

Towards a just agricultural transition in North Africa

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The bleak reality of global climate change becomes clearer with each new report issued by the Intergovernmental Panel on Climate Change.¹ North Africa is extremely vulnerable in the face of climatic and environmental crises, which are a daily occurrence in the lives of the millions of people living in the arid, semi-arid and desert areas of the region. Over the last few decades, drought rates and temperatures have risen continuously, leading to increasing desertification. The region also suffers from severe water scarcity², land degradation and livestock depletion.³ The accelerated environmental crises directly and indirectly affect agriculture (including grazing) and fishing activities. They also intensify poverty and erode food sovereignty.⁴ Approximately 52 per cent of the total population in North Africa live in rural areas⁵ and this population, which includes small-scale farmers and farm workers, is among the poorest and most impacted by the stark effects of agroecological crises.

North Africa's perilous situation in regard to climate change stands in contrast to the fact that the region accounts for a very small percentage of global greenhouse gas emissions. In 2017, the entire African continent produced approximately 4 per cent of global carbon dioxide emissions, while the average emissions per African person were the lowest in the world, at approximately 0.9 tonnes per annum.⁶ In the North Africa region, Egypt produced 0.6 per cent of global emissions, Algeria 0.5 per cent, Tunisia 0.1 per cent and Morocco 0.15 per cent.⁷ A recent study shows the global unevenness of greenhouse gas emissions: while the Global North's rates stand at 90 per cent, the Global South produces only 10 per cent.⁸ However, countries in the Global South bear the brunt of the crises brought on by climate change, and are in dire need of a just transition – to help mitigate the harmful impacts of environmental change and to adapt to their long-term consequences.

Agriculture is both negatively impacted by climate change and a significant contributor to it. Due to the dominance of global capitalist food systems and industrial agricultural production, land use and forest management accounted for a total of 23 per cent of greenhouse gas emissions between 2007 and 2016.⁹ North African countries are no exception to this pattern, dominated as they are by a high-emissions corporate food regime.¹⁰ Against this background it is vital to assess the possibilities for, and obstacles to, a just transition in the North African agricultural sector.

Table 1. Selected economic, social and demographic indicators shaping agriculture in North Africa

Indicator	Algeria	Egypt	Tunisia	Morocco
Share of agriculture in GDP (2020)	14.2%	11.5%	11.7%	12.2%
Percentage of the labour force active in the agricultural sector (2020)	10%	21%	14%	33%
Agri-food trade balance (in \$1 million): a comparison between Europe and the world (2017)	World 9,063	World 8,750	World 797	World 242
	Europe	Europe	Europe	Europe
	2,815	1,070	95	1,907
Agricultural arable land in 2018 (million hectares)	7.5	2.9	2.6	7.5
Percentage of irrigated land out of total agricultural land	3.2% (2017)	100%	3.9% (2013)	4.6% (2011)
Rural population in 2020 (in millions)	11.5	58.6	3.6	13.5
Percentage of the rural population out of the total population (2020)	26%	57%	30%	36%

Sources: World Bank data 2021; * Bessaoud, O., Pellissier, J.-P., Rolland, J.-P., Khechimi, W. (2019) 'Summary report on agriculture in Algeria', CIHEAM-IAMM.

The agricultural sector in North Africa has experienced significant transformation in the last few decades. As Table 1 shows, the share of agriculture in GDP is low. Yet despite the declining share of agriculture in GDP, the agricultural sector remains a primary source of employment, particularly in Egypt and Morocco. Likewise, the percentage of the population that lives and works in rural areas remains high, despite ongoing urbanization. In recent decades, North Africa has also witnessed a sharp increase in rural poverty, malnutrition and social inequalities.¹¹ Finally, with the exception of Morocco and Tunisia, North Africa also has a negative trade balance with Europe.

Fighting hunger and coping with the impacts of climate change on agriculture and rural populations necessitates an economic, social and environmental transition. What such a transition should look like, how it takes place, and who should carry it out has been the subject of much debate (see Box 1).

Box 1: A just transition versus just a transition

The term 'just transition' refers to a set of principles, processes and practices that create a shift away from an extractive economy towards a globally equal, low-carbon economy.¹² The concept of a just transition first appeared in debates between the environmental movement and the labour movement in North America. It then developed in the 1990s as a concept linked to workers' needs for decent

employment and green jobs and was adopted by the International Labour Organization, as highlighted in the Paris Climate Agreement.¹³ More recently, the concept of a just transition has become more comprehensive, bringing together socio-economic and environmental dimensions, both at the level of the nation state and globally. The term also creates space for engaging with questions of gender, class and varied forms of anti-colonialism in relation to the transition towards a low-carbon alternative to the status quo.¹⁴ This broader approach towards a just transition enables discussions about a far-reaching social and economic restructuring that addresses the sector-specific and context-specific roots of inequality.

In this context, this article looks at the challenges, components and characteristics of a just transition within the agriculture sector in North Africa. As in many other countries,¹⁵ the last few years have seen local and traditional knowledge of food systems, and ecological and regenerative agriculture, put forward as solutions to the dominant agri-food system and ecological crises in North Africa. However, these new dynamics have not been sufficiently studied: there is no overview of these developments or the practices and networks upholding them. This article fills this gap by evaluating and comparing agricultural policy transformations and the possibilities of a just transition in the agriculture sectors in Algeria, Egypt, Morocco and Tunisia.¹⁶ The article is divided into three sections. The first section analyses agricultural policies and the trajectory of agricultural development in the region. The second section explores questions of environmental and climate debt, as well as the effects of uneven environmental changes on natural resources and opportunities for development. The third section presents and discusses ecological and regenerative agriculture, local initiatives and networks of actors who are building a just transformation of agriculture in North Africa.

1. Agricultural policy transformations in North Africa

This section analyses the shifts in access to resources and agricultural policies that took place in North Africa in the post-colonial era, in order to better understand the transformation of the agricultural economy and the dominant development model in the region over time.

1.1 Access to land and water in the post-colonial era

Discussions about the agrarian question were prominent during anti-colonial struggles and in the aftermath of national liberation projects.¹⁷ After the colonial era ended, countries pursued multiple pathways in regard to managing their agricultural resources and the colonial heritage within the sector.¹⁸ Algeria, Egypt, Tunisia and Morocco implemented a variety of agrarian reform models in the period 1950–1970, which produced crucial shifts in agricultural policies and the state of rural societies across these countries.

Following Algerian independence in 1962, the National Liberal Front (FLN) adopted agrarian reforms that amounted to an agricultural revolution. It promoted rural development by facilitating the access of small-scale and landless farmers to land and by providing them with social and technical support.¹⁹ Additionally, 250,000 hectares were redistributed to war veterans who were grouped into 250 productive peasant cooperatives. The lands previously held by colonists were distributed to over 2,200 farms, the majority of which were large farms with an average of 1,000 hectares, for a total area of 2.5 million hectares.²⁰ During the 1970s, uncultivated lands were nationalized while large land holdings were restricted.²¹

In Morocco, agricultural modernization became a central pillar of the country's development path after independence in 1956. In 1962, for example, the National Institute of Agricultural Research was established with the aim of modernizing the agricultural sector. Under pressure from the Moroccan Workers' Union (UMT), the National Union of Popular Forces (UNFP), the Party of Progress and Socialism (PPS), and the Istiqlal Party, the government passed agrarian reform laws in 1963 to recover the lands of colonizers, implemented over two phases, ending in 1973. Expropriation of previously colonial land was significant, amounting to 1 million hectares of arable land:²² the monarchy redistributed the lands formerly in the hands of French colonists to rural elites as a means of securing power and buying loyalty towards the Makhzen.²³ In 1969, the Agricultural Investment Charter was approved, and in 1972 a law was passed which granted farmers agricultural lands from state-owned private property. A law on peasant cooperatives, giving them access to modernized plots in former collective lands, was also enacted. The state also invested in building dams and undertook large-scale irrigation projects, with the aim of developing a new, loyal class of middle-income farmers. Nevertheless, the system of land control remained in the hands of the state. Indeed, it served as a tool to purchase local elites' loyalty and to reduce conflict.²⁴

In Tunisia, three years following independence, Law 48 of 7 May 1959 enabled the state to take possession of neglected and unused collective agricultural properties, covering an area of approximately 500,000 hectares. In the same period, local notables, merchants, self-employed and powerful members of the ruling Constitution Party were able to buy some of the colonial lands.²⁵ Then on 12 May 1964 a law was passed that nationalized 300,000 hectares of colonial lands. Thus, by the end of the 1960s, the Tunisian state owned 800,000 hectares of agricultural land: approximately 10 per cent of the total area of agricultural land in the country.²⁶ These lands helped initiate the short-lived experiment of peasant cooperatives in Tunisia, which disintegrated in 1969, just eight years after it was launched. After this, Tunisia began to shift towards a more market-based, neoliberal approach. In a move that benefited local leaders and powerful individuals, Tunisia privatized collective lands through the Law of 14 January 1974.²⁷

In Egypt, agrarian reform was a central policy during the first era of the July 1952 regime, in the early post-colonial period. Between 1952 and 1970, 343,000 hectares (12.5 per cent of agricultural land) were redistributed, to 343,000 families, consisting of 1.7 million individuals – almost 9 per cent of the rural population.²⁸ As the result of the Nasser regime agrarian policies, villages saw significant changes in their class composition: while the larger, more influential landlords lost much of their lands, there was an increase in the area owned by small- and medium-scale farmers, and there was improved rent security for tenants. Also, there was a minor improvement in the situation of landless farmers and agricultural workers.²⁹ The 'green revolution' instituted by postcolonial governments relied on agricultural mechanization, chemical fertilizers, pesticides, and hybrid seed varieties to increase agricultural production.

Ultimately, North African agriculture development models in the two decades following independence focused on modernizing the agricultural sector and preserving large farms, whether through state administration or through highly centralized and controlled cooperatives. To various degrees, North African countries adopted progressive, state capitalist and 'green revolution' policies. This was

achieved through a combination of strategies, such as providing technical and material support to farmers, supporting production inputs, inaugurating large irrigation projects, boosting and disseminating modern agricultural knowledge and guidance, establishing research centres and agricultural schools, and establishing agricultural cooperatives. In this era, the state in these countries utilized discourses of modernization reliant on mechanization, commercial and export agriculture, and the marginalization of small-scale local knowledge. In fact, despite the emphasis on food self-sufficiency, the export of cash crops continued to follow the same pattern that had been dominant in the colonial era, especially for commodities such as citrus, vines, vegetables, cotton and olives.³⁰

1.2 The impact of neoliberalism on agriculture and natural resources

The turn towards neoliberalism in North Africa began in the 1980s. Under pressure from international financial institutions, namely the International Monetary Fund (IMF) and the World Bank, countries in the region began to liberalize foreign trade, devalue local currencies, and allow an increased dominance of the market, through both the continued privatization of public companies and the gradual erosion of public services. Priority was accorded to reducing public debt, social spending and employment rates in the public sector.³¹

As a result of neoliberal transformations, North African countries saw a major change in water and land management. The state withdrew from the management of natural resources, allowing the private sector to take over. This led to an increase in the penetration of private investment companies in the agricultural sector, with the private sector acquiring more resources, particularly in vast desert areas, through access to groundwater and land that the state made available to major agricultural investors.³²

In Algeria, the era of state farms came to an end in 1980s, with the latter being divided into small farms of 10 to 70 hectares. In 1987, these lands were progressively moved into the hands of agricultural investors. Accompanying this change was a gradual shift towards market forces,³³ notably with the long-term liberalization of agricultural production inputs, leading to an increase in the price of fertilizers, pesticides and farming equipment. This in turn led to an increase in the prices of agricultural products as a whole. Following the 1994 agreement between Algeria and the IMF, state support for agricultural inputs was completely removed.

In Morocco, the neoliberal transformation in the agricultural sector intensified in 2003. This was exemplified in the privatization of two public companies that had managed the bulk of the lands recovered from colonists: the Agricultural Development Company (SODEA) and the Agricultural Land Management Company (Sojita). With this move, the ownership of 90 per cent of former colonial lands was transferred to private investors, the state's major administrative notables, the army, and the security apparatuses.³⁴

In Tunisia, neoliberal policies were implemented before the initiation of the Structural Adjustment Programme (SAP) under the World Bank in 1986. The state geared agricultural production towards export and high value-added crops, facilitating private sector access to land and putting an end to state commercialization of agricultural products.³⁵ These policies were coupled with the state's progressive withdrawal from traditional agricultural sectors.³⁶

Since 1979, Egypt has pursued a policy of economic openness. State-owned farms were dismantled, agrarian reform laws were amended, and the Agricultural Cooperative Union was dissolved. Also, the state applied a set of measures to reduce subsidies to farmers in the Nile Valley and Delta, such as removing pesticide and fertilizer subsidies, and allowing the private sector to control agricultural production inputs.³⁷ Further, the ownership limit imposed on agricultural companies was abolished, enabling investors to own more reclaimed lands. In 1992, Law 96 was passed, regulating rental relations between landlords and tenants. This law put an end to rental security, triggering a sustained wave of protests in the Egyptian countryside.³⁸

In North Africa as a whole, during this period, states focused on expanding their hold over desert agriculture for the export market while accelerating the commodification of state lands, making them available to agricultural investors.³⁹ Since the 1990s, policies of agricultural development in the desert have been regarded as a solution to the food provision and production crisis in North Africa.⁴⁰ International financial institutions supported policies of agricultural expansion in the desert based on a capital- and technology-intensive model of production of mostly export crops, with associated degradation of water and land resources.⁴¹

As a result of these neoliberal transformations, food self-sufficiency policies were terminated in favour of more market-based food security policies. The latter meant that food came to be sourced through market mechanisms, often irrespective of provenance – whether this be global commodity markets, domestic production or even food aid. Accordingly, major shifts occurred in diets, leaving North African countries exposed to a sharp increase in nutritional diseases and food dependency. Algeria and Egypt became amongst the biggest importers of wheat globally.

Following 40 years of neoliberalism, the key features of the current dominant agri-food system in North Africa can be summarized as follows:

- The removal of subsidies for small peasant farmers and the gradual withdrawal of the state from all forms of technical and material support for agricultural production. This includes the state abandoning its role in centrally controlling agricultural operations and practices, such as fertilization, and the types of seeds and pesticides used. This withdrawal has given the private sector unfettered access to food staples and import channels. The state also entirely surrendered its role in determining the prices of agricultural inputs and outputs to the forces of the market, ceasing agricultural input and credit subsidies.
- The promotion of a model of industrial agriculture based on large-scale farms. This was achieved by reclaiming desert spaces and enabling agricultural investors to access large areas of land. Thus, colonial structures were repurposed and reproduced through a system in which land is now in the ownership of the few; these dynamics are particularly visible in the cases of Morocco and Egypt.
- The adoption of a policy of primarily export-driven agriculture through financial incentives, the provision of chillers in airports, etc. Most importantly, North African states form part of a system of international trade that serves to bolster the interests of the Global North at the expense of local populations in the Global South.

- The dominance of a globalized, consumerist diet with a high rate of cheap carbohydrates, leading to an increase in the rates of food-related diseases, high rates of obesity and malnutrition. Additionally, there has been a replacement of food self-sufficiency policies with market-based food security policies.

1.3 The current situation: a marginalized peasantry and an extractive capitalist mode of agriculture

The decline of the welfare state in the post-colonial, neoliberal era saw the emergence and reproduction of a localized dualism that had existed in the colonial era: the existence of two agricultural sectors – one characterized by private, large-scale farms in receipt of state support, the other based on small-scale farmers in plains, valleys and oases, dependent on rain-fed agriculture and characterized by under-development and marginalization.

In North Africa, agriculture is a major sector of employment for women, accounting for 55 per cent of women's employment, in comparison to only 23 per cent for men.⁴² With the migration of men and women (whether it be for economic reasons, or as a result of wars and conflict), the number of seasonal migrant workers is continuing to increase. In Egypt, for instance, according to the 2010 agricultural census,⁴³ the total number of women workers in the agricultural sector amounted to 5 million in that year, 40 per cent of whom undertake unpaid labour for their own families. Further, the growth of capitalist forms of agriculture has amplified the feminization of agricultural work, along with the dependence on girls, who can be as young as eight years old, who work in very poor and exploitative conditions.⁴⁴ The nature of agricultural work is problematic on many fronts, starting with the working conditions and health and safety issues (see the next paragraph), and extending to the local and global division of labour and its relationship with women's empowerment and development. The working conditions of women farm workers are especially important in light of the [current Covid-19-related health crisis](#), as well as fears of a new food crisis, which would exacerbate already existing tensions in the region. For instance, the recently published FAO Food Price Index (FFPI) shows a large increase in the prices of meat, dairy, cereals, vegetable oils and sugar between November 2020 and November 2021, worldwide.⁴⁵

Agriculture is one of the most dangerous production sectors in the world. According to estimates of the International Labour Organization, approximately 170,000 agricultural workers are killed every year. Workers in agriculture are at least twice as likely to die at work as workers in other sectors. Millions of agricultural workers are exposed to serious work injuries in accidents linked to agricultural equipment or poisoning with pesticides and other chemicals.⁴⁶ Indeed, due to the underreporting of deaths, injuries and work-related diseases in the sector, it can be assumed that the real picture of health and safety for agricultural workers is likely to be worse than official accounts.

Relationships of unequal exchange in the global system underpin the agricultural crisis in North Africa. Countries in the region are subjected to unequal exchange with the Global North, particularly the European Union (EU), through a variety of trade agreements that enable the EU to benefit from North African agricultural products at preferential rates. These agreements not only facilitate the exploitation of the region's resources, they also maintain and further entrench the difference in wages in the agricultural sector in the South compared to the North, and the extraction of surplus value for the benefit of European consumers.⁴⁷ As the biggest trading partner of North African countries, much of the region's production is geared towards export to the EU market. The EU therefore directly impacts development policies and the dominant trade and agriculture plans in the region. Under the slogan of 'trade for development',⁴⁸ the EU, in partnership with local elites, pushes North African countries to sign free trade agreements, which, in turn, aggravates the structural crisis.⁴⁹

As dependency theorists argue, while colonialism may have gone, the development model of the colonial era has remained dominant in different ways, perpetuating the disparities between the Global North and South. Under neoliberalism, former colonizers played a key role in integrating peripheral economies into the global economy and trade system and creating patterns of dependency.⁵⁰ Meeting the needs of the European market necessitates monocropping, large farms, and catering to the preferences of European citizens – for example in the way in which olive oil is prepared, or in the cultivation of specific varieties of dates, strawberries, flowers and citrus.

In sum, these agricultural policies and practices have created another form of dualism. On the one hand, industrial agriculture degrades land and water. Based on the intensification of capital and energy, capitalist agriculture further pushes agricultural workers – men and women – into precarity. It also exacerbates inequalities and centralizes land ownership. This is clearly the case for desert agriculture, where large areas are allocated to big investors while small-scale farmers are restricted to limited spaces.⁵¹ On the other hand, the absence of subsidies for peasant farming has led to the impoverishment of small farmers and the degradation of natural resources in oases and rural areas. Further, the legacy of the 'green revolution', with its intensive use of fertilizers, pesticides and hybrid seeds, has culminated in the neglect of intergenerational local agricultural and ecological systems. As a result, natural resources such as land and water have deteriorated, the biodiversity of seeds has declined, and the balance between humans and the environment has been disrupted, causing what is referred to as a 'metabolic rift'.⁵²

2. Just transition: facing an unequal ecological exchange

As previously argued, the concept of 'unequal exchange' advanced by proponents of the dependency theory focuses on the movement of labour power and capital. However, despite its importance in providing valuable conceptual insights, this concept fails to provide an in-depth insight into the mechanisms of a just transition. Understanding the possibilities of a just transition requires looking at the process of unequal *ecological* exchange, a concept which is more comprehensive than the former. To achieve this, it is key to investigate four clusters of resources: 1) the raw materials and energy used to produce goods and services; 2) the land required to directly or indirectly produce those goods; 3) the services consumed in order to produce those goods; and 4) labour in supply chains. Such unequal socio-economic and environmental flows prevents countries of the Global South achieving development on their own terms.⁵³

BOX 2: From unequal ecological exchange to climate debt

The concept of unequal ecological exchange emerged and developed within academic debates, while the concept of ecological debt materialized within the environmental justice movement.⁵⁴ As a term, climate debt was introduced during the 1992 Earth Summit in Chile, with the aim of highlighting the continuity of historical and colonial forms of exploitation of resources in the Global South. Above all, ecological debt is an economic concept that is shaped by two struggles relating to distribution. The first one is unequal ecological exchange that can be summarized as the cumulative product of unequal trade-centred environmental exchange, while the second is the climate debt that can be summarized as a historical but persistent unequal distribution of global carbon sinks to the benefit of advanced capitalist countries.

Social and environmental movements of the Global South have faced difficulties with the first aspect of the concept of ecological debt. They have therefore focused on calculating and estimating climate debt. This was first done in 1999, through the Committee for the Abolition of Illegitimate Debt (CADTM). The 2010 World People's Conference on Climate Change and the Rights of Mother Earth in Cochabamba, Bolivia, also adopted the concept of climate debt. In the proceedings of that conference, climate debt is defined as the total of 'emissions debt' and 'adaptation debt'. The former refers to the cost of historical and current excessive emissions per person in the Global North, which deprive countries of the South of their fair share of air. The latter points out the exorbitant costs incurred by countries of the Global South in adapting to the significant damages and risks of greenhouse gas emissions and climate change, despite their limited contribution to the environmental crisis. Climate debt is therefore seen as part of a broader debt to Mother Earth.⁵⁵ In the Cochabamba conference proceedings, developed countries were called upon to take a set of measures which can be summarized as follows: 1) decolonizing the atmosphere by reducing greenhouse gas emissions; 2) remunerating countries of the Global South for losing development opportunities due to life under a colonized airspace; 3) taking responsibility for climate change-based migration; and 4) tackling debts related to climate change mitigation and adaptation and handling the damage of the excessive emissions of the Global North.⁵⁶

In North Africa, historically unequal ecological exchange is intertwined with relationships of exchange with European countries. Here, unequal exchange affects the allocation of water, land, climatic resources, energy, and labour power, all of which are geared towards food production for European markets. North African countries bear the environmental costs, as their local ecosystems are destroyed and their natural resources depleted. They also bear the economic costs by generating surplus value through international trade with European countries. This, in turn, has far-reaching consequences for the sustainability of resources, energy and land in North Africa, as well as for the ability to develop frameworks for food sovereignty and to achieve a just transition locally. Unequal environmental exchange perpetuates an imperialist way of life in the capitalist core countries, while severely restricting the chances of a just transition in the South.⁵⁷ What is presented as an environmentally and socially just transition for Europe is not necessarily the case for the peripheries attached to the continent in the southern Mediterranean and West Africa.

Discussions about just transition focusing only on the capitalist core in the Global North, whether in relation to the crisis of the Western mode of production and consumption, or indeed the introduction of technological ecological modernity as a solution to the crisis, completely overlook the situation of countries in the South, as well as the possibilities for, and hindrances to, achieving a just transition in those contexts. Here, a critique of Global North-centric just transition is essential: while such a transition is portrayed as global, it broadly disregards questions of ecological and climate debt in relation to countries of the Global North.⁵⁸ As studies about Moroccan women workers on farms in the south of Spain have shown,⁵⁹ unequal exchange and climate debt should be at the heart of debates about a just transition in North Africa. The export of vegetables, fruit and cheap labour to Europe is a by-product of the destruction of nature.

There have been many estimates of the scale of climate debt. For example, at the Copenhagen Summit, a study by the International Institute for Environment and Development estimated the cost of climate change to developing countries at up to £6.5 trillion over the next two decades.⁶⁰ Likewise, another study by the African Development Bank demonstrated that the costs of adaptation in Africa range from \$20 to \$30 billion per annum over the next 20 years.⁶¹ Submitted to the Secretariat of the United Nations Framework Convention on Climate Change (UNFCCC) after the Paris Climate Summit, these reports highlight the plans of North African countries (among others) to reduce emissions and adapt to climate change, and the expected costs of such changes. For example:

- Tunisia stated that in order to adapt to climate change and achieve a 41 per cent reduction in emissions by 2030, in comparison to the 2010 level of emissions, the state needs international funding, capacity-building, and technology transfer, the total cost of which would be \$20 billion.⁶²
- Morocco estimated the cost of reducing greenhouse gas emissions by 42 per cent at \$50 billion.⁶³
- Egypt identified the need for \$73 billion to alleviate the impacts of climate change, without setting specific quantitative goals for reducing emissions.⁶⁴
- Algeria reiterated its commitment to reducing greenhouse gas emissions by 22 per cent by 2030. These plans were put forward without a specification of the value of this support or of climate change adaptation. Such a change, however, requires external support in terms of funding, technology development and capacity-building.⁶⁵

Although these figures are dramatically bigger than the development support North Africa receives, they portray but a small aspect of the economic burdens of climate change, and the global responsibility for bearing its consequences.

3. Agroecological and regenerative agriculture as vehicles for a just transition in North Africa

North African countries are, to varying degrees, integrated into the contemporary global food system, which is dominated by transnational corporations, international trade and export-led agriculture. As previously argued, these patterns of global unevenness have led to the rapid degradation of natural environments and resources, and to the marginalization of small-scale farmers and peasants, and the local communities in which they are embedded.

The region therefore needs to rewrite its agricultural, environmental, food and energy policies. It is necessary for alternatives to be locally centred and to be able to flourish autonomously, independent of European interests. This necessitates a bottom-up, rather than top-down, approach – one that is informed by the daily practices and struggles of agricultural workers, local activists and actors in the region. It is evident that some peasant practices and ideas spreading in the region intersect with the principles of regenerative ecological agriculture – also known as agroecology (see Box 3). These form the building blocks of an ecological transition in the agricultural sector. The adoption of these practices is driven by a number of factors, including peasants' need to cope with climate change, and the high prices of pesticides and chemical fertilizers. There has also been a renewed interest among sections of both the rural and urban population in re-invigorating traditional agricultural technologies and using innovative ways to confront water scarcity, soil degradation and rising temperatures. Grounded in concrete realities, these practices delineate a possible starting point for building a bottom-up just transition project. A just transition must empower the local population and redefine development as development that is based on participation, and the preservation and renewal of resources.

BOX 3: Agroecology as a science, a practice and a social movement

Agroecology can be defined as a science, a practice and a social movement.⁶⁶ The main aim of agroecology is to transcend the dominant agricultural paradigm and to develop agro-ecosystems that have minimal dependence on external inputs through practices that work with natural cycles and which centre farmer autonomy and agency in decision-making and the production of knowledge.⁶⁷ Regenerative agriculture is a branch of agroecology which represents a more reparative farming system. Regenerative agriculture and agroecology directly address the challenges of climate change as they focus on soil health, biomass, biodiversity and soil carbon sequestration.⁶⁸ Regenerative agriculture and agroecology are guided by some of the following principles:⁶⁹ 1) the interdependence of all parts of the agrarian system, including the farmer and the family; 2) the importance of ecosystem balance; and 3) the need to multiply ecological interactions and the workings of natural cycles in order to reduce the need for chemicals and other industrial inputs.⁷⁰ Agroecology and regenerative agriculture enable farmers to thus both meet their food needs through sustainable production methods while also revitalizing natural and agricultural environments.

Source: Based on Méndez et al. 2013⁷¹ and Wezel et al. 2009⁷²

3. 1 Practices of agroecology, regenerative agriculture and food sovereignty

Table 2 shows a selection of eco-regenerative agricultural practices identified through studies of local and indigenous knowledge related to water preservation in North Africa,⁷³ as well as the few studies dealing with ecological and regenerative agriculture in the Maghreb, namely in Tunisia, Morocco and Algeria.⁷⁴ These have been complemented by the results of my own fieldwork in the countryside of Egypt, Tunisia and Morocco between 2008 and 2019, as well as interviews with scholars and activists in the North African Network for Food Sovereignty.

As demonstrated in Table 2, these practices are linked to an increase in soil biomass,⁷⁵ a high level of organic matter, the enhancement of biodiversity, and an increase in effective ecological/biophysical interactions within the agricultural system. Additionally, these practices renew and preserve the agricultural landscape, maintain and provide water resources, improve the livelihoods of agricultural workers, and provide safe, healthy and culturally appropriate food for local populations.

Table 2: Selected practices of eco-regenerative agriculture in North Africa

Category	Practices
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Category	Practices
Soil management, soil improvement and carbon sequestration	No-till farming Crop rotation (alternating cereals with leguminous crops) Diversity of crop compositions in farms Unprocessed organic fertilizers Processed organic fertilizers (compost) Liquid organic fertilizers (compost tea) Organic worm-based fertilizers (vermicompost) Liquid worm-based organic fertilizers (vermicompost tea)
Water resource management	Khattaras, Foggaras, cisterns (al-Majel) in Morocco, Algeria and Tunisia, respectively Bridges (Tunisia) Growing country-specific varieties Night irrigation (Egypt) Crop condensation North African oases three levels farming system
Energy saving	Manual labour Use of animals Flow irrigation Night irrigation Solar irrigation
Environmental landscape management and wildlife control	Ecological traps Manual collection of grass Multiplying varieties and not planting the same crops in the same plot of land
Sustainable agricultural production	Terrace cultivation (mountainous regions of Morocco and Algeria) Oases systems Mixed agro-pastoral systems
Seed sovereignty	Seed self-production Municipal/domestic seed usage

Sources: Author's fieldwork in Egypt and Tunisia, 2018 and 2010; Ameur *et al.*, 2020; Hamamouche *et al.*, 2018; Mohammed, and Ruf, 2010; Ayeb and Saad, 2013; Boualem *et al.*, 2011.

The aim here is not to give a complete overview, but rather a snapshot of practices related to ecological and regenerative agriculture in the contexts studied. Despite increasing experimentation with agroecological practices – often with the support of grassroots initiatives and organizations – fully integrated eco-farms remain very rare in North Africa. More commonly, peasants mix ecological farming practices with capitalist farming practices, examples being the use of both chemical and organic fertilizers, or resorting to both ecological and non-environmental modes of crop irrigation.

The emergence of these practices can be explained in part by the strategies small-scale farmers develop to bypass difficult environmental and economic conditions. For instance, small-scale farmers in Egypt are more inclined to switch to the use of animal waste and organic fertilizers when faced with the exorbitant prices of chemical fertilizers and pesticides. Similarly, they favour local seeds and rely on seed saving and sharing practices to circumvent the high prices of imported seeds. Likewise, in the Maghreb, small-scale farmers and peasants use local knowledge and technology relating to environmental water preservation in the face of increasing water scarcity. While these practices do not necessarily stem from a radical environmental vision for agriculture, they can nevertheless be transformative. They serve as attempts to improve the livelihoods of impoverished farmers, helping them continue their farming work in the face of capitalist exploitation. In this case, practices of agroecology and regenerative agriculture can be depicted as a kind of agroecology of the poor, as they are a product of poor people's focus on their own livelihoods.

3. 2 Local actors and networks

There are a number of civil society organizations and government research institutions that support the transition towards ecological agriculture at different scales. This section highlights some of these initiatives.

Some of the institutions, associations, organizations and networks mentioned in Table 3 below play multiple roles in promoting agroecology and regenerative agriculture, through for example providing training tools on agroecological practices, producing research and reports, and facilitating networking between actors. In North Africa, farmers' cooperatives occupy a key position in supporting ecological farming practices,⁷⁶ particularly when understood in the context of the Maghreb-specific concept of cooperatives (*Ta'adoudya*), which encompasses notions of solidarity, cooperation and sisterhood. These local forms of joint action, solidarity and alliance building are crucial: they help further integrate agro-ecological systems through knowledge dissemination and the extension of practical help in the form of training courses in soil maintenance and renewal, the provision of organic fertilizers, and the propagation of native seeds. These mutually beneficial partnerships are necessary to widen and popularize agroecological experiences. Raising issues around workers' health and the use of chemical fertilizers, agricultural workers' unions push for organic methods of pest control, while associations facilitate the building of participatory relationships through direct selling, unionization, and mutual aid in a way that transcends the narrow confines of the market and private, individual interests.

Table 3: Examples of initiatives supporting eco-regenerative agriculture in North Africa

Organizations	Geographical area of work
The North African Network for Food Sovereignty	North Africa
Alexandria Research Centre for Adaptation to Climate Change (ARCA)	A government institution in Egypt
Organic Agriculture Association	Egypt
Fayoum Agro Organic Development Association (FAODA)	Fayoum, Egypt
The Integral Development Action of Minia	Province of Minia, south of Egypt
Egyptian Association for Sustainable Agriculture	Province of Asyut, south of Egypt
Arid Regions Institute	A government institution in Tunisia
Observatory of Food Sovereignty and the Environment (OSAE)	Tunisia
Shapes and Oasis Colours Association (AFCO)	Chenini Oasis, south of Tunisia
Torba Association	Algeria
Pedagogical Ecological Farm	Zéralda region, Algeria
Network of Agro-ecological Initiatives in Morocco (RIAM)	Morocco
Worm-breeding groups – producing worm-based organic fertilizers	Egypt, Tunisia, Morocco, Algeria
Agricultural cooperatives	Egypt, Tunisia, Morocco, Algeria
Peasant/agricultural trade unions	Egypt, Tunisia, Morocco, Algeria
Food baskets linking consumers and producers (linking farmers to consumers in cities)	Egypt, Tunisia, Morocco, Algeria
Local agricultural markets	Egypt, Tunisia, Morocco, Algeria
Agricultural women workers' trade unions	Tunisia, Morocco

Source: Compiled by the author based on interviews with research participants conducted in 2021.

As previously argued, despite the growing emphasis placed on the importance of local forms of regenerative agriculture and agroecology in confronting climate change, these practices remain largely marginalized in North Africa, at the level of both agricultural development policies and climate change mitigation policies. Indeed, these practices are primarily implemented on an individual level (farms) or at a local scale (community) with the support of civil society organizations and some research institutions. These dynamics do not allow for major changes to take place in agricultural policies, and they do not help rebuild food sovereignty on the basis of regenerative ecological agriculture. This problem is compounded by the dominance of industrial agricultural science and technology in the curriculums of agricultural colleges. For instance, in Egypt, pesticide, fertilizer and seed companies fund academic conferences in colleges of agriculture, while the curriculum promotes genetic engineering and the biotechnological revolution as solutions to the global food crisis.

Despite these limitations, observations from the field demonstrate growing bottom-up pressure to build food sovereignty while supporting regenerative ecological agriculture in the region. It is on this basis that it is possible to set in motion a just transition of the agricultural sector in North Africa.

4. Conclusion

This article has shed light on the opportunities for, and challenges to, a just agricultural transformation in North Africa. Mainly export-led and intensive in its use of energy and capital, industrial agriculture remains the dominant framework for agricultural policies in the region. These policies are incapable of confronting climate change and the environmental crisis in the region. In fact, they add to it. Further, they are unable to achieve food sovereignty in North Africa, and actively contribute to the marginalization and impoverishment of agricultural workers and rural populations. This article has highlighted some of the dynamics within rural communities and their efforts to innovate and regenerate through local knowledge, with the aim of counteracting the degradation of natural resources and peasants' livelihoods.

Additionally, the article has shown the pluriverses of agroecology and regenerative farming practices. However, these practices remain interwoven with capitalist farming methods. This can be mainly attributed to the absence of organized and sustained public policy support for an agroecological transition.

North Africa needs to rewrite its agricultural, environmental, food and energy policies. At the heart of any serious just transition programme should be the goal of achieving autonomy, ending dependency, reducing poverty, and mitigating the effects of climate change and environmental degradation. Building such a programme requires a more radical and local participatory approach, in order to regenerate and preserve local natural resources. This move offers a road to liberation from dependency; it requires building novel and locally-rooted knowledge systems and skills that support ecological and regenerative agriculture. The green revolution of the post-independence state would not have been possible without state intervention and support. State support consisted not only of providing production inputs, irrigation projects and mechanization, but also of providing agricultural extension services and establishing extension farms and research centres and institutes. Therefore, ecological and regenerative agriculture in North Africa is in need of a locally-oriented just transition plan. However, this will not be achieved without pressure from below, informed by the needs and aspirations of small-scale farmers, peasants and farm workers, who remain indispensable in a just transition in the region and beyond.

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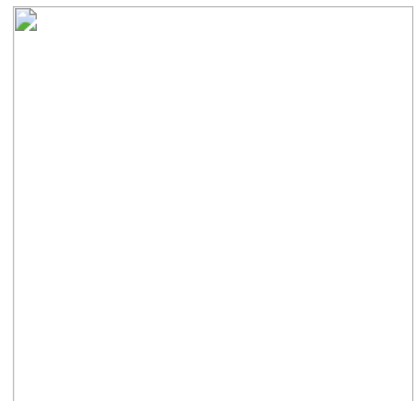
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