

Adaptation Initiative Reading Seminar #1  
Re-Greening of the Sahel  
Thursday, October 26, 2017  
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**Summary of papers**

**Herrmann, Anyamba and Tucker, 2005, Recent trends in vegetation dynamics in the African Sahel and their relationship to climate, *Global Environmental Change***

The droughts in the Sahelian region in the late 1960s through the 1980s were unprecedented in their length and impact. Since the 1980s, there has been an increase in greenness over large areas of the Sahel, though not uniformly. This paper looks at the pattern of and relationship between vegetation greenness and rainfall variability in the African Sahel. This study uses the Normalized Difference Vegetation Index (NDVI) as a proxy for vegetation greenness and gridded satellite precipitation estimates as a proxy for rainfall, and looks at data between 1982 and 2003.

The overall trend in monthly maximum NDVI is positive over a large portion of the Sahel region in the time period, and is accompanied by widespread increases in rainfall. The results confirm that vegetation greenness in semi-arid environments is more strongly related to rainfall over a period of time, than to instantaneous rainfall. However, there are also areas in which the vegetation has been greening up more than expected by rainfall alone – ‘positive hot spots’ – as well as areas that show negative trends, where greening has fallen behind what would be expected from the increase in rainfall.

Overall, positive trends in NDVI indicate a net increase in biomass production between 1983-2003, challenging the notion of irreversible desertification in the Sahel. While rainfall is the dominant reason for the increase in vegetation greenness, the authors state there is evidence of another, human-caused change, though field studies are required in order to show causes at the local level. Human-induced factors include changes in land use, exploitation of natural resources, production strategies and conservation efforts.

**Reij, Tappan and Belemvire, 2005, Changing land management practices and vegetation on the Central Plateau of Burkina Faso (1968-2002), *Journal of Arid Environments***

Farmers, governments and NGOs started to experiment with improving soil and water conservation (SWC) techniques in the early 1980s in the northern part of the central plateau of Burkina Faso, following a series of drought years. Between 1968-2002, the total investment in SWC techniques has been about 200 million USD. While some say that the environment continues to degrade, others note significant improvements in yields.

This study looked at the impact of SWC investments in nine villages between 1968 and 2002 and identified a number of impacts, including: increased yields in millet and sorghum which means improved household food security; greater availability of forage for livestock; more cash available to invest in livestock; rising ground water tables; population growth; and decrease in rural poverty. Areas not treated with SWC techniques continue to degrade. In sum, the technological change in SWC in the early 1980s helped trigger a process of agricultural intensification.

## **DISCUSSION**

### **Context for the papers**

While climate scientists were debating causes of drought, things were actually happening on the ground. The Reij paper looks at local action, how people reacted to narratives that linked drought and desertification to local human activity, and aspects of local knowledge to remedy land degradation that were improved upon and used. The Herrmann paper looks at the issue from a more regional perspective. Now that we know that drought was not caused by local human activity, rather by changes in the climate system at scales much larger than the Sahel, can the Reij paper be re-read to provide a way forward for adaptation to climate change in the end? Interventions to combat land degradation make better and more efficient use of rainfall, so these could be ways to respond to greater variability in precipitation. Climate affects land cover, and there is feedback.

Scientists hypothesized that the Sahelian droughts of the 70s and 80s were caused by mismanagement of land resources (cutting trees, etc. that persisted drought and reduced precipitation). The correct explanation is that the droughts were caused by large-scale changes in sea surface temperatures. But to what extent can we attribute these effects to global climate changes, specifically to anthropogenic emissions [of greenhouse gases and aerosols]?

The core issue that these papers bring up: What can we do to adapt? How big of a role can human interventions play in something that has such big drivers in decadal variability? What can we say to continue to captivate people to adapt? How are responses taken up in some places and not in others? Where do they work, where could they work? And what should people adapt to – mean changes in precipitation, or changes in the sub-seasonal distribution of rains, including dry spells and drought?

It took a long time to recover from the droughts, so when all of a sudden we see something different – greening – it is difficult to know what to attribute this to. The global system, or the local adaptation measures? Maybe it's a combination of both, but it is not easy to disentangle. You would want intelligent greening anyway (for both mitigation, adaptation, co-benefits, cooling, etc.).

### **Adaptation**

Mitigation is global but adaptation is local. We need to consider what humans do in different places. There are many examples in history where things happen, humans adapt, and sometimes it is successful and sometimes not.

There is also a scale issue. Climate projections are happening at the regional or global scale, while adaptation is at the local scale, rooted in immediate experiences. One example – most projections for the southwest US talk about enduring drought, and communities are worried about water scarcity. Then there were floods and we were completely unprepared, and had not even considered from a planning/policy perspective that the opposite may happen.

Adaptation is really up to local municipalities. Sometimes there is not local capacity because there's no legacy planning. Cities are cash strapped and don't have money for everything. In polls, people care more about things like education and health than climate change.

Climate can't be forgotten. For example, there has been a lot of investment in REDD and within less than 10 years, Brazil has seen a huge drought and related fires, which released almost all of the carbon that was claimed to have been stored through REDD. If at the same time, they were also preparing for widespread fires, those impacts would have been mitigated and they would have not lost all the gains through the program. Climate needs to be part of the thinking, but it is only one piece of the puzzle. Adaptation is a multi-disciplinary problem.

There is also a question of how the communities themselves play a role in adaptation, or how they understand. It is an overwhelming concept for the general public. We don't necessarily make it easy for them, nor are the communities included in planning and conversation. Climate services is one piece that tries to address this.

### **Using Science for Policy**

What is the role of climate science? We have to understand the nature of the variability and trends in different locations, and also have some sense of attribution. The cause determines what we can do. These two papers bring this issue to the forefront. There is so much variability; at the local scale, this variability doesn't always mean something for adaptation in practice. There is then a question of how to reconcile local experiences and narratives with large scale trends. There are nuances in policy and law, and you don't always have all the expertise that you need around the table.

By studying the climate, we can improve on our resilience. But the information delivered to non-scientists should be slightly different. Policy makers often want to know what exactly is the technical adaptation. But there is enough uncertainty that we cannot prescribe something specific, though we keep telling people that we will someday know. Climate has become taboo in government.

Policy prescriptions are largely not changed by the nuances of the natural sciences predictions. Sometimes it is too overwhelming for policy makers to be given so much data, and being asked to respond to this much data. Slight changes might or might not improve policy outcomes.

But there are also two different policy streams: reactive policy and resiliency planning. More dynamic and nimble policies and frameworks that can allow people to better prepare, and can build resilience to the point that makes sense. There is also a question of who uses the science, and how it gets institutionally into the system, trickled to the local level responses.

In Syria, there was a 3 year drought which created a shift in population, and the government didn't do the right thing. Perhaps they didn't know if it was something that would pass. We have to understand WHY a problem is caused. This is a case where climate projections would have been very useful.

Then we have structural policy – things like early warning and early action systems, that are based on vulnerable populations. These types of structural approaches to providing more security in a climate insecure future don't necessarily need narrow projections. Donors are willing to give money for climate related actions and projects. How do you convince them that early warning systems are actually adaptation to climate change?

### **Migration**

We don't recognize some of the adaptation strategies that people have, including migration. There is a signal between drought and out-migration. Was out migration an issue in the 70s and 80s in this region? And are people going back?

In the case of Senegal, there was lots of out migration to Europe in the 70s and 80s. People in the northern Sahelian region of Senegal are less vulnerable to climate; they rely heavily on remittances. There is a culture of migration (pastoralists) and they already faced it. In the wetter southeast of Senegal, there was no intervention because they didn't reach points of famine and migration. Adaptive capacity indicators are very low there (no roads, health centers, low education levels, etc.). Tend to not out-migrate because they are not used to it, so vulnerability to climate is much higher.

Are climate change migrants treated differently from other migrants, and can we meaningfully separate them? Climate refugees vs economic refugees – they are all intertwined and is difficult to say with accuracy that someone is a climate refugee versus a political refugee, for example.