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Land degradation and climate change: sights set on a transition to agroecology

Could land help resolve the climate equation? Long confined to the margins of the climate negotiations, land has only ever been loosely associated with the strategies to combat climate change. Agriculture as a sector emits large amounts of greenhouse gases (GHG) but is highly complex and strategic, technically difficult to monitor and politically sensitive. Until very recently it has been kept out of the negotiations. In the past few years, the potential role for lands and soils[1] in combatting climate change has nonetheless become the object of a new attention. Today, agricultural policies are facing the combined challenge of food production and the preservation of ecosystem functions, while world population and demand for food are increasing. Climate negotiations can no longer ignore the phenomenon of land degradation that affects almost 12 million hectares every year (UNCCD, 2012), while 52% of farmlands are already degraded. Integrating lands into the climate strategy will be a long process, including complex issues to which the COP21 is unlikely to be able to resolve.

1. The fight against land degradation at the heart of the climate issues

In the past, strategies to combat climate change have centred on two complementary approaches, mitigation and adaptation. Mitigation aims at reducing world emissions of GHG and to increase the potential for carbon capture (Locatelli, 2011). Adaptation focuses on adjustments to human and natural systems to cope with current or future climate effects so as to limit negative impacts and to derive benefits. While mitigation aims at tackling the causes of climate change, adaptation focuses on impacts at the local level.

Because these two approaches do not share the same aims and are not applied at the same scale, there has been a tendency for climate policies to consider and implement them separately. However, activities that concentrate on either one of these targets – mitigation or adaptation – can directly impact upon the results of the other target. Adaptation projects for example can lead to practices being adopted that emit more GHG, resulting in what some refer to as maladaptation (Barnett and O'Neill, 2010). On the other hand, adaptation may also bolster mitigation when it permits a better carbon sequestration. Although the synergies between adaptation and mitigation have not yet been entirely quantified or taken into account, possibilities for mutual reinforcement between the two objectives do exist. One recent study has shown that with an investment of 225 billion USD into agricultural adaptation activities, all the negative impacts related to temperature and rainfall variations could be mitigated by 2050 (Lobell et al., 2013). However, this raises the question of which practices to promote for adaptation and more generally, which political initiatives to promote progress towards both mitigation and adaptation at the same time. Given the current situation, it is imperative to keep hold of both ends of the chain and act on both components.

[1] The « land sector » is considered to consist of soils, but also what they hold within them and support above and below the ground level on which we walk. Concerning the climate change negotiations, this covers farming, soil use in the broad sense, and forests.

Combatting land degradation offers such a synergy between the two climate goals. By promoting the preservation or the restoration of soil ecosystem functions, the fight against land degradation directly contributes to food security, but also to mitigation through carbon sequestration in soils. For the past fifteen years, the United Nations Convention to Combat Desertification (UNCCD), which has a mandate to combat soil degradation in arid, semi-arid and sub-humid dry regions, has advocated for the adoption of sustainable land management measures. However, the issue of degradation, its magnitude and its impact on other sectors, remains, paradoxically, inadequately taken into account. To meet these challenges, the UNCCD has put forward the initiative of a neutral world in terms of land degradation.

2. The initiative of Land Degradation Neutrality (LDN): a tool for synergy

Land degradation neutrality appeared for the first time in a proposition submitted during the Rio+20 conference, in the form of a « zero net land degradation » (ZNLD). This objective would be attained by (a) managing land more sustainably, which would reduce the rate of degradation; and (b) increasing the rate of restoration of degraded lands so that these trends converge to obtain a zero net degradation of lands. The target figure for ZNLD is at the intersection between the three Rio conventions and must enable: (1) the prevention of the degradation of productive land; (2) the halt to biodiversity loss; (3) the combat against climate change. Taken up in the Sustainable Development Goals (SDG), under objective 15 and its target 15.3, the initiative has led to the definition of the concept of Land Degradation Neutrality (LDN), which was adopted at the COP12 in Ankara. The role of the UNCCD in implementing LDN was also specified, which raised the question of the extension of its mandate. The long term goal is to obtain an agreement among the countries that are party to the UNCCD during the COP13, at which each country could commit itself to voluntary national targets in terms of LDN.

The extent of land degradation is still controversial and the factors leading to it, on a global scale, are the result of complex interrelations that are difficult to quantify. However, there is a strong convergence between the need to prevent degradation and that to restore lands that are already degraded. Indeed, land degradation directly contributes to climate change through the liberation of buried carbon and the reduction of the potential to sequester carbon by degraded land. Modifications in land use and degradation represent a significant part – about 20% – of the global GHG emissions. Land is also particularly vulnerable to climate change. Most African countries, from North Africa to sub-Saharan Africa, are concerned by land degradation, with 2/3 arable land loss estimated from now to 2025 (CSFD, 2008). Arid and semi-arid regions are particularly affected by climate change (degradation of vegetation cover, soil erosion, biodiversity habitat destruction, reduction of infiltration capacity and water storage, etc.). In general, sustainable land management (SLM) constitutes the main strategy against the phenomenon of degradation. TerrAfrica (2005) gives the following definition for sustainable land management *'the adoption of systems of soil use that, through appropriate management practices, allow users to maximise the benefits procured from the land, while preserving or strengthening their ecological functions'*. In practice, this supposes that carbon capture and storage is improved, along with water retention, the quality of soil cover, protection against wind and water erosion, and to valorise the complementarities between arable and livestock farming, etc.

Land Degradation Neutrality constitutes an opportunity as well as an important way to promote sustainable land management and to combat land degradation. LDN gives substance to the convergence between the Rio conventions, while these convergences are still too often the subject of lyrical speeches with little practical consequence. When degraded lands lose their productive capacity, they lose their ability to fix carbon in the soil at the same time. Land restoration and the combat against degradation both work towards the goal of mitigation. For example, activities of ecological restoration have been integrated into the National Appropriate Mitigation Actions (NAMA), and several developing countries would like the agricultural mitigation activities to be taking into account so that they can complete their voluntary contributions (Campbell et al., 2014). If the LDN initiative

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appears to go along with these synergies, it also raises a number of questions before arriving at a coherent and operational concept:

- To attain the goal of land degradation neutrality signifies having a rate of restoration that is at least equal to the magnitude of the world rate of degradation. This aim follows a legitimate finality to ensure that land use is sustainable. However, this type of accounting carries the risk of creating a right to degrade, in the sense that deterioration in one location could be compensated by the rehabilitation of an equivalent area elsewhere, which should legitimize degradation;

- The correspondence between degradation and restoration rests on the assumption that the value of land is enforceable, measurable, but also, always comparable. However, it is doubtful whether degraded land at a point X1 can be substituted, or equalled by the restoration of another at a point X2. The implementation of LDN could reduce the value of lands to their sole productive or use value. Thus, under the cover of an 'equivalent quality' slogan, things that are not equivalent could be compared or be considered equal. Elements that define the balance between degradation and restoration are not equivalent either. All degradation brings with it irreversible loss of natural capital, which cannot be offset by restoration. LDN activities should respect the ''Avoid, Reduce, Offset'' sequence in the same way that it is applied in biodiversity offsets programmes;

- While degradation is taken as being a persistent reduction of biological and economic productivity, as implied in the MEA[2] report (MEA, 2005), there is no internationally recognised method to reliably measure and assess the levels of degradation/restoration. The available data on land degradation today is still insufficient at a quantitative level. This being so, how can land be interpreted as being effectively 'restored'? How should we estimate the restoration of ecosystem functions and services? Who defines the assessment criteria for the contribution of these services to individual well-being and more broadly, to the general interest? Methods of assessment of land degradation must be improved in order to respond to these uncertainties;

- Land restoration is desirable today, but the use to which the land will be put after restoration must also be defined. The choice of options for SLM and restoration is a complex question. In order to be effective and acceptable, land management practices must take into account the local context, but also correspond to the development trajectories accepted by the populations, and for whom a free prior and informed consent is held. This being so, should it be to restore large tracts of lands on a large scale, or to foster family and small peasant production systems, or both, and if so, in what proportions?

Large-scale adoption of SLM is required for attaining the goal of LDN. But we need to reintroduce the question of equity and ask ourselves to whom land restoration should benefit. This question must also be in the mind of the different players involved in land management. For the States (i) which must include this new objective into their National Action Plans. For the donors (ii) who must position themselves in relation to this objective. For the private sector (iii) which could participate in funding commercial restoration projects. Since LDN ought to be considered as a veritable tool for sustainable development, what can be done to ensure that its implementation contributes effectively to the three pillars of sustainable development? Does it mean that LDN operations should be integrated in the present NAPs for combatting desertification? What will be the territorial coherence of national versions of the LDN?

[2] Millennium ecosytem assessment

Considering the present definition of LDN, we believe that it is indispensable to throw some light on its pathway. The aim of neutrality in land degradation must benefit first and foremost the most vulnerable populations and those who are exposed to the effects of climate change. These populations, already confronted with these changes, are themselves coming up with appropriate solutions (Dufumier, 2010). LDN must be directed towards development and to supporting these craftsmen, family farmers on the scale of the most vulnerable territories. The mitigation target that shines through LDN should in no way obscure the absolute necessity and urgency to adapt agricultural production models. The aims of LDN and its promotion should not simply rest on carbon and its storage in agricultural soils, but provide solutions for family farming. One strong response to strengthen the sustainability and resilience of family farms is provided by agroecology, and should thus be promoted as an option to implement LDN.

3. Agroecology in arid regions: an option to implement LDN that benefits territories

If the initiative of LDN should be received positively, then it appears equally necessary to contribute to the definition and selection of the forms of implementation. These must not sweep the table free of ongoing national policy initiatives and previous achievements. In order to be efficient, methods of land management should mobilise the responsibility of the States, in forms that respect life choices and people livelihoods. Coming forward as a central proposition force, civil society considers agroecology and support for family farming in general as a stand-alone solution (Coordination Sud, 2015).

Funds dedicated to combat land degradation should contribute towards reinforcing adaption capacities of those who are the most concerned, the most experienced, but also the most disadvantaged, even those affected by pauperisation. Family farming includes under 1.5 billion small farmers on less than 20% of the world's arable land, but who contribute more than 50% of the global agricultural output for domestic consumption (Altieri and Nicholls, 2013). In these territories, climate change is primarily an agricultural issue, as confirmed in the IPCC report (2014). In this way LDN can contribute to adaptation, on condition that models of land management promoted along with land restoration contribute to making socioecological systems more resilient. The uncertainty bound into climate models, precipitation, the multiplication of extreme weather events and the emergence of new diseases requires a form of farming that is resilient and production models that allow a certain amount of adaptability. Agroecology, which is based on ecosystem functions and services, can help to provide guarantees against the risks posed by climate uncertainties, thus improving the farming systems' resilience.

Agroecological practices enable the environmental impacts to be reduced. For example, external inputs are replaced by ecosystem services (Morez, 1998). Such practices are based on an understanding of the complex interactions between soils, plants, crops, animals and humans. The agroecological approach is primarily concerned with the conservation of processes and biological diversity, which, in particular, consists of increasing the amount of carbon in agricultural soils. Many agroecological strategies exist, such as mixed crop and livestock farming or agroforestry, founded on the complementarities between trees and crops. The practice of assisted natural regeneration is one positive approach used in the Sahel. Agroforestry systems present an important potential for increasing carbon stocks in soils, but also for reducing erosion and land degradation (Mbow et al., 2014). These techniques have proved their worth as effective options to respond to the challenge of food security, but also for the preservation of ecological functions. Through the function of carbon fixation in soils and GHG emissions reduction (Tscharntke et al., 2005), agroecology plays a role in mitigation. There is a large consensus among the scientific community about the mitigation potential of family and peasant farming, based on the valorisation of soil organic matter. Increasing the carbon stock on farms is considered by the IPCC as an option, despite limitations that still exist, for example concerning the reversibility of soil organic carbon stocks, which requires permanent practices to be maintained.

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By promoting the resilience of socioecological systems, agroecology also directly contributes to adaptation. Faced with climate events, agroecology uses various practices (management of organic matter, water conservation in situ and in the soil, erosion control, adapted biodiversity conservation, etc.) to enable production systems to become more resistant to environmental conditions, while at the same time making soil both healthy and balanced. In many cases, these techniques, adapted to the local context, have the potential to increase yields with diversified production systems that are robust to climate hazards (De Schutter, 2010). Agroecology promotes food self-reliance of family farmers, but also applies to agricultural systems that are labour intensive, managed by populations rooted in their territory and who require decent and stable remuneration for their work. To resume, agroecology responds effectively to the dual challenge of development and climate change. It responds to the need to both adapt and mitigate and constitutes the most reasonable pathway to capture the climate potential of LDN and the combat against land degradation in general.

4. Beyond COP21: recommendations to support a transition towards agroecology

Lands and soils interact with the climate in more than one way, although this is not widely discussed. The combat against land degradation would strengthen the capacities of adaptation while at the same time mitigating the emissions that contribute to climate change. These joint benefits depend, however, on the type of use recommended in order to better manage lands. Restoring lands while reproducing production models that have led to this situation is not advisable. Agroecology as an option is up to the environmental and social challenges of today and tomorrow.

While it is doubtful that we can attain everything at COP21, it is essential to (re)consider the role of land and degradation in climate change. The three recommendations that follow are intended to clarify this orientation:

- **Implement LDN in a coherent way at a territorial level:** activities to restore land and reduce degradation must be coherent with local and national development plans. These actions must be supported by policies and appropriate public spending. The National Action Plans to combat desertification could be associated with the roll-out of certain plans for adaptation (NAPA) or mitigation (NAMA), which would make activities to combat desertification more coherent. Given the relationships between climate change and land degradation, the implementation of LDN ought to be integrated into rural development policies, to promote sustainable land use practices with priority given to agroecology;

- **Finance mitigation through adaptation by combatting land degradation:** many countries consider that financing mitigation will have a positive knock on effect on adaptation, in particular by means of the carbon market. An OECD report (2015) ordered by the COP21 presidency shows that adaptation only accounts for 12% of climate change funding. However, adaptation should be the priority for agriculture and climate change policies because farming[3] plays a critical role for a significant proportion of the world's population, especially in developing countries. Criteria for development aid should therefore favour adaptation actions that support food systems integrating agroecological knowledge and practices and that contribute positively to global mitigation efforts. In this context, combatting degradation and the restoration of lands are in a promising position;

- **Redirect aid to support the development of agroecological practices:** agroecology can only be upscaled if donors support the transition. Some practices based on agroecology are better suited to carbon sequestration in soils as well as for reinforcing individual and

[3] The World Bank estimates that investment in the agricultural sector is four times more effective at combating poverty than investment in any other sector (World Bank, 2008).

collective resilience. Financial support should be directed to disseminating these practices, including projects for capacity building and sharing agroecological knowledge (Van Walsum et al., 2014).

It must be recognised that agroecology offers solutions to effectively and equitably meet the challenges of climate change (GTD, 2013). With agroecology, the objectives of mitigation and adaptation are reconciled. This transition requires courageous decisions. Implementing LDN to the primary benefit of family farmers implies high costs for measuring and monitoring land degradation or soil carbon content. Considerable investment will also need to be made to restore lands if we are to reach a high level of restoration over a significant area. However, these efforts will be amply rewarded by the benefits from agroecology and the valorisation of family farming in terms of production and adaptation potential (GTD, 2015).

Agroecology models have proved themselves to be viable on a large scale and no longer need to be questioned. The need now is to redirect our financing efforts to promoting this knowledge. This is a reminder that it is not just a question of adaptation, attenuation or both and at any cost, but of giving ourselves the means to maintain the capacity for a collective response. The transition to agroecology, combining environmental protection and food security, stands out as the most inclusive answer. It is also not only the most rational but already the most reasonable answer in the face of climate disturbances. These two factors being key for international security, they may contribute to the development of a more sustainable world.

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Acronyms

COP: Conference of the Parties
GHG: Greenhouse Gas
IPCC: Intergovernmental Panel on Climate Change
LDN: Land Degradation Neutrality
MEA: Millennium Ecosystems Assessment
NAMA: Nationally Appropriate Mitigation Action
NAP: National Action Plan
NAPA: National Adaptation Programmes of Action
OECD: Organisation for Economic Co-operation and Development
SDG: Sustainable Development Goals
SLM: Sustainable Land Management
UNCCD: United Nations Convention to Combat Desertification
ZNLD: Zero Net Land Degradation

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