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Undergraduate



Overlooked? The Growing Threat of Desertification

Julian Zhu

For many, the story of a threatened environment and our roles as caretakers of a fragile Earth has become a mainstay of modern liberal rhetoric, perhaps to the point of weariness. Whereas many citizens have become more and more knowledgeable of environmental issues such as air pollution, climate change, and overfishing, other significant environmental problems – especially those that disproportionately affect developing countries – are overlooked, regardless of their urgency. Desertification, defined broadly as the transformation of productive land to infertile desert (primarily in arid and semi-arid regions), is one such problem, and one which threatens to undermine the long-term economic stability of many developing countries.

At first, the issue of desertification seems simple enough. As land becomes overworked – through intensive agriculture, overgrazing, or poor resource management – its ability to sustain plant life deteriorates, leading to the transformation of arable land to desert. That said, however, framing desertification as purely the result of human error doesn't capture the whole picture. While human action does indeed contribute heavily to desert spread, the economic forces that govern these actions, as well as environmental factors beyond human control, play significant roles in desertification, and only through an understanding of both the economic and environmental issues of desertification can meaningful efforts be made to halt its spread.

On a geophysical level, desertification is primarily the product of soil degradation and conflicts over land usage. Aeolian desertification, or desertification caused when windborne sand settles in previously arable regions, is a serious problem in semi-arid regions such as the Zoige plateau China, where desertified lands have expanded at a compounded annual rate of 4.07% from 1975 to 2005 (Dong 2010). For many people in the region, agriculture and livestock husbandry are the primary

modes of subsistence. As livestock herders raise increasingly larger herds, areas which cannot sustain the amount of grazing needed to raise such large groups of animals begin the transformation (Dong 2010). Healthy root systems play a key role in increasing soil's water-holding capacity and in holding soil down against high winds. As such, overgrazing directly threatens the natural resilience of soil against desert spread because it disturbs these root systems. In a similar fashion, marsh draining to make space for new agriculture and grazing land on the Zoige Plateau decreases the land's ability to

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sustain life in the long-term, because doing so kills the area's native plant life and disrupts the balance of the soil, which in turn leads to soil degradation and loss of long-term fertility.

Elsewhere, similar land use issues threaten a different environment. Karst is a type of land characterized by significant subterranean drainage and low levels of surface water (Chen et al., 2009). Karst land covers 15% of the world's land area and houses 1 billion people. Karst areas are highly delicate and have only a small band of agriculturally-usable soil between the surface and bedrock, making these regions extremely susceptible to rock desertification. As in the Zoige Plateau, intensive agriculture or overgrazing can leave soil vulnerable to dispersal by wind, leaving only non-arable rock. In karst

regions, natural weathering of carbonate rock to arable soil takes anywhere from two to eight thousand years of weathering. Thus, degradation could destroy the ability of said land to be agriculturally productive for thousands of years (Chen et al., 2009).

Despite the destructive effects of desertification, land/resource management by both government bodies and farmers in both karst areas and the Zoige plateau falls short. Rather than invest resources in maintaining the ecological health of the rangelands, most herders simply move to greener pastures, due to the sheer vastness of the Zoige Plateau. Sustainable grazing requires significantly reduced livestock herd sizes on the part of herders or far stricter regulation of rangeland usage on the part of government, neither of which are economically favorable in the short term.

Similar land use trends appear around the world, and often in developing regions. Today, desertification plagues the Algerian High Plateaus, northern Africa's most widespread rangeland and key grazing region. Once a highly forested region, demands for grazing land prompted heavy deforestation of the region in the name of economic growth. Both deforestation and the subsequent overgrazing severely damaged the soil quality of the region, leading to desertification of many parts of the once-fertile plateau through topsoil loss and sand accumulation (Hirche et al., 2011). As such, the problem of desertification in both the Zoige Plateau and other regions is produced by both environmental and economic forces: though overgrazing might be the direct cause of degradation, economic systems favor maximizing short-term food production, even at the expense of long-term economic and environmental sustainability.

Though many of today's environmental issues are influenced by economic as well as environmental factors, desertification differs from other failures of resource management in one significant way. Consider overfishing in the USA, where lack of regulation in catch size/method decimated fish stocks. Without strict catch limitations, industrial fishing companies treated fish stocks as limitless, eliminating far more fish from stocks than wild populations were able to sustain. Desertification, while also an issue of poor resource management, is a problem whose main effectors are not neces-

sarily industrial giants but impoverished subsistence farmers and herdsman. As with overfishing, poor resource management is a central element, but whereas one could make the argument that overfishing stems primarily from the drive for excess profit, desertification – as caused by farmers and herdsman in regions of the world such as sub-Saharan Africa and southwest China – is fundamentally a problem of survival. In areas where desertification is prevalent, poor people become

“...crop rotation helps to maintain land's ability to produce food for many years and avoid the nutrient depletion that turns arable land infertile”

trapped within a vicious cycle: farmers often need to work their land as hard as possible simply to provide for their families, but such intensive use destroys land fertility and destroys the ability of farmers to maintain themselves financially in the long term (Requier-Desjardens, Adhikari, & Sperlich, 2010). As such, any efforts to combat desertification need to address not only the physical processes that produce desertification, but also the economic factors that propagate increased land degradation.

Efforts made to fight desertification vary greatly depending on the geographical features of the region. For instance, in sandy desert areas characterized by high Aeolian desertification, curbing/stabilizing sand dunes and establishing wind breaks are two ways of addressing the physical forces that propel desertification (Saad, Sharrif, & Gairola, 2011). While these methods do not fix the problem of land degradation or resource mismanagement, they can buy time for farmers and policymakers to improve soil quality or change agricultural practices in vulnerable areas. For a longer-term solution, smarter agricultural practices such as crop rotation can help maintain soil health and fertility. Because different plants consume and replenish different nutrients, crop rotation helps to maintain land's ability to produce food for many years and avoid the nutrient de-

pletion that turns arable land infertile (Lichtfouse et al., 2009). Introducing crop rotation and other sustainable agricultural strategies require that a) farmers have access to multiple crops or seed varieties to grow and b) farmers know the benefit of crop rotation, and should be considered as facets of broader efforts against land degradation.

Reforestation, or the strategic planting of trees in at-risk regions, is another anti-desertification technique, due to the soil-stabilizing and water-holding qualities of trees. This strategy can have a doubly-positive effect, by improving land productivity in addition to preventing degradation. In the Cuvelai Basin of Namibia, residents rely on trees and wood resources for all aspects of their lives: trees provide fuel and timber for homes and furniture, as well as base materials for crafts sold for income (Seely & Klintenberg, 2011). When faced with land degradation due to overpopulation and encroaching commercial interests without a vested interest in long-term forest health, Namibian policymakers turned to silviculture – or tree planting – to maintain the forests central to the well-being of the Cuvelai Basin residents. As of yet, however, the conservation efforts remain ineffective. Such policies do not go far enough in curbing industrial interests or addressing the spread of urban areas, highlighting the fact that desertification is a problem that demands a multifaceted response.

To not only halt but reverse desertification, policymakers need to pursue aggressive and multi-front efforts, but strategies such as strict resource management or reforestation can be expensive and timely. For these reasons, some desertification experts are proposing not only physical but economic anti-desertification strategies. Improved property rights for poor farmers helps incentivize long-term care and stewardship, as a farmer is far more likely to care for their land if property protection ensures the long-term safety of said farmer's assets (Requier-Desjardens et al., 2010). At the level of national government, taxes and subsidies are two ways that governments can address the issue of food prices not matching true cost, which would include the cost of land maintenance. This can be done by either taxing non-sustainable or land-degrading agriculture, or subsidizing sustainable practices. A taxes-based approach will likely need to accompany addi-

tional policy change to be fully effective, as taxing impoverished farmers without giving them the means or tools to switch towards a more sustainable land-use model will do little to alleviate the spread of desertification. While monetary incentives encourage farmers to consider switching to more sustainable methods, equally important are efforts by policymakers to educate their citizens on the actual practice of sound land management. Areas that rely on agricultural exports as regional income should be wary of losing competitiveness in globalized markets, as taxing non-sustainable production raises prices of products, and making the switch to sustainable practice takes time,

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effort, and an investment of resources that many farmers and policymakers may not be totally familiar with.

Because land overuse is often the product of poor farmers overworking land in order to produce enough goods to make a living, providing alternate income routes for poor farming communities can lift part of the financial load off overburdened land. Redirecting human resources towards rural development projects



Figure 1. Chinese farmers work in the desertified Xinjiang region.

(e.g. constructing schools, well/road building) not only alleviates pressure on intensive agriculture, but can also produce tangible public benefits to the community as a whole (Requier-Desjardens et al., 2010). In some regions, channeling efforts towards protecting natural biodiversity can turn an otherwise overworked farming area into a tourist-magnet, inviting a foreign cash stream that also works as a conservation effort. Both these strategies, however, rely on some other factor beyond the control of farming communities. Rural development projects, for example, requires municipal or national government funding to provide income for laborers, and developing biodiversity requires a region be biologically diverse and tourist-friendly in the first place. In other words, both strategies demand revenue streams from without, and therefore cannot be overly relied on as desertification-combating strategies. As stated before, efforts to halt and reverse land degradation trends in at-risk regions will require a combination of strategies – both economic and physical – in order to produce meaningful results. Developed countries tend to have few issues with desertification in their own territories. Since the Dust Bowl, the United States has been free of any vast anthropogenic agricultural disasters. Additionally, the second half of the 20th century has been marked by huge strides in agricultural prac-

tice, ranging from massively improved fertilizers to genetic engineering of crops. Similar narratives can be traced in other fully developed countries such as France, Germany, and the like. That said, even developed nations should be concerned about desertification due to the globally connected nature of today's economy.

In some countries, desertification threatens both economic and social integrity, and could result in a country's economic collapse. In Libya – with only 1% of its land arable and 95% of its land desert – a combination of resource overexploitation, insufficient water (a combination of population growth and climate change), and economic pressures to overproduce are pushing Libya closer and closer to the threshold after which the country loses the ability to produce enough food for its own population. After this point, Libya will become dependent on foreign food imports, a situation that places the Libyan government at the mercy of their food providers (Saad et al., 2011). For all countries, the loss of food security and the ability to self-sustain are significant political and economic destabilizers, and political instability in a country is often the precursor to greater regional instability. Similarly, economic collapse or disaster in one country can create a domino effect (as seen with the US mortgage crisis), making every instance of desertification an issue that transcends borders.

As an issue, desertification is often sidelined by seemingly larger, more politically charged environmental problems such as climate change and deforestation, despite the fact that the threat of desertification is both very real and very dangerous. Policymakers in countries like Libya and China can strive as best they can to defend against desertification, but to truly halt desert spread, international commitment and effort is required. While desertification's immediate effects are felt most sharply in developing countries, the long-term impact of desertification on the health of the planet is imminent, demanding a swift and multipronged response.

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