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Nature-based solutions and agroecology: business as usual or an opportunity for transformative change?

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Abstract:

Multiple United Nations (UN) meetings are adopting “Nature-based Solutions” (NbS) in their climate change mitigation and adaptation efforts to address greenhouse gas emissions from industrial food and farming. However, there are risks that NbS could exacerbate inequalities

with more effective, low-cost agroecological options marginalized. Increased policy attention on solutions for climate, nature and people offers prospects for reversals in favor of NbS that redistribute funding and redress power inequalities, placing Indigenous peoples, small-scale farmers, women, fishers, pastoralists, and forest dwellers at the center of implementation efforts.

Key words:

Net-zero; food systems; funding; agriculture; Indigenous peoples and local communities



Corinne Mngomezulu, an agroecological farmer in Ingwavuma, South Africa, holds a harvest of pearl millet. Corinne is a member of the Lindizwe Agroecology Farming Group. Agroecology farmers in Ingwavuma are reviving small grains including pearl and finger millets, which are drought tolerant and nutritious grains indigenous to Africa. These grains are being displaced by the hybrid seeds of selected commodity crops in the industrial model of agriculture. (c) Biowatch South Africa

1. Introduction

“Nature-based solutions” (NbS) are firmly on the policy table as an approach to address the interconnected crises of biodiversity loss and climate change. At the 26th United Nations (UN) Climate Change Conference of the Parties (COP26), governments focused on the role

that NbS can play in climate change mitigation and adaptation efforts to reduce greenhouse gas emissions and to harness their potential to store carbon. In a parallel process, the role of NbS in the post-2020 Global Biodiversity Framework is actively under debate, supported by the recently launched *IUCN Global Standard for Nature-based Solutions* that provides an internationally recognized framework to standardize NbS approaches. A 70-country intergovernmental panel for nature and people, drawing on the NbS model, has also called for action to conserve 30% of global land and oceans by 2030 through public and private finance [1]. Industrial food and farming are responsible for an estimated 30% of total greenhouse gas emissions per year [2] due to associated deforestation and land use degradation, the use of intensive, fossil-fuel based fertilizers, and the way in which food is stored, transported, packaged, processed, retailed, and consumed. It is therefore unsurprising that NbS are also embraced by the UN's Food and Agriculture Organization for their potential to mitigate these impacts, and for their role in the sustainable production of food [3]. Significantly, food systems and agriculture are a significant focus at the 27th Climate Change Conference of the Parties, with NbS continuing to be at the forefront of potential mitigation and adaptation strategies.

With a focus on agriculture, we respond to the urgent call for social and natural scientists [4], alongside farmers and civil society actors in the food system [5], to engage with policy-makers on these issues. In doing so, we raise concerns about the application of NbS in the context of a skewed geo-political landscape, where the concept itself, its intended beneficiaries, and its proposed implementation remain vague, contested, and fraught – whilst simultaneously being projected as an apolitical intervention [6]. The deep inequalities that exist within countries and globally - with the wealthiest 1% of the world's population emitting more than twice as much carbon dioxide as the poorer half of the world, and climate

change risks increasing the vulnerabilities of the world's poorest people and countries - reiterate the necessity for a more systemic transformation and decarbonization of our economies. In drawing attention to these disparities, and the inherent risks of NbS applications exacerbating existing inequalities, we call for the reconfiguration of finance that supports food systems transformations for diversified agroecosystems; that respects the social, cultural, and economic rights of Indigenous peoples, pastoralists, fishers, and peasant farmers; and that embraces diverse ways of knowing and being in the world.

2. What are nature-based solutions? (NbS)?

The term “Nature-based Solutions” first emerged during negotiations under the UN Framework Convention on Climate Change in 2009, with roots in early work on biomimicry for industrial design in the 1990s, and solutions to agricultural problems in the early 2000s. Promising “win-win” solutions for multiple environmental and social crises, and now with “almost as many definitions as followers” [7], the concept has been widely adopted. Definitions range from understanding the term as “actions to protect, sustainably manage and restore natural or modified ecosystems that address societal challenges, effectively and adaptively, providing human well-being and biodiversity benefit” [8] through to those “inspired by, supported by or copied from nature” [9], among many others.

As a broad church embracing an ill-defined concept, versions of NbS are interpreted and implemented very differently by varied actors with diverse interests. Actions may include the restoration of coastal wetlands, seagrasses, and mangroves to protect biodiversity, support fisheries and reduce coastal flooding; erosion control to protect downstream communities from flooding; and urban strategies to increase the porosity of human-made infrastructure

using trees, vegetation, and green roofs to reduce flood risk, improve water quality and food production, and ameliorate the urban heat island effect. In agriculture, NbS strategies extend to maintaining soil structure, enhancing pollination, managing pests and diseases biologically, and increasing crop diversity. Many of these important approaches build on knowledge developed over decades - or even centuries in the case of innovations based on Indigenous, women's and local knowledges - and have been brought together under the umbrella of NbS to support international, national, and local efforts to stem biodiversity loss and adapt to cumulative climate risks [10].

3. Nature-based solutions and carbon offsetting

However, it is for the purpose of climate mitigation that NbS has emerged most powerfully, including a much-disputed claim that NbS could provide around one-third of the global mitigation effort needed by 2030 [11]. Mitigation strategies employed to reduce emissions might include reducing deforestation and setting aside areas for conservation; interventions in human-managed ecosystems, such as reducing the use of synthetic nitrogen-based fertilizers on croplands; or by restoring peatland or planting trees in agroforestry systems to lock in carbon.

Many of these “net-zero” strategies, typically promoted by higher-emitting states, are linked to carbon offsetting schemes as part of their governments' commitments to the neutrality requirements of the Paris Climate Agreement. Concerns have been expressed that such initiatives might not only obscure climate inaction and delay the drastic reductions in emissions that have been called for by the Intergovernmental Panel on Climate Change (IPCC) [12], but that they also legitimize the continuation of destructive activities such as

mining, oil and gas exploration and intensively mono-cropped agriculture, by “offsetting” their negative impacts through investments in creating, maintaining, or restoring natural or “modified” systems elsewhere. In what some have termed “unintended consequences” and others have called “carbon colonialism,” these actions not only shift the burden of mitigation away from wealthy countries and corporations to lower income countries in the global South, but also heighten risks to farmers, pastoralists, and Indigenous peoples within them [13]. The trillions of dollars that the financial sector invests in land management schemes [14] have already led to the displacement of local people and associated human rights violations, adding credence to these concerns [15]. While significant policy attention has been given to the mechanization and financialization of offsetting schemes, little attention has been paid to the negative social impacts of livelihood insecurity, deepening poverty, increased human migrations, and associated global security.

Unsurprisingly, offsetting initiatives are most stridently advocated by the largest emitters of greenhouse gases: governments of wealthy countries with high emissions, large oil and gas companies, agribusiness, mining, and other industries responsible for much of the interconnected biodiversity and climate crises. Oil and gas company TotalEnergies, for example, has committed to net-zero emissions by 2050 with “carbon-neutrality solutions as integrated parts of its business” [16]. Similar commitments have been made by consumer giant Nestlé, a pledge that relies on “high quality natural climate solutions,” including planting 20 million trees every year for the next 10 years and working with farmers to shift to regenerative agricultural practices [17]. Bayer, a transnational corporation that controls around a third of the global seed market and a quarter of the global pesticide market, has a similar target of net-zero emissions, including through “reduced ploughing and digital solutions” and the

“purchase of certificates from climate protection projects with recognized quality standards”
[18, 19].

BOX 1. NATURE-BASED SOLUTIONS OR CORPORATE PLANTATION ENCLOSURES?

The establishment of monoculture forest plantations is often put forward as a ‘nature-based solution’ for climate change mitigation and carbon sequestration, as well as adaptation benefits, but there is extensive scientific literature showing negative social and environmental impacts, particularly for Indigenous groups and other rural people reliant on the land [34,35]. Fast growing non-native species are often planted closely together with high levels of fertilizer and other inputs applied to enhance growth, with short term greenhouse gas emissions resulting from this strategy, as well as long-term negative biodiversity and ecosystem impacts [36]. Social impacts are also well documented [37]. In Tanzania, for example, foreign land acquisitions leading to the establishment of monoculture forest plantations have worsened the livelihoods of rural producers, while narratives about these acquisitions have fostered the notion of green carbon investment success stories [38].



Monoculture plantations may be seen as a nature-based solution for climate change mitigation and carbon sequestration but growing evidence shows negative social and environmental impacts. Source: Rachel Wynberg

BOX 2. NATURE-BASED SOLUTIONS TO COPE WITH WATER SCARCITY IN KWA-ZULU NATAL, SOUTH AFRICA

Innovative nature-based solutions have long been developed by farmers across the world to cope with low rainfall, drought, and steep lands. In the Ingwavuma District of northern KwaZulu-Natal, South Africa, the Lindizwe Agroecology Farming Group has worked with the non-government organization Biowatch South Africa to introduce swales to catch run-off water to maintain plots for multiplying seed. Planting basins are dug to intercept the water flowing down the slope and scarce, available biomass is concentrated in these basins to provide the seed with extra care and protection. Several seeds of grains, legumes and pumpkins are planted together in each hole. Corinne Mngomezulu, a Lindizwe member, experimented and further innovated by making the planting basins larger. These are dug well into the second soil horizon. Maize and pearl millet stalks are placed in the pit bottoms and are then overlain with layers of 'kraal' manure, soil and compost, before being capped with a protective layer of maize and pearl millet mulch. Over the summer season these grow into a tangled and productive carpet of companion plants, shielding the soil to conserve moisture and build soil fertility. These are vital innovations on this very dry and rocky escarpment.



An aerial view of the fenced fields of the Lindizwe Agroecology Farming Group in Ingwavuma. From the air the checkerboard pattern of the planting basins is visible. These have been carefully mulched to conserve precious water in this dry and rocky escarpment. (c) Biowatch South Africa



The sloping seed plots of the Lindizwe Agroecology Farming Group in Ingwavuma. (c) Biowatch South Africa



Corinne Mngomezulu's large planting basins (c) Biowatch South Africa

4. Nature-based solutions and agroecology

The different interests and motivations of actors are evident in the adoption of NbS strategies to reduce the negative impacts of industrial agriculture. For example, agribusiness, the financial sector, many governments, and international Non-Governmental Organizations primarily focus on carbon offsets and technical solutions such as climate-smart agriculture, sustainable intensification, or precision agriculture to further intensify land use for food production. These actors may use the term “agroecology” to refer to practices that apply such approaches. However, pursuing these strategies often ignores the systemic environmental, health, economic, gendered, cultural and political costs of the industrial food and farming complex [20] and perpetuates rather than transforms the existing model of high-input monocultures dependent on fertilizers, pesticides, and hybrid seed [21].

In stark contrast, Indigenous peoples, small-scale farmers, and affiliated social movements frame NbS to reflect and reinforce autonomous lifeways and territorial self-determination and emphasize regenerative and agroecological approaches that advance food sovereignty situated in economies of care. This interpretation of agroecology as transformative of the dominant food system seeks to reconnect biologically diverse farms with local and regional

markets – linking producers and consumers in relations of proximity and greater solidarity within and between territories.

Building on centuries of cultural and biological co-evolution, this transformative agroecology promotes systemic changes based on the re-design and diversification of agroecosystems through ecologically- and relationally based diverse cropping, agroforestry and agro-sylvo-pastoral systems already embraced by at least 75% of the world's 1.5 billion smallholders, family farmers, and Indigenous people [21-23]. Such approaches are innately nature-based, imitating the structure and function of natural ecosystems. Through such approaches, biodiversity loss and greenhouse gas emissions are reduced, and a substantial amount of carbon is stored in the vegetation and soils [21, 24-26].



The astonishing diversity of seed in Corinne Mngomezulu's household seed bank includes several farmer varieties of maize; the small grains sorghum and pearl millet; legumes, which are key to food security and soil fertility; and traditional Zulu melon and pumpkin varieties. Peanuts are seen stored in traditional clay pots sealed with cow dung. Peanuts are a staple traditional dish in the area, and are used in place of oil.

However, despite the proven impact of these methods, funding streams are vastly uneven in the NbS space [27], with the largest share of public and private funding allocated to net-zero schemes, carbon offsets and research that favors a version of agroecology that accords with the industrialized system. In contrast, research and development funding and investments for transformative agroecology, indigenous knowledge and land management systems are disproportionately low, or non-existent [28-29]. Despite being much less capital-intensive, more effective, and low-cost, agroecological options are thus marginalized in policy interventions and practices, as are the voices of their proponents. By divesting from petrochemical agriculture and discontinuing subsidies to the fossil fuel industry – estimated to account for \$5.2 trillion or 6.5% of global GDP (Gross Domestic Product) [30], with almost 90% of the US\$540bn in global subsidies given to farmers each year considered “harmful” [31]- significant funding flows would be freed and could be diverted to an agroecological transition.

5. A transformative approach for Nature-based Solutions

The COVID-19 pandemic, combined with biodiversity loss, cultural erosion and the escalating climate-related hazards of fire, floods and heat have shed a harsh light on the need for transformative change. The existential threat we face from climate change demands that policy-makers broaden their thinking on how to meet human needs within planetary limits. In reclaiming nature-based solutions we have an opportunity to reflect on our deep connection with the rest of nature, and to recognize that our separation from nature, and the conversion of our emissions into tradable commodities, may well be part of the problem. For NbS to be part of a transformative solution, power inequities must be recognized, including the systemic redistribution of such power, to embed marginalized groups – Indigenous peoples, women,

small-scale farmers, and biodiversity custodians – at the center of NbS implementation efforts.

Multiple UN meetings on climate, biodiversity and food systems are debating the use of NbS in their strategies [32]. These opportunities should be used to target actors and processes in the global food system that contribute the most to greenhouse gas emissions, as opposed to externalizing their impacts. They also offer the prospect for significant policy reversals by national governments – in favor of time-proven and cost-effective agroecological and indigenous practices that need more support to enable socio-ecological resilience to compounding climate-related shocks and socio-political and economic stresses [33]. In so doing, substantial public funding could be prioritized for research and public engagement on how to radically rethink mainstream economics and develop diverse economies for equity and sustainability – from local to global levels. For this to take place, the full inclusion in these processes of Indigenous peoples and the small-scale farmers, women, fishers, pastoralists, and forest dwellers who continue to be custodians of 80% of the world's biodiversity is central. By making space for diverse cultures, worldviews, languages, and ways of knowing and doing in a reclaimed NbS discourse, a future path can be set that is truly transformative for planet and people.

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