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<https://doi.org/10.1093/acrefore/9780190854584.013.298>

Published online: 31 August 2021

Summary

Agroecology is an alternative paradigm for agriculture and food systems that is simultaneously: (a) the application of ecological principles to food and farming systems that emerge from specific socioecological and cultural contexts in place-based territories; and (b) a social and political process that centers the knowledge and agency of Indigenous peoples and peasants in determining agri-food system policy and practice.

Historically, agroecology is associated with a multifaceted body of transdisciplinary knowledge. The academic literature emphasizes the role of scientists in developing an interdisciplinary agroecology over the past ninety years. However, the practice of agroecology is much older, with deep roots in many Indigenous and peasant societies of Africa, the Americas, Asia, Australia, Europe, and Polynesia. Although these societies never adopted the term “agroecology,” their time-tested practices in growing food and fiber illustrate many principles of modern agroecology.

The transdisciplinary field of research on agroecology examines how agroecology contributes to equitable and sustainable food and fiber production, processing, distribution, and consumption. Agroecology builds on people’s knowledge, Indigenous management systems, and local institutions through “dialogues of knowledges” with social science, natural science, and the humanities. The study of Indigenous and peasant agri-food systems has thus been pivotal for the development of both agroecology and anthropology.

The agroecological perspective is based on a transformative vision of the relationship between people and nature. Economic anthropology has unearthed a wide diversity of systems of economic exchange that are informing work on agroecology, including the vital importance of Indigenous and peasant economies, gift economies, circular economies, subsistence, and economies of care. These are pushing agroecologists to think outside of the box of dominant commodity capitalism. Agroecology is also based on a radical conceptualization of knowledge systems, whereby work on cognitive justice, epistemic justice, Indigeneity, and decoloniality is upending the dominance of Western, scientific, Eurocentric, and patriarchal worldviews as the basis for the future of food and agriculture. Agroecology is also underpinned by radical notions of democracy and new conceptualizations of popular education, transformations in governance, and empowering forms of participation.

While the transformative agenda offered by agroecology is deeply contested by proponents of industrial and corporate food and agriculture, agroecology is increasingly important in academic and policy debates on sustainable food, farming, and land use. Exploring the relationship between agroecology and anthropology is both fruitful and

timely because it can help re-root agroecology—which is increasingly at risk of becoming an abstract and devitalized concept—in the fundamentally localized practices and culture of agri-food systems.

Keywords: agroecology, agri-food system, ethnobiology, economic anthropology, decoloniality, food sovereignty, sustainability, ecology

Subjects: International and Indigenous Anthropology

Introduction

Over the past ninety years, the academic literature on agroecology has largely emphasized the role of scientists in studying and developing the field (for example, see Doré and Bellon 2019 and Leakey 2017). Agroecological practices are, however, much older, and have roots in many Indigenous and peasant societies of Africa, the Americas, Asia, Australia, Europe, and Polynesia. Although none of these societies use the term “agroecology,” their time-tested and locally distinct practices of producing food and fiber illustrate many principles of modern agroecology.

Such practices, for example, typically integrate a diversity of plant and animal species in complex combinations on the farm and in the territory to build functional farming and land-use systems. Throughout the world, there are many place-specific examples of agricultures based on integrating trees with livestock and crops (agro-sylvo-pastoral farming), producing food from forests (agroforestry), growing several crops together in one plot (polyculture), and using locally adapted and genetically diverse crops and livestock by working at different scales—from the farm plot to the wider landscape mosaics that sustain crop cultivation, pastoralism, fisheries, hunter-gathering, and forest-based livelihoods.

Since the 16th century, European colonizers—and later geographers and anthropologists—have perceptively described the ingenuity of Indigenous and peasant agricultures on different continents. In South America, the Spanish missionary, Gaspar de Carvajal, reported dense settlements along the banks of the Amazon in the 1540s. Prior to the colonial genocide, resident Indigenous populations were much larger than they are today, and their livelihoods largely depended on managing a tapestry of small plots for a combination of uses: diverse multistoried intensive gardening, hunting, fishing, and the collecting of food, fibers, and medicinal plants (Dufour 1990).¹

During his travels in China, Korea, and Japan in the early 20th century, the US agronomist Franklin King described how the peasant farmers successfully farmed the same fields for four thousand years without destroying their fertility. King’s ethnographic observations highlighted important agroecological principles of sustainable soil-fertility management, including the careful terracing of fields to reduce soil erosion; the recycling of composted plant, animal, and human waste and its return to the land; the use of a diversity of crop species and mulches to

cover the soil; green manuring; inter-tillage; irrigation; and crop rotations (King 1911). Similarly, the Russian biologist Peter Kropotkin's anthropological and geographical expeditions in Siberia and Europe led to comprehensive descriptions of the diversity, complexity, and resilience of 19th-century peasant farming. Kropotkin also highlighted the importance of cooperation and mutual aid for the management of the remarkably complex agri-food systems that sustained regional Indigenous and peasant societies (Kropotkin [1902] 2006).

Through their detailed descriptions of Indigenous and peasant knowledge on food and farming, several anthropologists and ethnographers have contributed significantly to the development of agroecological theory and practice. In turn, the analysis of the diversity of agroecological practices in Indigenous and peasant societies has had an enduring influence on the production of knowledge in different fields of anthropology, including ethnobiology, economic anthropology, and social and political anthropology.

The study of Indigenous and peasant agri-food systems has been pivotal for the development of agroecology and anthropology. We first analyze the ideas and practices that have shaped agroecology as a field over time, and highlight the connections between anthropology and agroecology, along with other fields such as agronomy and ecology. We also explore key questions and themes that have characterized agroecological research, along with the major controversies and debates today.

Next, we critically analyze the seminal contributions that agroecological Indigenous and peasant practices have made to the development of anthropology and how, in turn, different fields of anthropology offer insights for the evolution of agroecological thought and practice today. New frontiers for agroecological research are also suggested here.

Origins and History of Agroecology

The origins of agroecology can be traced back to the agricultural and land-use practices of Indigenous peoples, pastoralists, fishers, and peasant farmers. These agroecological Indigenous and peasant practices developed from the close association between communities' livelihoods and local environments. Over time, diverse ecologies and sociocultural systems emerged in specific places through processes of "society-nature co-evolution" (Norgaard and Sikor 1995). For example, in their book *The Maya Forest Garden* (2015), anthropologists Ford and Nigh explain how Maya farmers are the "spiritual caretakers and co-creators of the Maya forest" through the *milpa* system, a perennial multicropping and multistage cyclical agriculture/agroforestry system based on maize and at least ninety other Mesoamerican plants. They note that the system has been key to the management of the neotropical woodlands of Maya lands,

and has shaped and conserved forest ecosystems. . . . The integration of the milpa cycle into neotropical woodland ecology transformed the succession of plants. . . [creating] the Maya forest [as] a garden where more than 90% of the dominant tree species have benefits for humans. . . . The traditional Maya farming system recorded today—the complex agroforestry polyculture milpa . . . reflects the sustainable agricultural strategies of the [Maya] people who [have] lived in the forest for 8,000 years. . . .

(Ford and Nigh 2015)

Starting in the 1920s, agroecology as a field began to develop in academic and professional institutions. Mexican scientists and practitioners have played an important role in that history, arguing for an ecological approach to food production as early as 1926, at the First Agroecological Congress in Meoqui, Mexico (Rosado-May 2015).

After the Russian agronomist Basil Bentsin used the term “agroecology” in a published paper (Bentsin 1928), a number of scientists such as Karl Klages (1928) began to merge the sciences of agronomy and ecology (Gliessman 1990). Initially, agroecology strongly focused on ecological science as a basis for the design of a sustainable agriculture. However, the importance of farmers’ knowledge was increasingly recognized and championed by early pioneers of agroecology.² Among Mexican scholars, for example, the work of Efraím Hernández Xolocotzi between the 1940s and late 1970s is noteworthy for emphasizing intercultural dialogue as a way of constructing agroecological knowledge that combines ecological science with people’s knowledge (Hernández Xolocotzi 1977, 1985).

From the 1960s onwards, the increasing awareness of the environmental impacts and pollution caused by industrial farming and Green Revolution agriculture in Asia and Latin America encouraged the forging of much closer links between agronomy and ecology in the search for a more sustainable agriculture (Herber 1962; Merrill 1976). For example, as part of the growing movement to resist the introduction of Green Revolution practices and inputs in Mexico, several programs—called International Courses on Tropical Ecology with an Agroecological Approach—were organized between 1979 and 1981 at the College for Tropical Agriculture in Tabasco (Gliessman 2015). In the United States in the early 1980s, the pioneering work of Miguel Altieri (1987) and Stephen Gliessman (1990) helped position agroecology as a credible alternative to industrial monoculture. Around the same time, the farmer and environmentalist Pierre Rabhi championed agroecological approaches in France and West Africa. He organized training workshops in agricultural ecology at the Centre d’études et de formation rurales appliquées and the Gorom Gorom Agroecology Centre in Burkina Faso, which he set up in 1985 (Rabhi 1989; Rabhi and Caplat 2015).

Evolving Definitions and Scope of Agroecology

Over the past forty years, the definition of agroecology has evolved through four broadly distinct phases. In the first phase, agroecology was conceived in the 1980s as a set of methods and practices for the design of sustainable agricultures that conserve natural resources (Altieri 1987; Gliessman 1990). This definition of agroecology emphasized the need to restore a more balanced relationship and durable coexistence between agriculture and nature in the face of the growing negative impacts of industrial and Green Revolution farming. In the 1990s

—the second phase—agroecology was redefined as the application of ecological concepts and practices for the design and management of sustainable agroecosystems (Thomas and Kevan 1993). The “agroecosystem” became the fundamental unit of study, in which both biological processes and socioeconomic relations were to be researched as a whole, in an interdisciplinary manner (Altieri 1987).

At the heart of these definitions of agroecology is the idea that agroecosystems should mimic the biodiversity, structure, and functioning of natural ecosystems. Such agricultural mimics, like their natural models, can be productive, pest-resistant, nutrient-conserving, and relatively resilient to shocks and stresses such as climate change. The goals of sustainability and productivity are met through designing agroecosystems so that they enhance functional diversity at the genetic, species, ecosystem, and landscape levels. Functional diversity is of high ecological importance because it can influence several aspects of agroecosystem functioning like pest control, nutrient cycling, organic matter decomposition, yields, and resilience. Complementarities in time and space are created through the use of agroecological methods such as genetic mixtures, crop rotations, intercropping, polycultures, mulching, terracing, the management of diverse microenvironments for nutrient concentration and water harvesting, agro-pastoral systems, and agroforestry.

By the early 2000s, agroecology as a scientific discipline broadened its framing in a third phase, moving beyond the farm towards the study of food production, distribution, and consumption. This led to a new and more comprehensive definition of agroecology as “the ecology of food systems” (Francis et al. 2003). By focusing on the technical and institutional dimensions of the food system as a whole, agroecology embraced a holistic approach, in contrast to the partial and atomistic ones typical of agricultural and food sciences.³ In the 21st century, agroecology research has widened its focus to critically analyze the global food system and explore alternative food networks that relocalize production, processing, and consumption. This approach seeks to reinforce connections between producers and consumers by integrating agroecological practices with alternative market relationships and short food chains within specific territories (CSM 2016; Gliessman 2015; Kneafsey et al. 2008).

Initially, agroecology research methods reflected those in agronomy and quantitative ecology, for instance analytic descriptions of species diversity, comparative analysis of cropping systems, and experimental testing of hypotheses. More recently, qualitative research methods have been adopted as a way of understanding social, economic, and political dynamics in agri-food systems (Carroll et al. 1990; Gliessman 2015). This methodological pluralism reflects the large number of disciplines now involved in agroecological research, including ecophysiology, ecology, physical geography, economics, anthropology, and human geography (Wezel and Soldat 2009).

The definition and scope of agroecology has also been influenced by radical perspectives from critical agrarian studies and ethnographies of peasant societies. For example, Sevilla Guzmán and Woodgate (2015) have traced the origins of agroecology to neo-Narodnism, heterodox Marxism, and different strands of libertarian thought, including social anarchism (see also Sevilla Guzmán 2011).⁴ Building on the work of the Soviet agrarian economist Alexander Chayanov (1989), van der Ploeg has analyzed agroecological praxis as a form of resistance to capitalist modernization by agrarian social movements and peasants struggling for autonomy

(van der Ploeg 2009, 2013, 2020). This tradition of agroecology emphasizes “the ecological management of natural resources through forms of collective social action that develop alternatives to the current crisis of civilisation” (Sevilla Guzmán 2006).

Today, this more radical definition of agroecology has been adopted by a growing number of Indigenous and peasant organizations, activist scholars, and other social actors who are aligned with the global food sovereignty movement.⁵ For example, representatives of Indigenous and peasant communities from across the world described their transformative vision of agroecology at the recent International Forum on Agroecology in Mali:

Agroecology is the answer to how to transform and repair our material reality in a food system and rural world that has been devastated by industrial food production and its so-called Green and Blue Revolutions. We see Agroecology as a key form of resistance to an economic system that puts profit before life. . . . Our diverse forms of smallholder food production based on Agroecology generate local knowledge, promote social justice, nurture identity and culture, and strengthen the economic viability of rural areas. As smallholders, we defend our dignity when we choose to produce in an agroecological way.

(Nyéléni 2015)

Social movements and peasant organizations such as La Via Campesina thus strongly link agroecology to the notion of food sovereignty.⁶ For them, agroecology is based on the affirmation of the right to food as well as the rights of Indigenous peoples (UNDRIP 2007) and peasants (UNDROP 2019). An agroecology-based food sovereignty movement also asserts people’s right to decide their own food and agricultural policies (Anderson et al. 2015; De Schutter and Vanloqueren 2011; Nyéléni 2007). Based on a politics of emancipation, this people’s agroecology heralds an iterative transformation towards a more just and sustainable food system (Anderson et al. 2020; De Molina et al. 2019; Nyéléni 2015), and is rooted in the affirmation of people’s knowledge and collective political agency for self-determination.

Agroecology is thus increasingly viewed as a science, a practice, and a movement (Wezel et al. 2009), or a mingling of all three (Rivera-Ferre 2018). It is noteworthy that the High Level Panel of Experts on Food Security and Nutrition (HLPE) in the United Nations Committee on World Food Security recently defined agroecology as follows:

Agroecological approaches favour the use of natural processes, limit the use of purchased inputs, promote closed cycles with minimal negative externalities and stress the importance of local knowledge and participatory processes that develop knowledge and practice through experience, as well as more conventional scientific methods, and address social inequalities. Agroecological approaches recognize that agri-food systems are coupled social-ecological systems from food production to consumption and involve science, practice and a social movement, as well as their holistic integration, to address [food and nutritional security].

(HLPE 2019)

The HLPE's definition is important in the context of the Food and Agriculture Organization of the United Nations (FAO) because it reflects a growing official acknowledgement that social, cultural, and political aspects lie at the heart of the theory and practice of agroecology. However, major controversies swirl around the question of how this more holistic and transformative understanding of agroecology might be advanced.

A Contested Paradigm for Food and Farming

Barely mentioned by governments and much of the scientific community just a decade ago, agroecology is now increasingly recognized as a viable approach for addressing the multiple ecological and social crisis of the global food system (De Schutter and Vanloqueren 2011; FAO 2018a, 2018b; Rosset and Altieri 2017). Agroecology is viewed by many as key for mitigation and adaptation to climate change, for halting and reversing the widespread loss of biological diversity, and for contributing to the United Nation's Sustainable Development Goals (FAO 2018b; HLPE 2019).

However, agroecology is increasingly interpreted in very different ways by a diversity of social actors. Indeed, the term "agroecology" is used by different actors as a component of normative visions of the future that are polarized: either broadly seeking to conform to the dominant industrial food and farming regime, or to radically transform it (Levidow et al. 2014; Pimbert 2015a).

Given early 21st-century funding priorities for agricultural research and development, most scientists primarily focus on tweaking the industrial system by inventing "new" problem-solving approaches such as climate-smart agriculture (CSA) and sustainable agricultural intensification (SI), which are essentially "more of the same" (Royal Society 2009).⁷ CSA and SI approaches selectively incorporate agroecological practices to improve efficiency in resource use in farming, while also often promoting an eclectic mix of inputs and processes such as herbicide-tolerant crops, toxic insecticides, genetically modified seeds and livestock, proprietary technologies and patents on seeds, energy-intensive livestock factory farming, large-scale industrial monocultures, big data and digital-based precision farming, carbon-offset schemes, and biofuel plantations (Pimbert 2015a). When included in CSA and SI—or made to coexist with genetically uniform monocultures in homogenous farming landscapes—agroecological techniques end up conforming to the dominant agri-food regime and the logic of capitalist development (Levidow et al. 2014).

In sharp contrast to this business-as-usual scenario, transnational social movements such as La Via Campesina, grassroot NGOs and critical agroecological scientists are mobilizing to strengthen agroecology as a process of bottom-up construction of decolonized knowledge and innovations that need to be supported—rather than led—by science and policy (La Via Campesina 2013). They strongly reject an agroecology promoting "input substitutions" that maintain dependency on corporate suppliers of external inputs and global commodity markets, and leave untouched the structural vulnerabilities (ecological, economic, and social) of monocultures and linear agri-food chains. Instead, these social movements back a transformative agroecology based on a fundamental redesign and functional diversification of agroecosystems, as well as their integration with re-territorialized local and regional markets (CSM 2016).

In a comprehensive analysis of available evidence, Anderson et al. (2019) have shown that this kind of large-scale agroecological transformation depends on more inclusive democracy and justice in six key areas, or domains: access to natural ecosystems, including land, water, and seeds; systems of economic exchange and markets; knowledge and culture; social networks and local organizations; discourses; and equity, gender, and diversity.

Within each of these domains are structures and processes that constrain agroecology, and others that enable it. Indeed, Anderson et al. (2020) outlined how the different “governance interventions” of different actors have multiple effects on a transformative agroecology. Interventions that undermine agroecology have two effects: (i) *suppressing* agroecology by actively repressing and criminalizing it and (ii) *co-opting* agroecology by supporting it only to become equivalent to the dominant regime (i.e., “conventionalization”). Interventions that *maintain the status quo* enable coexistence by (iii) *containing* agroecology as elements of the dominant regime are strengthened and alternatives ignored and (iv) *shielding* agroecology from regime dynamics so it is less threatened. In contrast, agroecological transformation of agri-food systems are enabled by (v) processes that *support* and *nurture* agroecology to develop on its own terms and (vi) *release* agroecology from its disabling context by dismantling elements of the dominant regime and *anchoring the values, norms and practices* of agroecology within and between territories, and at different scales. Their analysis provides a way to understand the complex and highly charged political process that is creating major controversies and power conflicts at local, national, and global levels (Anderson et al. 2020).

Agroecological pathways to sustainable agri-food systems are thus frequently contested. For example, there are strongly diverging views on whether agroecology can feed the global population (for a recent discussion of this and other major controversies, see HLPE 2019). Ultimately, however, such controversies reflect conflicting paradigms of societal choices and people’s relationships with nature.

Agroecologists who seek to transform the dominant agri-food system often need to broaden their social imagination by more fully embracing approaches outside of capitalism, colonialism, racism, and patriarchy (Pimbert 2018a). In that context, a focus on the political economy of agri-food systems can help understand how—and why—agroecological pathways are constrained and marginalized or, alternatively, how they might be enabled and scaled out to more people and places. The wider academic literature on the political economy of agriculture and agrarian change can offer helpful insights in this regard.

First, studies of household decision-making reveal how farmers manage the complex social and ecological demands of farming while participating in social life and in the larger political economy (Flachs and Richards 2018). For example, a focus on decision-making by farming families is key to understanding the evolution of forest landscapes and the dynamics of environmental change in Amazonia (Moran et al. 2005). Analysis of Kekchi Maya household responses to local economic and ecological contexts shows that transformation of the rural economy and Mayan culture in Belize is shaped by the interplay of global and local processes (Wilk 1997).

Second, a large body of work on agrarian change shows how land relations and farmer risks change with the spread of capitalist relations of production. For example, Marxist scholars have examined capitalism’s plundering of nature *via* commodity production, and how it has led to the current metabolic rift in the Earth System (Foster 1999; Foster and Clark 2020). The

notion of “accumulation by dispossession” (Harvey 2005) offers a framework to better understand the unfolding power dynamics in food and agriculture—including past and present violent acts of land dispossession as well as the incorporation of peasant and Indigenous communities in global value chains through agro-industrial plantations, contract farming, and maximization of territorial rent (Giraldo 2019). The dominant food regime based on agro-extractivism depends on specific food circuits that enable the expanded reproduction of capital and exercise of specific forms of power (McMichael 2005). Several Marxist political economists have analyzed changes in land and labor induced by capitalist relations of production in food, agriculture, and land use (Barlett 1980; Chibnik 1981; Harriss-White 2012; Harriss-White and Janakarajan 2004; Kautsky 1988; Mann and Dickinson 2008).

Third, ethnographic studies on agrarian change also offer valuable insights. For example, intersectional inequalities within and between households of cotton farmers facilitate the extraction of surplus value from agriculture in Burkina Faso (Luna 2019). In Costa Rica and Latvia, the imposition of intellectual property rights on seeds replaces the centrality of social kin in farmer exchanges with bureaucratic transactions that facilitate a global process of commodification and control of seeds (Aistara 2011). These and other case studies in India (Brown 2018; Flachs 2017, 2019; Kumar 2016), Indonesia (Li 2014), the Philippines (Stone and Glover 2017), and the USA (Nelson and Stock 2018)—for example—all highlight the importance of locating discussions on agroecology and agrarian change within the larger political economy of agri-food systems.

Subverting the cultural project of capitalist modernity partly depends on consciously locating agroecology—as a science, practice, and social movement—in a wider political economy context. Similarly, developing agroecologies for many possible different worlds—a pluriverse (Kothari et al. 2019)—partly depends on learning from the rich history of knowledge, practices, and institutions embodied in Indigenous and peasant food and land-use systems. The work of anthropologists can offer many useful insights in this regard.

Mutually Constitutive Agroecologies and Anthropologies

Indigenous peoples and peasant communities have been using an array of agroecological practices for centuries (Berkes et al. 2000; Dharampal 1983; Gómez-Pompa and Kaus 1992; Gómez-Pompa et al. 2003; Jones 1936; King 1911; Maezumi et al. 2018; Netting 1993; Toledo 2000; Toledo and Barrera-Bassols 2008). Ethnographers and anthropologists have been among the best documenters of local agricultural and land-use systems that incorporate principles similar to those of agroecology.

Many anthropologists have typically spent a year or more living with Indigenous and peasant communities and working with them while doing field research. They often studied not only local farming practices but also the forms of economic exchange, customary rules, and other institutions involved in the production, processing, exchange, distribution, preparation, and consumption of food and fiber.

A critically important understanding of society and nature thus resulted from the decisions of anthropologists to study what Indigenous peoples and peasant farmers were already doing. Across time and space, the study of Indigenous and peasant agroecological practices has offered many insights and new knowledge to different fields of anthropology—from

ethnobiology to social and economic anthropology, from historical ecology (Balée 2006; Ellen 2008) to multispecies ethnography (Miller 2019; Tsing 2015). In turn, different domains of anthropology have offered new insights for the theory and practice of agroecology, and continue to do so today. In this sense, anthropology and agroecology can be seen as mutually constitutive.

Agroecology has typically provided scientific explanations for many traditional farming and land-use practices of Indigenous and peasant communities (Altieri 1995; Gliessman 2015). In his discussion of the history of sciences, Thomas Kuhn (1979) says that in many cases scientists succeeded in “merely validating and explaining, not in improving” techniques and social institutions that had been developed earlier by such communities.

Kuhn’s remark is broadly relevant to the production of both anthropological and agroecological knowledge. It is also a reminder of the huge—and largely unrecognized—intellectual contributions that generations of Indigenous peoples and peasant communities have collectively made to current knowledge on biophysical, economic, and social phenomena (Levi-Strauss 1996; Posey 1999). Indeed, a decolonized history of BIPOC (Black, Indigenous, and people of color) contributions to agroecological and anthropological knowledge has yet to be written (see Box 1). This is a frontier for future research.

Box 1. Decolonizing Knowledge

Within agroecology and anthropology, the diversity of knowledge and cultures is generally valued. However, academics in these fields often overlook the racialized characteristics of global capitalism and its deep historic links with the racism and heteropatriarchy of colonialism and slavery. They are often also unaware of or indifferent to the complicity of Western scientific traditions in past and ongoing neocolonial dynamics. An approach to knowledge that glosses over the colonial basis of the material, cognitive, and spiritual dimensions of our world systems generally serves to further exacerbate the coloniality of knowledge.

Based on discredited ideas of racial superiority and inferiority, from the 15th to the mid-20th century, European imperialism instigated a brutal system of chattel slavery and directly colonized and ravaged the majority of the world (Bhambra 2014a, 2014b; Quijano 2000; Said 1978; de Sousa 2015; Tuhiwai Smith 2012). Violent colonial logics go hand in hand with modernity and define today’s world systems. Scholars specializing in decolonialization assert that modernity and colonialism interlink as one process, described as modernity/coloniality (Grosfoguel 2006, 2011; Mignolo 2007a, 2007b). Knowledge production during this historical period was mobilized to serve colonial logics and narrated Indigenous peoples and colonized bodies as less than human and culturally inferior (Said 1978; Wynter 2003). The existence and voices of colonized women, other sexualities and genders were doubly erased (Lugones 2014).

Knowledge processes in anthropology and the humanities objectified and denied the social agency of the colonized subject; imperial power simultaneously obliterated Indigenous and non-European knowledges (Bhambra 2014b; Tuhiwai Smith 2012). By

doing so, the relationship between colonial power and knowledge effectively rendered modernity as European, and thereby maintained the ongoing erasure of colonized cultures, humanity, and knowledges (Bhambra 2014a, 2014b). As such, knowledge production became a thoroughly Eurocentric process. Current epistemologies continue to be marked by these colonial logics (Bhambra 2014b; Chilisa 2020; Grosfoguel 2007; Scheurich and Young 1997); that holds for anthropology and some of its contributions to agroecology (Asad 1973; Harrison 1991; Hymes 1969; Mogstad and Tse 2019).

While most former colonial states have been liberated from formal colonial rule, uneven power relations persist, and continue to shape the global knowledge economy and social relations (Mignolo 2007a). Inequalities thus persist between the Global South and North in terms of material reality and within the knowledge economy (de Sousa 2008).

Further, the role of structural inequality, discrimination, and oppression based on anti-Blackness, race/caste, ethnicity, class, gender, sexuality, and many more differences (de Sousa 2008) are rarely explicitly engaged with in agroecological research. It is vital therefore to situate agroecology in a decolonial and historical perspective, given its emphasis on Indigenous knowledge and social justice. In this regard, the work of Linda Tuhiwai Smith (Tuhiwai Smith 2012) and Bagele Chilisa (2020) are key references for decolonizing research and help to differentiate postcolonial from decolonial research.

Indigenous communities in settler-colonial states such as Canada or Australia, and many other communities affected by colonialism, continue to struggle for their territories (LaDuke 1999; Tuck and Yang 2012). For example, the Anishinaabeg people on the White Earth Indian Reservation in Minnesota are reviving the cultivation of a traditional food of the Ojibwe people, wild rice. As they reclaim their agroecological practices, they honor the legacies of the Ojibwe people to food and farming as an act of resistance to white supremacy and colonial domination (LaDuke 2016). However, it is debatable whether mainstream agroecology and anthropology place enough importance on Indigenous claims for land/self-determination, or adequately respond to the intersectional political challenges of anti-Blackness, racisms, and heteropatriarchy (Barry et al. 2020; Bradley and Herrera 2016; Chilisa 2020; Kelly et al. 2020; Kepkiewicz and Dale 2019; Pels 2018; Tuhiwai Smith 2012).

Agroecology-based Indigenous and peasant practices have made important contributions to the development of anthropology and, in turn, anthropology continues to offer insights for the theory and practice of agroecology today.

Ethnoecology and Indigenous Agricultural Practices

The study of Indigenous and peasant agricultural systems has directly contributed to the development of ethnobiology and ethnoecology (Anderson et al. 2011). Through ethnoagricultural analysis, anthropologists have better understood the importance of local ecological knowledge and Indigenous classifications of soils, plants, animals, local weather

patterns, and other biophysical processes. Researchers such as Alcorn (1984), Balée (2013), Brokensha et al. (1980), Bremen and deWitt (1983), Conklin (1956), Fairhead and Leach (1996), Kimmerer (2013), Posey (1985), Richards (1985), Sullivan and Homewood (2018), and Watts (1983), among others, have studied Indigenous production systems and their associated categories of knowledge on environmental dynamics and agricultural practices.

For example, Conklin's (1956) seminal ethnographic study of Hanunoo agriculture in the Philippines revealed the ecological complexity and sustainability of different types of shifting cultivation. His work highlighted the importance of multicropping, high levels of crop genetic diversity, rotation cropping, and agroforestry in the entire production framework of shifting cultivation. He also emphasized the benefits of tapping into this rich source of Indigenous agroecological science.

Agroecology today develops by building on the "science of the concrete" (Levi-Strauss 1996) developed by men and women among farmers, Indigenous peoples, pastoralists, fisherfolk, and forest dwellers. Unlike most agricultural research and development, agroecological approaches consciously seek to combine the knowledge of peasant farmers and Indigenous peoples with the latest insights from the science of ecology. This transdisciplinary approach (Méndez et al. 2016) makes sense because Indigenous and peasant production systems—and the local knowledge they embody—are effective responses to place-specific challenges and opportunities. On the whole, this time-tested experiential knowledge has allowed communities to derive their food and livelihoods in diverse contexts and in culturally specific ways, as documented by anthropologists. Five broad categories of such knowledge are particularly useful for the development of agroecological science and practices today (see Box 2).

Box 2. The Five Aspects of Indigenous and Peasant Knowledge Central to Modern Agroecology

Five areas of Indigenous and peasant knowledge are particularly important for agroecologists:

Local taxonomies: detailed knowledge and classification of different types of soils, plants, animals, weather systems, and ecosystems.

Ecological knowledge:

- i. Climate, winds, topography, tides and water currents, minerals, microclimates, plant communities, and local ecology.
- ii. Knowledge of structures, and dynamic processes and relations such as the influence of the moon and other planets on growth cycles of crops and livestock.
- iii. Knowledge of human-made landscapes through coevolutionary action of communities and nature—Indigenous understandings of the environmental history of cultural landscapes.

Knowledge of farming and land-use practices:

- i.

Functional biodiversity, such as the intentional mixing of different crop and livestock species and varieties to stabilize yields, reduce the incidence of diseases and pests, and enhance resilience to shocks and stresses.

- ii. Optimal use of resources and space, including terracing.
- iii. Recycling of nutrients.
- iv. Water conservation and management, including the creation of swales and reservoirs as well as multiscale Indigenous irrigation systems.

Experimental knowledge that stems from:

- i. Careful observations and systematization of dynamic processes over time, space, and multiple scales.
- ii. Use of domesticated and wild plants and animals for food preparation and the creation of new recipes within distinct food cultures.
- iii. Active experimentation. For example, farmers' seed selection, as well as their animal and plant breeding, has generated a myriad locally adapted crop varieties and animal breeds. Indeed, most of the world's crop and livestock genetic diversity we still see today is an embodiment of the knowledge and creative work of previous generations of women and men farmers across the world.

Conceptualizations of other species' agency and value:

- i. Understanding plant and animal behavior in ways that accord self-directed agency and value.
- ii. Understanding human communities as part of a complex web of life.
- iii. Recognizing the mutual dependencies between humans, nonhuman species, and other elements of the world (rocks, winds, rivers).
- iv. Forming and sustaining active relationships to the more-than-human world based on these conceptualizations.

While some of these Indigenous and peasant knowledge systems still exist, many have been disrupted or destroyed by colonialism, enslavement, the expansion of industrial plantations and capitalist agriculture, mining and other extractive industries, racist violence, and genocide. Only fragments of this rich legacy of knowledge remain, in the academic writings and notebooks of ethnographers and anthropologists.

Nevertheless, both the past and present intellectual contributions of Indigenous and peasant communities are crucially important for agroecologists. For example, the anthropological study of food, culture, and society has much to offer in reconceptualizing agroecology, which currently neglects the role of food preparation and consumption in diverse cultures (Morgan and Trubek 2020), so that it is transformative. Indigenous and peasant knowledges (cf. Box 2) can also help heal the metabolic rift between humanity and nature (Foster 1999; Foster and Clark 2020) and build probiotic, multispecies alliances (Lorimer 2020).

The material basis of production (such as soil health, biodiversity, peasant seed systems, water) can indeed be regenerated by using modern agroecological approaches based on the practices of Indigenous and peasant communities (see Boxes 2 and 3).

Box 3. Six Modern Principles of Agroecology That Originated in Indigenous and Peasant Knowledge and Practice

- Adapting to the local environment and its diverse microenvironments.
- Creating favorable soil conditions for plant growth and recycling nutrients, particularly by managing organic matter and encouraging soil biological activity.
- Minimizing losses of energy, water, nutrients, and genetic resources by enhancing the conservation and regeneration of soil, water, and agro-biodiversity on the farm and in the neighboring landscape.
- Diversifying species, crop varieties, and livestock breeds in the agroecosystem over time and space—including integrating crops, trees, and livestock at the field and wider landscape levels.
- Strengthening the “immune system” of agricultural systems through the enhancement of functional biodiversity—natural enemies of pests, allelopathy, and antagonists, for instance, by creating appropriate habitats and through local adaptive management.
- Enhancing beneficial biological interactions and synergies throughout the system and among the components of agricultural biodiversity, thereby promoting key ecological processes for sustainable production and resilience to stresses and shocks.

(Adapted from Altieri 1995; Gliessman 2015).

Agroecological diversification at the farm level is important in this context. However, the bigger challenge for the future is ensuring that land use focuses on creating mosaics of agricultural areas and patches of wild biodiversity at multiple scales (Perfecto et al. 2009; Perfecto and Vandermeer 2017). This “natural matrix” model sustains a variety of habitats and microenvironments and a diversity of wild species (such as algae, flowering plants, insects, amphibians, reptiles, birds, and mammals), many of which are edible and often key for the provision of ecosystem functions such as pollination. Applying this model along the rural-urban continuum would structurally and functionally recreate many of the biodiversity-rich cultural landscapes developed over large geographical areas by Indigenous and peasant communities in the Americas, Africa, Asia, and Europe (Alcorn 1984; Anderson et al. 1985; Ford and Nigh 2015; Gómez-Pompa and Kaus 1992; Mann 2011; Pimbert and Borrini-Feyerabend 2019; Posey 1985). And such revitalization of ecosystems through agroecological transformations would in turn help to sustain livelihoods and rebuild the material basis of economic life (IPBES 2019) while keeping the impacts of agriculture within safe planetary limits (IAASTD 2009, 2020; Steffen et al. 2015).

Economic Anthropology and Agroecology-Based Systems of Exchange

Anthropologists have helped to reveal the diversity of human economies on different continents (Carrier 2012; Hart et al. 2010). From the 1870s to the 1940s, several anthropologists initially focused on whether the economic behavior of “primitive” societies was guided by the same notions of efficiency and rationality that “underpinned a Western industrial society striving for universality” (Hann and Hart 2011).

The ethnographic fieldwork of Richard Thurnwald (1932) in New Guinea during World War I demonstrated the significance of reciprocity as a fundamental principle of social organization in what he referred to as “primitive” economics. Similarly, Bronislaw Malinowski’s intensive field observations in Melanesia revealed the propensity of the Trobriand islanders to transfer goods as gifts through a complex system of inter-island trade, organized without markets and money, as well as “ceremonial barter” based on *kula* objects (Malinowski 1922). In contrast, the sociologist Marcel Mauss argued in *The Gift* (1925) that money and markets were human universals, though not in their current (that is, capitalist) impersonal form. According to Mauss, economic relationships between entire social groups were mediated by gift-exchanges, services performed out of obligation, and a whole range of things people can do for each other (Mauss 1925).

The insights of economic anthropology derived from the study of Indigenous and peasant societies may help in designing an enabling economics for agroecology-based systems. Transforming production, processing, distribution, consumption, and waste disposal for sustainability calls for a new economics, not just technical change. Knowledge from economic anthropology could help agroecologists and policymakers broaden their vision and assumptions about economic organization, the creation and circulation of wealth, and economic exchanges in food and farming. At this critical moment in history, “decolonising our economic imagination” (Latouche 2011) is key for the development of a diversity of relocalized agri-food systems, embedded in territories that are undergoing agroecological transformations for sustainability and justice.

Insights from economic anthropology can help rethink and transform agri-food systems in several ways.

Circular Economies to Relocalize Production and Consumption

Planetary limits are currently being vastly exceeded (Steffen et al. 2015, 2018). Reversing these trends partly depends on restructuring and relocating food and fiber production, processing, distribution, and consumption within decentralized, democratically governed, and circular systems (Jones et al. 2012; Pimbert 2018b). Anthropological observations on the organization of Indigenous and peasant economies that focus on how material resources are sourced (Narotsky 2012), distributed and redistributed (Polanyi 1957), as well as consumed (Colloredo-Mansfield 2012), are particularly relevant here.

For example, Kropotkin’s ethnographic studies of the metabolism of peasant economies played a key role in shaping his vision for an industrial-agrarian mutualism, which he details in *Fields, Factories and Workshops* ([1898] 1913). Kropotkin’s ideas on how to overcome the

spatial inefficiencies of capitalist production and generate synergies between industry and agriculture are echoed today in some research on circular economies (such as Isenhour and Reno 2019; Jones et al. 2012; Pimbert 2012).

These ideas can help agroecologists develop and promote circular systems that mimic natural ecosystems at different scales—from individual farm plots to landscapes and cities. The building blocks include enhancing functional biodiversity, ecological clustering of industries, recycling, and localized production and consumption in specific territories (Pimbert 2015b). Most significantly, circular systems that combine food and energy production with water and waste management can reduce carbon and ecological footprints, while maintaining a good quality of life through controlled processes of de-growth in consumption and production (Latouche 2019). As shown by Cullen et al. (2011), “achievable design changes” could reduce global energy consumption by 73 percent. Economic restructuring based on agroecology and the eight “Rs” (re-evaluate, reconceptualize, restructure, redistribute, relocalize, reduce, reuse, and recycle) are indeed key for climate change adaptation and mitigation because agri-food systems alone are responsible for close to 40 percent of global greenhouse gas emissions (IPCC 2020).

Breaking Out of the Box of Dominant Economics

Field work and comparative studies have highlighted many distinct forms of economic exchange in Indigenous and peasant societies (Malinowski 1922; Polanyi 1968; Sahlins 1972; Reclus [1891] 2016). In all cases studied, the “economy includes more than markets or the market like exchange of goods and service” (Gudeman 2012). In *The Great Transformation*, the economic historian Karl Polanyi (1957) shows how Indigenous and peasant economies were submerged in social relationships. Factors of production were neither monetized nor commodified. While many of these societies did have marketplaces, they did not have self-regulating, supply-and-demand market economies. Money (in different forms) was employed in several precapitalist societies, but it was only used in transactions involving a limited range of goods and services (Mauss 1925; Mellor 2019). This is in sharp contrast with the market capitalism that became uniquely and increasingly dis-embedded and disconnected from the social matrix from the 19th century onwards (Polanyi 1957).

Drawing on historical and anthropological evidence, Rist (2013) shows how mainstream economic science rests on beliefs and assumptions that are deeply committed to commodifying social relations and nature. “Economic science” is highly ethnocentric, and reflects colonial and parochial views that prevailed in Europe between the late 18th and mid-19th century. Mainstream neoclassical economics rests on a set of half-truths and presuppositions that are shown to be either obsolete or just plain wrong—including the idea that all individuals are self-interested and rational calculators with unlimited wants (Rist 2011).

These insights from economic anthropology invite agroecologists to think “outside the box” and imagine the radical possibility of creating forms of economic exchange outside the dominant commodity capitalism that underpins global agri-food systems and land use. Developing socially just and ecologically sustainable systems of exchange for agroecological production requires intellectual resources that can help exit the “dismal science” (economics)

that props up capitalism and modernizing development (Gibson-Graham 2006; Hill 1986; Rahnema and Bawtree 1997). Embracing diverse definitions of well-being and wealth is urgently needed to heal the current “metabolic rift” between society and nature.

In this context, a major challenge for the theory and practice of agroecology is to adaptively develop forms of economic exchange between producers and consumers that are based on radically different principles such as reciprocity, partitioning economic activity via money and nonmonetary based markets, solidarity, and gift relations—all of which have served to deeply embed economics in society throughout much of human history (Bliss and Eger 2020; Gibson-Graham 2008; Graeber 2011; Gudeman 2001; Mauss 1925; Polanyi 1957; Rist 2011). The “subsistence perspective” is useful here in that its economic framing is holistic, and simultaneously focuses on the productive and reproductive labor of women, peasants and Indigenous peoples, and nature (Salleh 2017).

The Subsistence Perspective

Agroecology and anthropology intersect conceptually in the “subsistence perspective” developed by ecofeminists since the 1970s (Mies and Bennholdt-Thomsen 1999). Formulated through work with peasant and Indigenous women, it is a call for a new economics and politics (Salleh 2017), and connected to ideas of de-growth (Latouche 2011, 2019; Muraca 2013), commons (Federici 2018), and economies of marginalized, hidden, and alternative communities (Gibson-Graham 2005, 2008). Its radical proposition is that a society should be organized around the necessities of life (care, food, water, shelter), that their provision should be based on need rather than wealth or status, and that these life-sustaining activities should be performed in awareness of humanity’s mutualistic entanglements in a complex web of life.

Past and present debates on social reproduction (Bhattacharya 2017; Federici 1975; Katz 2001), peasant economies, agrarian change, and the enclosure of commons (Clement et al. 2019; Luxemburg [1913] 1951; Meillassoux 1972; Mies 2014; Perelman 1984; Scott 1976; Thompson 1963) show that the organization of labor as commodity—and hence the economy as we know it—was possible only once people had been violently separated from their means of autonomous subsistence. The enclosure of land and natural resources was a central factor in this separation (see, *inter alia*, De Angelis 2007; Federici 2004; Thompson 1991), and, in order to institute individual freedom of contract, it was necessary to eradicate noncontractual social relations, such as “kinship, neighbourhood, profession, and creed” (Polanyi 1957).

Agroecological practices on farms and in landscapes aim to restore and enhance ecological health, biodiversity, soil fertility, and access to land through community (re)building. Such practices are based on the understanding that the health of soil is reflected in community, individual, and planetary health (Balfour 1943; Howard 1947; Wall et al. 2015), and that the act of eating is an agricultural act (Berry 1990), shaping bodies and habitats.

From the subsistence perspective, regenerating fertility, autonomy, and community health depends on a cyclic economy based on care, the valuing of productive and reproductive labor as well as the labor of nature, and on local engagement of communities with a permanent regeneration of the humanity–nature metabolism (Salleh 2017).

An Anthropology of Reversals for Democracy and Inclusion in Agroecological Transformations

Overturing Asymmetries of Subsistence

Building on the insights of the economist Rosa Luxemburg ([1913] 1951) that capitalism requires noncapitalist classes, societies, and dimensions to continuously expand, the subsistence perspective brings into focus colonial and neocolonial exploitation of slaves, peasants, and workers in so-called developing countries, as well as exploitation of housewives, and domestic and precarious workers, in the so-called informal sector everywhere. While subsistence-based livelihoods are being undermined by myriad forces, the usually unpaid and sometimes poorly paid labor of everyday reproduction is indispensable for the continuous functioning of the global economy.

It is widely known that it is primarily women who do the bulk of work aimed at keeping everyone fed, warm, and healthy, while decision-making is primarily in the hands of men (Benería 1979; Mies 1981). Attention to interpersonal, intra-family, and wider community relations reveals these asymmetries in workload and decision-making power in rural, peasant, and Indigenous settings, as well as in cities. In communities no longer devoted to agriculture, women remain the primary caretakers of all reproductive needs in the family—that is, food preparation, cleaning, washing, personal hygiene, preparation of medicines or organization of medical attention, even when they work full time outside the home (Federici 2012).

Yet differences of race, class, sexuality, age, ability, and other factors intersect with the gendered division of labor in ways that produce heterogeneous experiences of women and men in terms of their daily reproduction and their engagement with food and fiber production—for their own or other people's subsistence. Agroecology increasingly integrates social, cultural, and political analysis, and academics as well as practitioners in the field are beginning to pay detailed ethnographic attention to interpersonal power dynamics at play in fields, farms, markets, and food systems. However, work remains to be done on how difference produces uneven experiences of exploitation and empowerment in reproductive, life-making practices.

Agroecology and Cognitive Justice

Agroecological solutions are not delivered from the top down. They are developed through respectful intercultural dialogue between scientists, and farmers, and citizens—building on people's priorities, knowledge, and culture. When agroecologists sensitively engage with and affirm local Indigenous and peasant knowledge, and recognize Indigenous peoples and peasants as knowledge producers, they work against epistemicide: the killing of knowledge systems (de Sousa 2015).

At a deeper level, however, decolonizing knowledge (Box 1) demands an active and reflexive approach that directly confronts the coloniality of power (Menzies 2001; Donato da Silva et al. 2019; de Sousa 2008; Tuhiwai Smith 2012). Connell (2018) identifies three issues relevant for advancing the agenda of decolonization.

The first is the recognition that the global knowledge system is deeply unequal, and dominated by the Global North (Connell 2018). Today, science and academic knowledge are predominantly developed and controlled by experts in Europe and North America. In a systemic analysis of agroecological research by Luis Fernando Gómez and colleagues (2013), they found that academics in the Global North conduct research wherever they like, but do not publish in outlets based in the Global South in their native languages, thus limiting the utility of this knowledge in the local context and language. Meanwhile, academics in nonindustrialized countries rarely conduct research outside of their borders and publish wherever they can (Gómez et al. 2013). A key challenge for proponents of agroecology is to grapple with these systemic inequities to ensure that the knowledge, wisdom, and perspective of voices from the Global South are recognized, valued, and fully represented in scholarship, policy, and social movement mobilizations (Peoples Knowledge Editorial Collective 2017).

The second issue lies in who asks the questions and who decides on methodologies (Connell 2018). To decolonize is to develop methodologies that work with and center communities seen as “other,” so that their perspectives can be mobilized in a respectful and meaningful way (Grosfoguel 2011; Radcliffe 2017; Tuhiwai Smith 2012). In agroecology, this means focusing on the perspectives of women, Indigenous, and other groups discriminated against because of their race, ethnicity, sexual identity, religion, or caste (Keller 1985; Pimbert 2018a). The work of Black feminists in particular has shown how racialized discrimination interlocks with heteropatriarchy, and how the lived experiences of women differs significantly among groups (Bhambra 2015; Crenshaw 1991; hooks 1994; 2000; Ujuaje and Chang 2020). There is a growing recognition therefore that emphasizing the intersectional perspective is a fundamental for agroecology if it is to advance notions of social justice and equity (Bradley and Herrera 2016; Ferrando et al. 2021; Montenegro de Wit 2020; Penniman 2018; White 2018).

Bradley and Herrera (2016) have noted the nuanced and complex ways in which whiteness pervades food movements in North America, for instance, in the romanticizing of agriculture, the exclusion of people of color from the movements, the exoticizing of others’ food cultures, and the lack of questioning around structural racism and heteropatriarchy in society. They suggest that researchers address how their scholarship, and the institutions in which they are embedded, reproduce white supremacy and gendered heteronormative hierarchies in knowledge production (Bradley and Herrera 2016; see also Kelly et al. 2020). The recent Black Lives Matter uprisings have also brought into sharp focus the disconnect between antiracism and agroecology scholarship (Montenegro de Wit 2020). Maywa Montenegro de Wit (2020) argues that agroecology intentionally centers around antiracism and learns the lessons from abolitionists, such as Angela Davis, in order to radically confront racialized capitalism in the food system and elsewhere. This work is already underway. For example, Leah Penniman at Soul Farm provides space for Black and Brown farmers to learn and develop their activism. Soul Farm also coordinates a reparations movement for Black farmers as a proactive way in which agroecology can face the history of slavery, dispossession, and ongoing racism (Penniman 2018).

The third issue is related to the way knowledge is made—the construction of epistemologies that drive knowledge-making, and the historical and contemporary privileging of Eurocentric epistemologies (Chilisa 2020; Connell 2018; de Sousa 2008; Tuhiwai Smith 2012).

Tackling this involves rejecting the universalization of people's experience and recognizing a pluriversal world—a “world of many worlds, each with its own ontological and epistemic grounding” (Escobar 2020). These pluriversal worlds are erased by the coloniality of knowledge, but it is from their multiple positionalities that alternative futures can emerge—ones radically more sustainable and just than proposed solutions emerging from the universalist-modern perspective that pervades developmentalist thinking and practice. Such a shift will also require the cultivation of processes and spaces that allow for respectful dialogue between plural knowledges, rather than negating or advancing one knowledge system over the other (Hall and Tandon 2017; Menzies 2001; Pimbert 2018a). This is about facilitating a rich “ecology of knowledges” where the power of different types of knowledges are considered in a reflexive way so that one knowledge system does not dominate—a process which some scholars have called cognitive justice (de Sousa 2008).

Democratizing Governance for Agroecological Transformations

Agroecological transformations are usually informed by political knowledge derived from the experience of oppression and dispossession, of “becoming developed,” and of neocoloniality. This knowledge often underpins a lived political theory of agroecology that affirms Indigenous and peasant rights to food sovereignty (Amin 2018; Nyéléni 2007, 2015). The right of people to decide their own food and farming policies is central to the food sovereignty paradigm, and depends on people participating in democratic and inclusive governance (Pimbert 2009).

More generally, agroecology follows a bottom-up logic, emphasizing local knowledge and grassroots innovations as well as ecology, diversity, and emergent complexity. As agroecology-based agri-food systems spread and scale out to more people and places, a decentralized and distributed decision-making process is needed for local adaptive governance and ecosystem management. This should be based on the principle of subsidiarity where decisions are made at the local level and at the most appropriate scale by people affected by them (CBD 2002; Pimbert 2018b).

Most notably, the adaptive management of agri-food systems requires people's direct participation in local decision-making and inclusive deliberative democracy within and between territories. Agroecology transformations thus fundamentally challenge governments and wider society to adopt forms of participatory governance that counter centralization, top-down blueprint planning, uniformity, control, and coercion.

Insights from history and radical anthropology suggest two possible routes to more democratic and inclusive governance of agri-food systems and agroecological transformations.

The first is reforming the state to ensure that national, provincial, and municipal governments can support the bottom-up, decentralized, and diverse participatory processes that are key for successful agroecological transitions and sustainability at the territorial level. A shift to a more enabling state demands fundamental transformation of the organizational structures, operational procedures, budgets, professional culture, and practices that mediate state-led governance (Chambers 1993; IIED and IDS 2000; Illich 2005; Korten 1984, 1988; Pimbert 2004). A rich body of research has documented the role of state, corporate, NGO, and agricultural extension programs in displacing the local knowledge and farming systems that form the basis of agroecology (Anderson et al. 2020; Chambers 1997; Kloppenburg 2004;

Scott 2020; Sivaramakrishnan and Agrawal 2003). The dominant knowledge embodied in the organizational culture of state government often needs to be fundamentally transformed to enable governance regimes that can support agroecological pathways to sustainable food systems.

For example, narrow-lens, universal, and reductionist explanatory models used by government bureaucracies have generated a crisis in agriculture and natural resource management through their inability to come to terms with the dynamic complexity and variation within and among ecosystems (Gunderson et al. 1995). Transforming government bureaucracies is thus a huge challenge. Nevertheless, there is an abundant literature that works on the assumption that the nation state can be reformed for the better, not only within Marxist and liberal political anthropology (such as Diamond 1979; Greenhouse 2018; Marcus and Menzies 2005) but also in studies of the anthropology of change in organizations and large bureaucracies (Goetz 1997; Sharma and Gupta 2005; Wright 1994). This literature suggests avenues for future research on enabling state-led governance for large-scale agroecological transformations.

The second approach seeks to strengthen governance by, with, and for people. People-led forms of governance do not necessarily take the nation state as a given. Indeed, in some cases, these governance models reject the state and its system of government. Such regimes are based on self-managed grassroots networks that engage in inclusive and directly democratic deliberative processes for policy making and institutional choices.

In this regard, grassroots, critical, and popular education have been shown to be vital not only in developing agroecology, but also in culturing new forms of governance and political movements (Anderson, Maughan, et al. 2019; Fasih et al. 2003; McCune and Sánchez 2018; Meek and Tarlau 2016). For example, David Meek's work shows how critical processes of food systems education in the Landless Farmer's Movement (MST) in Brazil have been integral to building agrarian social movements. Tarlau's work on the MST (2019) shows how the movement has also strategically engaged with the state educational institutions (schools and universities) to advance their vision for social transformation from below. Farmer Field School (FFS) in Indonesia initially focused on agroecological learning for pest management in rice farming and then expanded into critical education for advocacy and political literacy (Fasih et al. 2003; Pontius et al. 2002). Farmer-led FFS enabled Indonesian farmer networks to develop knowledge for a Peasant Rights Charter in Indonesia. This prefigured thinking that has since spread throughout the international food sovereignty movement—see, for example, *La Via Campesina's* "Declaration of Rights of Peasants" and its call for an International Convention on the Rights of Peasants (La Via Campesina 2009). The collective knowledge developed by Indonesian peasant networks two decades ago thus provided governance norms that are now reflected in the United Nations Declaration on the Rights of Peasants and Other People Working in Rural Areas (Claeys 2015; Golay 2020; Pimbert 2018a), which was adopted by the UN General Assembly in 2018 (UNDROP 2019).

At larger geographical scales, governance is achieved by people organizing for widespread democratic coordination within territories and beyond. The architecture of such governance is based on federations of people's local councils linking villages, communes, towns, neighborhoods, local economies, ecosystems, and territories to act as a significant counterpower to the state and transnational corporations. The emphasis is on direct

deliberative democracy that respects and includes the voice and agency of the very poor and marginalized (especially BIPOC and women). Decision-making, the creation of new knowledge, institutional choices, and accountability are founded on thinking and practices that break with traditional ideas about central rule, control, and hierarchy.

This vision of governance is based on the experience “that it is possible and desirable for society to organize itself without government” (Ward 1973). However, the perspective is not common in anthropology and agroecology scholarship today. It draws on different traditions of social anarchism and libertarian socialism (such as Bookchin 2005, 2015; Kropotkin [1913] 2015; Macdonald 2009; Proudhon 1979; Reclus 1898). In this context, anthropological studies such as *People without Governments* (Barclays 1982), *Society against the State* (Clastres 1977), and the sensitive ethnographies of Dorothy Lee (1959) on Native American cultures are useful, along with lessons from current experiments in democratic confederalism and libertarian municipalism in Kurdistan (Bance 2017; Öcalan 2011, 2017). All these sources can help design more democratic and decentralized forms of governance for agroecological transformations.

However, inclusive governance principles that work for equitable and sustainable agri-food systems need to be adapted to each new context, rather than simply be emulated or transposed from the past.

In summary, large-scale shifts to agroecology-based systems partly hinge on the development of governance that is deeply democratic, and rejects intersectional discrimination (for instance, regarding caste, gender, or race). Moreover, governance for the common good needs to have the capacity to tackle the inequitable power relations that underpin the dominant regime and “lock in” industrial food and farming as the norm (Anderson et al. 2020; IPES-Food 2016). How to do this in practice is a surprisingly neglected area of study. This section has pointed to new research on what type of governance might enable more participatory democracy and inclusion in agroecology-based agri-food systems.

Conclusion

While agroecology as a field has been around for almost a century, it draws from deeper traditions of academic thinking in anthropology and adjacent fields, as well as millennia of practices devised by Indigenous and peasant societies. The field has grown slowly and steadily through the 21st century, yet in the last few decades there has been an explosion of scholarship and interest in agroecology. Agroecology is increasingly viewed as an alternative to the corporate global industrial agri-food system that is demonstrably driving multiple intersecting crises, including climate change, biodiversity collapse, pandemics, overshoot beyond safe planetary limits, malnutrition, and food insecurity as well as gross inequity (Anderson et al. 2020; IAASTD 2009; IPBES 2019; IPCC 2020; FAO et al. 2020; Steffen et al. 2015; UNEP et al. 2020; Wallace et al. 2020). A rich and significant future for agroecological scholarship seems in store.

The timely exploration of the relationship between agroecology and anthropology has shown how the study of Indigenous and peasant agri-food systems is pivotal for the development of agroecology. Insights gained from Indigenous peoples, peasants, and BIPOC can help decolonize and expand the purview of agroecologists who seek to transform the dominant

regime through science, regenerative practices, and the agency of social movements. People's knowledge, codified in progressive ethnobiology, economic anthropology, cultural and political anthropology, and respectful intercultural dialogues between scientists and local knowledge holders can help in envisioning, co-constructing, and facilitating deep agroecological transformations in the following realms:

- Ecological: reorganizing the material basis of agri-food systems in the image of nature to reflect ecological processes and regenerate diversity (genetic, species, ecological), resilience, and sustainability—from farm plots to landscapes along the rural-urban continuum.
- Economic: adopting plural forms of economic exchange (for instance, markets with and without money, basic income) to ensure care for people and nature, material security, sustainable livelihoods, and well-being in relocalized agri-food systems and territories in which economics is re-embedded in society.
- Social equity and gender justice: developing ways of knowing, pedagogies, new knowledge, institutions, policies, and practices that challenge and reverse intersecting coloniality, homophobia, patriarchy, and racism.
- Political: expanding people's direct participation and inclusion in the democratic governance of agri-food systems and the territories they are rooted in.

These are important frontiers for future research in agroecology.

Links to Digital Materials

Agroecology: Vision, Practice Movement—Voices from Social Movements [<http://www.agroecologynow.com/video/ag/>](http://www.agroecologynow.com/video/ag/)

Agroecology Compass [<http://www.agroecologycompass.net/>](http://www.agroecologycompass.net/)

The Principles of Agroecology [<https://www.agroecology-europe.org/our-approach/principles/>](https://www.agroecology-europe.org/our-approach/principles/)
—CIDSE (multimedia)

Agroecology Knowledge Hub, Food and Agriculture Organization of the United Nations [<http://www.fao.org/agroecology/database/en/>](http://www.fao.org/agroecology/database/en/)

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Notes

1. The discovery of Amazonian Dark Earths (ADE)—the extremely fertile *terra preta*—has led to drastic revisions of population estimates in pre-Colombian Amazonia. Current conservative estimates range from eight to ten million people in the Amazon basin only, while research on the spatial distribution of ADE continues to grow, suggesting that the numbers could be even higher (Clement et al. 2015). However, about 90 percent of all Indigenous inhabitants of the Americas died within the first fifty to one hundred years of contact with European colonizers. See Crosby (1972) and Denevan (1976) for reliable sources on the demographic collapse of the population of the Americas after 1492 due to enslavements, massacres, and deadly epidemics.
2. “Farmers” here refer to smallholder peasant farmers—men and women who grow crops and raise livestock, Indigenous peoples, pastoralists, artisanal fishers, landless farmers/workers, forest dwellers, hunters and gatherers, and other small-scale producers.
3. A food system gathers all the elements (for instance, the environment, people, inputs, processes, infrastructures, institutions) and activities that relate to the production, processing, distribution, preparation, and consumption of food, and the outputs of these activities, including socioeconomic and environmental ones (HLPE 2014).
4. Narodnism was a politically conscious movement of the Russian intelligentsia in the 1860s and 1870s which promoted agrarian socialism. Narodnism supported the existing system of rural communes and wanted to strengthen peasant self-governance. Aiming to distribute land fairly among the peasantry, the Narodniks mostly believed that it was possible to avoid the capitalist phase of Russia’s development and proceed directly to socialism.
5. According to the Declaration of Nyéléni, “Food sovereignty is the right of peoples to healthy and culturally appropriate food produced through ecologically sound and sustainable methods, and their right to define their own food and agriculture systems. It puts those who produce, distribute and consume food at the heart of food systems and policies rather than the demands of markets and corporations. It defends the interests and inclusion of the next generation. It offers a strategy to resist and dismantle the current corporate trade and food regime, and directions for food, farming, pastoral and fisheries systems determined by local producers. Food sovereignty prioritizes local and national economies and markets and empowers peasant and family farmer-driven agriculture, artisanal fishing, pastoralist-led grazing, and food production, distribution and consumption based on environmental, social and economic sustainability. Food sovereignty promotes transparent trade that guarantees just incomes to all peoples as well as the rights of consumers to control their food and nutrition. It ensures that the rights to use and manage lands, territories, waters, seeds, livestock and biodiversity are in the hands of those of us who produce food. Food sovereignty implies new social relations free of oppression and inequality between men and women, peoples, racial groups, social and economic classes and generations” (Nyéléni 2007).
6. La Vía Campesina (LVC) is an international movement that brings together peasant organizations of small- and medium-sized producers, agricultural workers, landless people, women farmers, migrants, and Indigenous communities from Africa, Asia, the Americas, and Europe. LVC comprises about 164 local and national organizations in 73 countries and represents about 200 million farmers altogether.
7. Worldwide, there is a chronic lack of investment in research for agroecology, both domestically and through overseas aid. In the United States, for example, a recent analysis of funding by the US Department of Agriculture (USDA) showed that projects with an emphasis on agroecology represented only 0.6–1.5 percent of the entire 2014 USDA Research, Extension, and Economics budget (Delonge et al. 2016). UK development aid barely supports agroecology: overseas aid for agroecological projects in Africa, Asia, and Latin America is less than 5 percent of agricultural aid and less than 0.5 percent of the total UK aid budget since 2010 (Pimbert and Moeller 2018). A similar picture holds true for East African countries, where the lion’s share of research and development funding by the Swiss government and the US-based Bill and Melinda Gates Foundation supports farming based on the problematic Green Revolution model, and the development of global value chains (Biovision and IPES-Food 2020).

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