlocking of levels and systems that might explain the difficulty in grasping the whole idea and in converging towards the same ranking of societal and environmental priorities for sustainable development, and even a co-viability of systems. Some experts/specialists/scientists, coming from earth, life and space sciences will be rather pessimistic about humans' ability to regulate and adapt, whereas others from human and social science perspectives will be more optimistic. As such, this special edition highlights the scientific knowledge that has been acquired and allows us to clear the way for the science of tomorrow, in particular the Community-Environment and Research-Action-Monitoring interfaces [Part 2] that let for interconnectivity between combatting land degradation and restoring populations' resilience and adaptability, their identity and confidence about their future.

Finally, the third part showcases the diversity and intensity of work carried out by humans in combatting degradation and their infinite imagination and capacity (individual and/or collective) to both promote ancestral skills and innovate (in agri-environmental techniques, in governance, etc.).

We thank the IFDD for having allowed us, the OSS and the IRD, to continue working together again in our now 25-year collaboration in supporting Africa to alleviate desertification and poverty. We are calling the francophone community to action on this subject and getting them talking about tomorrow's land and tomorrow's humans in Africa, and in the World! 🌻

2 www.unccd.int/Lists/SiteDocumentLibrary/Publications/UNCCD_Convention_FRE.pdf.

3 UNCCD - United Nations Convention to Combat Desertification.



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Message from the Minister of the Environment, Ecology and Forests in Madagascar

Desertification and land degradation are worldwide problems as 40% of emerged land is under threat and 60% is already affected. On top of this, at least 2 billion people are affected by desertification, which is a third of humanity. Madagascar is not exempt from this scourge as a third of its surface area is affected by the desertification process and around one million of its population is victim of it. Combined with the impact of climate change, this desertification and land degradation are compromising our socio-economic development and the sustainability of our environment. In 2015, we adopted two major decisions including target 3 of goal 15 on the one hand, that reads:

“By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world”. On the other hand, the definition of land degradation neutrality as being *“a state whereby the amount of healthy and productive land resources, necessary to support ecosystem services and enhance food security, remains stable or increases within specified temporal and spatial scales”.* With this in mind, we are committed to implementing the said decision by identifying out respective national targets for land degradation neutrality. By acting together and combining our efforts, we will succeed in reversing the foregone conclusion that is desertification. In September, the thirteenth session of the Conference of the Parties to the United Nations Convention to Combat Desertification (COP 13) will take place in Ordos in China in, where important decisions will be made, including the new strategy for combating desertification that will follow on from the ten-year strategy for 2008–2018. These decisions will help us to manage our land more sustainably and make it a leverage tool in our sustainable development. La Francophonie has always supported the Parties in the often-difficult negotiation by providing member countries with the necessary framework to facilitate discussions and negotiations. Furthermore, la Francophonie has contributed to national capacity building in the implementation of our Convention through various national and regional workshops. As we have come to expect, la Francophonie will certainly be involved in the negotiations and contribute to the making these decisions by giving member countries all the necessary tools to discuss and participate in the COP 13. To end my brief message, I would like to take the opportunity to address my deep and sincere thanks to la Francophonie. I also hope that in the future we will achieve land degradation neutrality with the unwavering support of la Francophonie. We will reduce the impacts of climate change, avoid conflicts over access to natural resources and help communities to prosper. ✨



Almoustapha GARBA

Minister of the Environment and Sustainable Development of Niger.

Complete biography
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Message from the Minister of the Environment and Sustainable Development in Niger

The Global Fight Against Climate Change: Niger's Commitment

Climate change, with its detrimental impacts on populations and natural resources, constitutes a real threat for our planet. It is therefore still a major challenge to overcome for our public authorities. Combating it needs to be a global effort and imposes a synergy of action by all nations and the major stakeholders in sustainable development. It is with this perspective that regional decision-makers implement efficient strategies for combatting this worldwide scourge, to support countries in their effort to find appropriate solutions to the different problems that stem from climate change. Meeting the sustainable development goals our countries strive for individually comes at this price.

The Heads of State sent a strong message of such an aim when they met at the Africa Action Summit, the first of its kind, organised to promote a continental co-emergence on climate change. The Heads of State's vision is of creating an appropriate framework that can promote solving the problems linked to food security and resilience to climate change. In particular, it aims to prioritise support for solid action where populations of African nations are faced with staggering land degradation and the worrying advance of desertification.

Sahelian Africa in general, and Niger in particular, has been struck at full force by the factors cited above, with the result of poor agricultural output, food insecurity and the large-scale impoverishment of our hard-working populations. Faced with the scale of the consequences linked to climate change, Niger, through a strategic recommendation with the vital aim of growing its economic performance, is therefore committed to relentlessly combatting the continued disintegration of our ecosystem. To do this, it has developed and adopted a Sustainable Land Management Strategic Framework and an investment plan. The cost of the action recommended by this landmark document is two thousand eight hundred and forty two (2,842) million US dollars for the 2015 – 2029 period.

This approach is a really helpful tool in decision making and aims to be programmatic. Making judicious investment choices about Sustainable Land Management in Niger allows us to better and more coherently coordinate the allocation of resources to finance and increase Sustainable Land Management action by the different government organisations and development partners. It highlights the crucial leverage points likely to boost priority action for the investments planned as part of this wide-scale operation.

In fact, the main elements of this decision-making tool are inspired by the vision of the President of the Republic, Head of State, SEM Issoufou MAHAMADOU, a vision laid down in the Niger Resurgence Program. Furthermore, it is perfectly in keeping with sectoral policies on the matter, such as the Economic and Social Development Plan (PDES), Niger's Fixed

National Contributions (CDN) to Climate Change, National Environment and Sustainable Development Policy (PNEDD), the 3N Initiative “les Nigériens Nourrissent les Nigériens” (“Nigeriens Feed Nigeriens”), the Multi-Year Spending Program Document (DPPD 2016–2018) as well as the Annual Performance Plan.

It is a formidable facility in advocating an increase in State investment in favour of Sustainable Land Management by 2030. The ultimate objective is to improve the synergy between interventions through avoiding action being duplicated and better use of financial resources.

Also, the support of Niger’s partners in the process of implementing the Sustainable Land Management process deserves to be underlined. This support amounts to, for example, 213,000 ha/year of degraded land to be recovered, 37,000 ha/year of dunes to be stabilised and 350,000 ha/year of Assisted Natural Regeneration (ANR) on a current capacity of 75,000 ha of degraded land recovered annually.

These are real aims, but making gains visible and the gap that needs to be closed to meet the Bonn commitment objectives (3.2 million ha of degraded land to be recovered for Niger) are still major challenges despite all the effort that has been made. This is why the country is resolutely committed to talking more to its partners.

Among discussions is the organisation of an International Conference on Desertification and the Green Economy. This arose from a meeting between the President of the Niger Republic, His Excellency Issoufou MAHAMADOU

and the Secretary General of la Francophonie, Her Excellency Mrs. Michaëlle JEAN, at the XVIth Summit of la Francophonie, held in Antananarivo (Madagascar) in November 2016.

The general objective of the conference is to have a high-level discussion about the experiences and practices of the Sahel countries in combatting desertification and promoting the green economy. This conference will also advocate the mobilisation of the resources necessary to combat desertification and promote the green economy in the countries of the Sahel. The conference will also be the opportunity to reaffirm the Sahel countries’ commitment to Land Degradation Neutrality (LDN).

The conference is planned for the 4th to the 6th of December 2017 and will bring together the countries of the Sahel region with similar environmental and desertification problems that wish to promote the green economy. The meeting will also involve many development partners who will bring the necessary support to combatting desertification and promoting the green economy.

I would like to take this opportunity to thank our partners in advance for their support and their concern. We are committed, in accordance with the guidance given by the international community, to continuing the fight to bring about the Sustainable Development Goals.

Certainly, the tasks ahead of us in the next few years are demanding and we must reiterate our profound gratitude to all for the unfaltering support in combating land degradation and desertification. 🌿



To stop the sand silting, the use of natural windbreakers (here rows of palms).

Photo credit: IRD – Christian Lamontagne



Monique BARBUT

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Complete biography
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Message from the Executive Secretary of the United Nations Convention to Combat Desertification (UNCCD)

Today more than ever, land is at the centre of global concerns. Indeed, it supports the food, water and energy production necessary for humans to meet their essential needs. Nearly 12 million hectares of arable land currently disappears each year due to desertification and drought – land where we could have grown 20 million tonnes of grain. Dry areas represent more than 41% of emerged land on the globe and they are home to more than two billion people. They are the stage for the ongoing process of land degradation that is aggravated by climate fluctuations, particularly drought and anthropic pressure including demographic growth and inappropriate management methods. All of these combined factors strongly undermine the capacity of populations to adapt to an increasingly hostile environment. This is all the more true in sub-Saharan countries where 80% of the economy depends on using the land to ensure their population's means of subsistence.

Many challenges stem from this situation in terms of food, water and energy security to cover the current and future needs of populations living in these areas that are amongst the poorest in the world. This insecurity drives a vicious circle that leads the most vulnerable populations, and young people in particular, to abandon their land. Without work, they then migrate in search of economic opportunities. They head to cities and initially move within their sub-region but are progressively tempted to go further afield, to North Africa and Europe, risking their lives in the process. Others are radicalised and join extremist groups that take advantage of their feelings of despair.

In this context, we must innovate to give hope back to these populations and meet the challenges they are confronted with by bringing them new solutions. By improving understanding of the links that exist between land degradation, migration and radicalisation with scientific research, we can lay the foundations for further action that supports development in rural areas and creates economic opportunities that benefit vulnerable populations. Combatting land degradation is therefore a global sustainable development challenge.

Based on our many successful experiences, real solutions do exist, we now just need to apply them by really getting to work!

By starting work today on sustainably managing arable land and restoring degraded land, we will reach land degradation neutrality by 2030.

By supporting major African initiatives such as the Great Green Wall of the Sahara and the Sahel or the 3S Initiative “Sustainability, Stability and Security”, we are supporting the creation of green jobs and economic opportunities linked to the sustainable use of arable land and the restoration of degraded land and of its productive base. By committing ourselves to developing renewable energies, including those based on promoting agroforestry products, we are providing for the needs of populations. All of these actions combine to increase food, water and energy supplies all the while reducing conflicts over access to resources and forced environmental migration. 🌱



Photo credit: IISD/ENB

PART 1

DESERTIFICATION: A GLOBAL CHALLENGE AND MULTI-STAKEHOLDER MOBILIZATION

Synthesis

The first set of contributions to the volume explore the historical building-up of the desertification agenda – the origins, achievement and challenges for the United Nations Convention to Combat Desertification (UNCCD); the implementation within Parties; and the respective role of civil society and scientific expertise. The contributions look also at how to move forward in the context of the Ordos 13th Conference of Parties. They especially examine how bridging between environmental agendas could foster higher political mobilization and benefit the global fight against desertification.

As a lot of other environmental issues, land degradation has slowly gained ground on the international agenda since the 1960s. Dramatic events like the 1970s Sub-Saharan famines or violent hunger-driven uprisings have contributed to sparkle political attention. But unlike pollution, biodiversity

or climate, the desertification issue has really struggled to become a separate and resilient agenda, tells Boubacar CISSE. The drafting of a UNCCD in 1994 constituted an important milestone, connecting for the first time land depletion –an environmental problem– with development and poverty issues – i. e. economic and social questions. The UNCCD's ambition, reminds us Marc BIED-CHARRETON, was also to sparkle genuine participation of the affected population by formalizing non-governmental organisations (NGOs') and civil society organisations (CSOs') contribution; to mobilize the international community; and lastly to support the access to expertise and technologies in land management, preservation and restoration.

The authors stress the enduring discrepancy between the progresses achieved in the understanding of the desertification phenomenon –taken as a multi-factors process of land fertility degradation– and its measurement or the understanding of its multi-scaled and sometimes geographically far-reaching consequences. The vicious circle between natural environment degradation and poverty is now clearly documented at local level, but the variability of local situations impedes the scaling-up of larger politics or programs, notes Wafa ESSAHLI. Central governments often struggle to envision the larger effects of their policies on land issues and to take into account local and traditional knowledge concerning land management. If almost all countries have created a national coordination mechanism and adopted a National Action Plan against desertification, the implementation of concrete action is very often still waiting. The lack of international financing is likely taken as an excuse for national inaction, states Marc BIED-CHARRETON, while existing local initiatives do not receive the interest and the support they deserve.

Since the 1960s, a large part of the raising awareness of the problem and of the fighting against desertification has indeed come from local and civil society movements. One of the major achievements of the Convention, according to Patrice BURGER, has been to organize the effective participation of non-State actors to their work. The observer status to the Convention is indeed open to regional, science, UN or civil society organizations alike. The consultation processes embedded in the COPs have effectively contributed to a better understanding and to the introduction of new issues, like land-grabbing, which are of civil society interest. The openness of the process has also gone in pair since the 9th COP with an unprecedented reflection on how to construct a representative and efficient CSOs panel within the Convention, successfully avoiding the common pitfalls of native English-speaking Northerner over-representation.

This contrasts quite dramatically with the meager results achieved by the international community, according to Wafa ESSAHLI, to channel their assistance in a way that supports long-lasting effort in land management and sustainable change in affected areas. At the eve of the 13th COP in Ordos (China), these authors regret the higher influence of the migration and the climate agendas than the land agenda itself to mobilize the Northern Countries to contribute to effective action programs in the field. Nevertheless, they hope that the fact that 15 out of 17 Sustainable Development Goals (SDGs) include land management measures will prove an apt tool for fostering a new global mobilization against desertification as well as shared expertise and larger cooperation between environmental conventions.

The lack of interest for the dynamics of desertification and land depletion themselves has long resulted in a much weaker scientific assessment process than the interfaces that have been developed for climate or biodiversity, regret Pierre-Marie AUBERT, Aleksandar RANKOVIC and Martial BERNOUX. The land expertise is currently disseminated among a set of concurrent fora, sometimes created and responding to the Climate or Biodiversity Conventions. Yet these science-policy interfaces have gradually grown responsive to larger influence and are encouragingly trying to take into account local and traditional knowledge and to develop cooperation and exchange between them, note Mariam AKHTAR-SCHUSTER, Martial BERNOUX, Jean-Luc CHOTTE, Lindsay C. STRINGER, Vanina PIETRAGALLA and Hamid ČUSTOVIC. Questions related to the soil organic matter –relevant for the Biodiversity and the Desertification conventions– constitute « border-questions » which are likely to foster transversal expertise and shared recommendations between fields. Coordinated expertise may thus forecast, as hoped by Louise BAKER and Sandrine JAUFFRET, the much-needed wider cooperation between the Desertification, the Climate and the Biodiversity Conventions. Land Degradation Neutrality (LDN) appears in this context as a good starting point to pursue both Desertification and Climate Agendas and thus to develop concrete and effective cooperation between both conventions. Adeline DERKIMBA and Magali PAUSIN, while endorsing the need for larger cooperation between environmental agendas, warn us about the risk to undermine one at the expense of the other if one does not pay attention to possible misunderstandings. Climate action tends for example to regard preservation and restoration as two exchangeable means to implement LDN while Desertification action will know that preventing degradation is always better than any restoring. 🌿



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PART 2

LAND DEGRADATION, A SUSTAINABLE DEVELOPMENT AND CO-VIABILITY CHALLENGE

Synthesis

The second set of contributions to this volume examines the relationships between land degradation and human life in arid and semi-arid regions with a focus on North Africa and Sahel. All historical records document how human livelihood in the region has been adapted to the ecosystem, long tapping into the natural resources without threatening the overall equilibrium. Accumulated scientific expertise underline how different the situation is today. Global environmental trends, and primarily climate change, are taking their toll, sharpening the traits of an already difficult climate. In this context, the adequacy of human livelihood practices are maybe even more determinant here than everywhere else for the resilience of societies.

The contributions to this volume detail how the anthropic factors explain the acceleration and spreading of the land degradation in the region along

the 20th century: a growing population, with its need for food, land, woods, has induced unsustainable changes in agricultural and livestock practices and fueled environmental depletion. The semi nomadic pastoralism has proved to be especially adapted to arid and semi-arid lands. But the current livestock has grown large enough in some cases to exceed the existent pasture which does not have the time to replenish between herds' runs. In North Africa, notes Aziz HIRCHE and *allii*, the resulting demand for cultivated fodder takes an increasing share of arable land, while in Sahel new natural lands are cleared into exploitation for pastoralism. In all cases, the balance is more and more fragile and dependent on land availability, agricultural inputs and ultimately money. Sharing the same observations, Omar BENSAOUD calls for a deep revision of public policies in order to put at their center the preservation and the rational management of the delicate natural resources of these fragile areas.

Pursuing a sustainable agriculture in arid and semi-arid Africa demands to take into account the expected climatic changes. Mongi SGHAIER warns against the cumulative effects of desertification and climate change on the regional food security. He logically calls upon action in order to adapt agricultural practices and maintain productivity in a sustainable way along six lines: introducing adapted technologies; diversifying home incomes in rural area; supporting local experimentation to find the best adapted agricultural practices to climate change; developing national climate adaptation plans; and enhancing political support to adaptation programs at each level.

The increasing footprint of human population in arid and semi-arid African regions is more and more perceptible according to the contributors. The ever-extending land use associated with human pressure unfortunately speeds up the natural tendency to salinization of soils in arid and semi-arid lands. Jean-Pierre MONTOROI points the strong relevance of agricultural practices that would fight against soil salinization associated with irrigation: use of good-quality water to dissolve salt, and working the soils to insure water infiltration and drainage. He insists on the need to value the knowledge and know-how of local farmers to maintain the quality of soils despite climate change and growing ecological stress. Monitoring the extent of these changes at regional and local levels has not proved to be an easy task. High hopes are today placed in the data derived from satellite imagery with a special interest in the realm of fighting desertification in Three set of data are to be considered : vegetation cover change sizing; land productivity evaluation and definition of the levels of organic carbon in soil. According to Richard ESCAFADAL, thanks to the more than 100 existing orbiting satellites and progresses made in imagery, interesting data are already available for the two first issues,

and the development of the third is held in good prospects. The free access to good data and interpretative technologies in developing countries should foster the use and the relevance of the results. It has already permitted to document and understand the uniqueness of Western African urbanization, and especially the rise of small and middle towns in rural areas.

Environmental challenges are numerous, underline Isabelle DROY and Frédéric ALEXANDRE: competition for land, soil sealing, growing pressures on traditional agricultural activities, etc. But cities may prove also a positive vector for a growing awareness and better adaptation. F. ALEXANDRE quotes the case of the very new city of Touba in Senegal which singles out by its exceptional and voluntary tree cover. Sébastien SUBSOL considers green belts around human cities as privileged space to imagine action aiming both to foster food security and to fight desertification.

Reducing human vulnerability to land degradation must ultimately consider the natural resources as an irreplaceable asset. In arid and semi-arid Africa, populations are indeed still deeply dependent on them for their livelihood, notes Isabelle DROY. Any strategy aiming to reduce poverty, any policy pursuing the achievement of Sustainable Development Goals (SDGs) must thus take the preservation of environment into account as a part of concrete action. Migration, for instance, has long been a practical mean to cope with human vulnerability and reduce poverty in arid and semi-arid Africa that must not be forgotten. Circular, temporary or permanent, the migrations constitute an important rite of passage for young men in the region, but also a source of complementary incomes and of social mobility. Any encompassing strategy to foster people's resilience should examine the growing limitation to human mobility in the region and beyond as a limitation to the pursuit of its very goal, stresses Florence BOYER. The degradation of land and arid ecosystems impacts less evidently but as forcefully on human health, namely on the quality and purity of basic human needs like air and water. Nadège MARTINY and *allii* observe indeed the correlation between the development of meningitis bacteria and the prevalence of eolian erosion during the dry season in the Sahel belt. A result suggesting that preventing land erosion would be of health value. Much in the same vein, Emma ROCHELLE-NEWALL and *allii* underline that only a sound management of natural resources, good agricultural practices and the preservation of the diversity of landscape can insure the good functioning of environmental services decisive for human health like natural water filtering.

The authors emphasize that pursuing the fight against desertification is also pursuing social and health agendas.





Photo credit: IRD - IRA - Christian Lamontagne

PART 3

MEANS TO COMBAT DESERTIFICATION

Synthesis

The last set of contributions to this volume is dedicated to projects, programs and concrete actions to fight against desertification in the Northern and Sahelian Africa. They cover a panel of far ranging subjects – from agriculture to international financing, including pastoralism, agroforestry, alternatives to wood consumption, the building of adapted legal instruments or women empowerment. Three questionings – how to acknowledge and leverage adapted agriculture techniques, how to build adapted technological and social innovation, and what role for political support from local to international levels – may guide us across them.

The best prospects for improving food security, incomes and livelihoods lie with a renewal of practices, taping both on inherited agricultural practices and recent scientific expertise. Considering the narrow margins

for intensification of the family farming model dominating the sudano-sahelian region, Pierre HIERNAUX notes that a renewed version of the native agro-pastoralism combo, offering income diversification and free organic inputs, is still the most adapted form. He nevertheless points out the limits introduced by Western land tenure, urbanization or lack of arable land to maintain traditional and adapted agricultural practices, and calls for all actors to work on this. Much in the same vein, Josiane SEGHERI considers the best means to leverage and intensify the inherited agroforestry practices in the region. She details some Assisted Natural Regeneration (ANR) techniques which permit to increase the coverage of useful trees in family farms in order to contribute to the diversification of incomes and the maintaining of soil fertility. Robin DUPONNOIS and Yves PRIN document new research and experimentation on the use of telluric micro-organisms to improve soil fertility. The introduction of *mycorrhizal fungi* especially proves to be a lasting source of soil fertility development in arid lands, even compatible with demanding crops like wheat. The authors envision thus new development, combining the selection of crops with their compatibility with *mycorrhizal fungi* enriched soil.

Social and technological innovations presented in all contributions are meant to enhance the livelihood of the most fragile populations. The empowerment and the better resilience of the most deprived reinforce the resilience of the society as a whole. Diversification of incomes, cohesion of the community, social adhesion, common understanding of issues, future planning, etc. – Lilia BENZID and Roukiattou OUEDRAOGO explain how land restoration projects and women empowerment benefit from each other. The impressive results achieved by the project “Acacia for all” in rural Tunisia, told by Sarah TOUMI, are speaking for themselves: 270 farmers involved, mainly women; 50,000 trees planted; 42 women-lead sustainable enterprises created since 2012; one million trees to be planted before 2018. Local capacity is decisive to make sure that land restoration projects are fully embedded in one community and well-driven, demanding local authorities capable both to discuss with administrations and financing agencies and to initiate local adhesion and participation to project. The “Form’action” program, which bring together NGOs and local authorities from five Sahelian countries, has taken up the challenge of learning-by-doing to transform one idea in concrete and operational project, praise Adeline DERKIMBA and *alii*. Conserving natural resources is often made concrete and possible by changing everyday technology for the many. Access to efficient or solar stove spars firewood and preserves tree cover; alternate building methods –like the Nubian vault, an earth roof technique– offer affordable and climate-adapted housing, saving on construction wood and roof plate, share Agnès RIZZO and Cécilia

RINAUDO. Since adapted technologies are the very mark of Sudano-Sahelian societies, Habiba KHIARI and Abina AbdoulKarim BELLO advocate participatory action research leveraging local knowledge, know-how and experimentations. Too little of them are listed, tested and validated when their results should be broadcasted and replicated. Olivier BARRIERE suggests finally to use the law as a technology to conceive land preservation action. Negotiated rights practices can be used to bring all the actors together and to set rules adapted to local culture and concrete problems. Not only it may offer practical alternative to conflicts, but it may also trigger a much needed discussion about a desirable common future, he argues.

Land preservation and fight against desertification have acquired deeper comprehension at the regional and international levels. New issues and action modes are more largely acknowledged. Considering legal and political pitfalls currently undermining traditional pastoralist practices, Alexandre ICKOWICZ and *alii* underline the limitations of local or even national levels to bring effective answers. Securing cattle’s runs against impediments –from other uses of land, to political unrest or borders control– demands a much larger take on the issue. The 2013 Declaration on the Contribution of Pastoral Livestock to the Security and Development of the Saharo-Sahelian Areas adopted in N’Djamena, Chad, offers the first regional framework to work on the issue. A step in the right direction, notes Bernard BONNET, since the framework permits a more comprehensive take on the regional pastoralist economy as a whole, i.e. addressing the challenges of pastoralism in arid land as well as the hardships of transformation or getting access to regional markets. New type of projects aiming to answer the special needs of cattle and herders are already financed by international cooperation. Considering the emerging initiatives in favor of African agriculture –from the NEPAD’s Comprehensive Africa Agriculture Development Program (CAADP) to the Great Green Wall for the Sahara and the Sahel Initiative, and the Sustainable Development Goals and Climate agendas, Rémi HEMERYCK describes a political momentum favorable to a comprehensive view of desertification issue. He pleads for a mobilization merging the climate adaptation and food security imperatives and capable of offering a desirable future for the arid and semi-arid regions. Jean-Marc SINNASSAMY note that the Global Environment Fund (GEF) has largely developed its programs to answer the financing needs of land preservation and restoration.

The coming international agenda and the current resonance between the different environmental agendas should support this trend in the long term. 🌻



Photo credit: IRD - IRA - Christian Lamontagne

CONCLUSION

ACTION TO COMBAT DESERTIFICATION FOR COVIABLE SYSTEMS AT ALL TEMPORAL AND SPATIAL SCALES

Synthesis

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■ Introduction

Despite the diversity and the intensity of the efforts made in combating desertification, that human imagination and the innovations are capable of creating both individually or collectively (cf. Part 3), the problem of land degradation in dry areas in Africa has not been resolved, and the environmental and societal challenges that it represents at local, regional and global levels remain major. (cf. Part 1). Although, in some areas, combat action is starting to show positive results, which can sometimes be seen in the landscapes and be felt by the populations that benefit from it, degradation's onslaught continues and is even intensifying. Its consequences



Photo credit: IRD – Bernard Moizo

Reforestation of the argan tree is meant to train the people to this culture and to the production of argan oil. The area boasts Biosphere Reserve status granted by UNESCO in order to protect the argan tree, threatened by desertification here in the surroundings of Argana, northeast of Agadir in the Souss region.

in terms of food security, climate, health, law and social equity are worrying. This concern is all the more poignant as the progressive increase in understanding allows us to consider the cause and effect relationship at different levels, to measure the complexity, the extent and the intensity of the problem in its societal and environmental dimensions, its spatial diversity and sometimes its acceleration over time (cf. Part 2). This gradual coming to light of the causes, mechanisms and consequences of desertification now also allows us to think about new remedial and regulatory mechanisms that directly concern land degradation and soil.

Best Practice in Action to Combat Desertification

Experience in various parts of the world has shown that the *broad-brush* projects to combat desertification, both small and large-scale, are destined to failure in the short, medium or long term if they do not integrate a comprehension and evaluation of the situation in the territory concerned and its agricultural, social and ecological dimensions. This assessment prior to action should allow us to determine the type of degradation anywhere (*what resources and processes are being deployed?*), the extent (*Is it still possible to stop, limit or restore?*), its temporal dynamics (*what is its position on the diagram, how long has it been going on, how fast is it happening?*), its spatial diversity (*What is the spatial distribution of the degradation? At what sites is the degradation most severe? What is the size of the area is affected?*), the respective share of “land-climate-society” in causing the degradation,

the multifunctional nature of the site (*how can resources be multi-purpose?*), the diversity of the stakeholders concerned (*that degrade, that manage, that combat and how are they represented? What are their values/attachments to the sites?*) and the types and intensity of consequences both locally and at multiple levels. This is the only way for action to happen at the right place and at the right time so that it slows down, interrupts or reverses the ongoing land degradation and encourages the people who are affected and involved in the long term.

Science Fronts

To better connect science to decisions and action, it is necessary to invent, consolidate and generalize approaches to models (models symbolic of knowledge representation, digital simulation models, data infrastructure, etc.) and tools that can accelerate the time taken to carry out a diagnostic before action to combat desertification, without reducing the quality of the diagnostic. It is also necessary to connect humans to machines better and facilitate repeating groups between formalizing enriched knowledge and adapting models and tools. Human, technical and financial resources need to be organized and coordinated in this way to understand, simulate and monitor the evolution (cf. co-evolution, differentiation, spatial, temporal and multi-level patterns, etc.) of the causes, mechanisms and consequences of the degradation according to different viewpoints and different levels of decision-making and action, to pinpoint the synergies that allow degradation at a site and offer alternatives. 🌱

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Its mission is to contribute to:

- Training and capacity-building in sustainable development of various categories of development players in French-speaking countries, especially in the energy and environment sectors;
- The promotion of the sustainable development approach in French-speaking countries.

The action of the IFDD falls within mission D “Sustainable development, economy and solidarity” and Strategic Objective 7 “Contributing to the development and implementation of the post-2015 development agenda and the Sustainable Development Goals”, of the Francophonie’s strategic framework.

Since 1992, with the “International Negotiations on Environment and Sustainable Development” program, IFDD supports francophone countries in the implementation of their commitments related to Rio conventions on climate change, biodiversity and desertification combating. The program support is done through capacity building activities, training, advocacy, information and tools provision for francophone development actors.

www.ifdd.francophonie.org

About the Sahara and Sahel Observatory (OSS)

Established in 1992, the Sahara and Sahel Observatory (OSS) is an international organisation with an African vocation based in Tunis, Tunisia. OSS initiates and facilitates partnerships around common challenges related to shared water resources management and implementation of international agreements on the environment in the Sahara and Sahel region.

The complex interactions between the plagues of desertification, the erosion of biodiversity and climate change and their impact on populations and development have been integrated into the OSS scientific and technical programs. These programs were elaborated in close collaboration with the concerned countries and the various stakeholders, in particular at the sub-regional level. The action of the OSS shall be governed by the principles of subsidiarity and complementarity with efforts undertaken at the level closest to the beneficiaries’ communities and territories. OSS scientific programs support member countries and organizations in the production, management, sharing and dissemination of useful information.

OSS programmes and projects are financed by voluntary contributions, grants and donations from its members and partners. OSS members include 23 African countries, 6 non-African countries, 3 Sub-regional organisations operating in Africa. OSS is a flexible structure with multi-cultural and multi-disciplinary team providing high value added contribution to a sustainable management of natural resources. For more information please consult: <http://www.oss-online.org/>





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