

## Agroecology as a Transdisciplinary, Participatory, and Action-Oriented Approach

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*This article traces multiple directions in the evolution of agroecology, from its early emphasis on ecological processes in agricultural systems, to its emergence as a multidimensional approach focusing on broader agro-food systems. This review is timely, as agroecology is being increasingly applied within a diversity of scientific-, policy-, and farmer-based initiatives. We contrast different agroecological perspectives or “agroecologies” and discuss the characteristics of an agroecology characterized by a transdisciplinary, participatory and action-oriented approach. Our final discussion describes the contents of the special issue, and states our goal for this compilation, which is to encourage future work that embraces an agroecological approach grounded in transdisciplinarity, participation, and transformative action.*

**KEYWORDS** *sustainable agriculture, participatory action research, agroecologies, food systems, interdisciplinary*

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## INTRODUCTION

Agroecology emerged as an approach to better understand the ecology of traditional farming systems and respond to the mounting problems resulting from an increasingly globalized and industrialized agro-food system (Altieri 1987). In its early stages, agroecology mainly focused on applying ecological concepts and principles to the design of sustainable agricultural systems (Altieri 1987; Gliessman 1990). This was followed by a more explicit integration of concepts and methods from the social sciences, which were necessary to better understand the complexity of agriculture that emerges from unique sociocultural contexts (Guzmán-Casado et al. 1999; Hecht 1995). In the last decade, the number of publications and initiatives that people describe as agroecological has exponentially increased (Wezel and Soldat 2009). The result is the emergence of several distinct standpoints, which, in this article, we refer to as different agroecological perspectives or *agroecologies*. As can be expected in any field of science or knowledge, we can observe some important differences between specific agroecologies. Critically reflecting upon and commenting on the coexistence of these agroecological perspectives was the key motivation for developing this special issue. A second motivation was to bring together authors whose work was inspired by notions of transdisciplinarity, participatory research or practice, as well as an action-oriented agroecological approach. Hence, the specific objectives of this introductory article and of this inaugural issue of *Agroecology and Sustainable Food Systems* were to: 1) discuss the implications of the increasing use and adoption of agroecology in unprecedented scientific, social and political spaces; 2) examine the evolution of the field of agroecology into distinct perspectives, or agroecologies; and 3) present conceptual and applied contributions of an agroecological perspective grounded in transdisciplinary, participatory, and action-oriented approaches. We finalize this article with a description of how the other contributions to the special issue complement each other to form a coherent and integrated agroecological approach.

## AGROECOLOGICAL MAINSTREAMING

The last three decades have seen a proliferation in the use of the term “agroecology” in a diversity of academic, policy, and advocacy spaces worldwide (Guzmán-Casado et al. 1999; International Assessment of Agricultural Knowledge, Science and Technology for Development [IAASTD] 2009; Wezel and Soldat 2009). In some cases, this is the result of agroecologists’ concrete, long-term efforts to establish the field in academic and policy spaces. An example of this is the establishment of a growing number of agroecology programs and degrees at universities of both developed and developing countries (Francis et al. 2003). Other integrations of agroecology are more

recent, but no less important. These include the adoption of the field by policy-oriented actors, as well as a wider use of agroecology within rural social movements and farmer or peasant organizations.

The appearance of agroecology in international food and agricultural policy debates is not new. However, until recently, it was mostly used in the context of nongovernmental organizations focusing on sustainable agriculture and rural development topics, and, more specifically, those oriented toward empowering small-scale farmers and resource poor rural communities (e.g. Food First). The turning point for the inclusion of agroecology at higher policy circles probably came with the publication of the IAASTD, and its recognition that the field represented an "alternative" promising approach to resolve the interrelated global problems of hunger, rural poverty, and sustainable development (IAASTD 2009).<sup>1</sup> Subsequently, Oliver De Schutter, who was appointed as the United Nations Special Rapporteur on the Right to Food in 2008, has continually advocated for the use of an agroecological approach to confront global food insecurity and food sovereignty issues. De Schutter has done this through policy-oriented presentations and lectures, publications geared for a broad audience, and an interactive website (see De Schutter 2011; De Schutter and Vanloqueren 2011; <http://www.srfood.org/>).

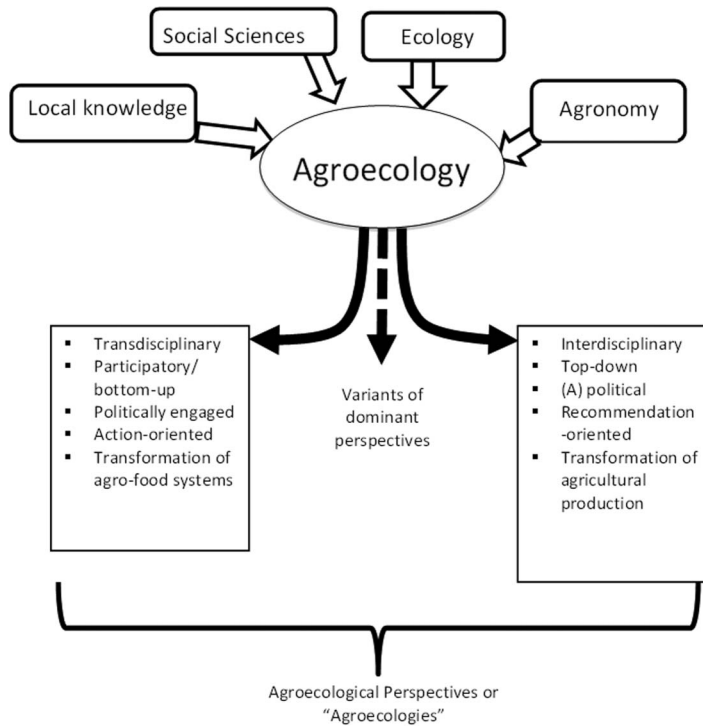
## AN EXAMINATION OF THE DIFFERENT AGROECOLOGIES

A recent comprehensive review by Wezel and colleagues (2009) interpreted agroecology as a field that has expressions as a science, a movement, a practice, or a combination of all three. The authors concluded that there is "certain confusion in the use of the term 'agroecology' (10), and that how different people use the term is affected by a variety of factors related to geography, scientific and contextual backgrounds. We disagree with the notion that there are no clear lines between existing agroecological perspectives. Rather, we argue that a persistent depiction of agroecology as unclear explicitly ignores important aspects of its evolution as a field of knowledge. In addition, presenting the agroecological approach as confusing, justifies the application of narrow definitions that may be better suited for particular perspectives. More concretely, it seems that this interpretation is favored by those that view agroecology solely as a new form of scientific endeavor, and with a stronger bent toward the natural sciences.

Although we agree that there is a wide diversity of interpretations and applications of an agroecological approach, we have identified two predominant perspectives. The first one tends to exclusively apply agroecology as a framework to reinforce, expand or develop scientific research, firmly grounded in the western tradition and the natural sciences (Wezel et al. 2009; Wezel and Soldat 2009). A European example of this is represented by the Agroecology Group led by Professor Teja Tscharntke at the

Georg-August University Göttingen in Germany. The group's web page describes their approach as follows: "Agroecological analyses focus on plant and animal communities, food web interactions, and conservation biology in temperate as well as tropical agricultural landscape and agroecosystems" (<http://www.uni-goettingen.de/en/74726.html>). This statement is consistent with the publications list in journals with an ecological and agricultural ecology focus. Other examples of academic groups in the United States, which also focus on the analysis of ecological processes at the farm and landscape scales, include the Henry A. Wallace Chair for Sustainable Agriculture at Iowa State University (<http://www.wallacechair.iastate.edu/default.html>) and the Agroecology Lab at the University of California, Davis (<http://www.plantsciences.ucdavis.edu/Agroecology/>). These agroecological approaches represent important endeavors for advancing findings on agronomic and ecological processes, and for improving the management of farms and landscapes. The information they generate could contribute to redirect agricultural production and management toward an ecologically based approach. However, although these standpoints may seek to impact broader agro-food systems, their approach remains largely grounded in natural science research with a primary focus on analyses at different scales (i.e., farm, landscape, region) of the agricultural production process, not of the agro-food system. If these perspectives are taken as the only agroecological approach to redesigning agro-food systems, they would miss seeing agriculture as a complex social-ecological system, obscure the social dimensions of agriculture, and silence the contributions of knowledge constructed outside of the western scientific paradigm. Nonetheless, research that follows this line of inquiry has resulted in important findings on the biophysical and environmental aspects of agricultural production. However, it leaves social and cultural issues of the dominant agro-food system mostly unexamined, and fails to engage the wider social science literature on food systems as part of its analysis.

In contrast, some agroecological scholars, often trained in natural science disciplines (e.g., entomology, ecology, and agronomy), have pursued a path that simultaneously deepens conceptual inquiry within specific sub-fields while expanding and redefining a broader agroecological perspective; one that engages with the social sciences and broader agro-food system issues. This agroecological approach developed from firm roots in the sciences of ecology and agronomy, into a framework that seeks to integrate transdisciplinary, participatory, and action-oriented approaches, as well as to critically engage with political-economic issues that affect agro-food systems (Gliessman 2007; Méndez 2010; Sevilla-Guzmán 2006b; Wezel et al. 2009). The use of terms such as "transdisciplinary," "participatory," and "action-oriented" may be interpreted as optimistic and vague by some observers. However, we perceive that the evolution of this particular form of agroecology has explicitly embraced these characteristics through an in-depth, and frequently challenging, process of reflection and action.



**FIGURE 1** Schematic representation of the evolution of different types of agroecologies.

We are not arguing that all scientific endeavors should be transdisciplinary, participatory, and action-oriented. In fact, we believe that the best-case scenario would be to have basic, discipline-oriented science actively informing and interacting with this reflexive perspective that seeks to be more participatory (by including knowledge from multiple actors) and increasingly clear about the normative values, politics, and possibilities for transformative change that are at play in today's agro-food systems.

In the previous paragraphs, we described what we consider the two predominant agroecological perspectives. In this context, it is important to recognize that in between these two broader approaches exists a gradient of interpretations and applications that may lean more toward one or the other, or seek a relatively balanced position between the two (Figure 1). For a recent example of an agroecological perspective in between the two dominant ones see a recent review by Tomich et al. (2011).

## AGROECOLOGY AS A TRANSDISCIPLINARLY, PARTICIPATORY, AND ACTION-ORIENTED APPROACH

In this section, we discuss an agroecological perspective with the following characteristics: 1) it originated from a predominantly ecological

and agronomic interpretation of the field in the early 1970s; 2) it has evolved toward an approach grounded in transdisciplinary and participatory research through engagement with social scientists, agricultural communities and nonscientific knowledge systems; 3) it incorporates a critique of the role of prevalent political-economic structures in the construction of the current agro-food system; and 4) as an action-oriented effort, it seeks to directly contribute to redirect current agro-food systems toward sustainability. This particular agroecological perspective has been advanced by some of the most influential academics in the field, including Stephen R. Gliessman (Gliessman 2007), Miguel Altieri (Altieri and Toledo 2011), John Vandermeer (Vandermeer 2009), Ivette Perfecto (Perfecto et al. 2009) and Eduardo Sevilla-Guzmán (Sevilla-Guzmán 2006b). In this section, we undertake an in-depth examination of the key characteristics of this perspective.

### Agroecology and Transdisciplinarity

We consider transdisciplinary approaches as those that value and integrate different types of knowledge systems, which can include scientific or academic disciplines, as well as different types of knowledge systems (i.e., experiential, local, indigenous, etc.), as well as adopt a problem-based focus (Aeberhard and Rist 2009; Belsky 2002; Francis et al. 2008; Godemann 2008). An appreciation for farmer-generated knowledge challenges conventional approaches to agricultural research and related policymaking that privileges Western epistemologies of knowledge production (Cuéllar-Padilla and Calle-Collado 2011). Since the 1980s, agroecologists have valued and sought to better understand the experiential agroecological knowledge of farmers as a necessary component to develop a more sustainable agriculture. This was clearly illustrated in Gliessman's (1978, 1980, 1982, this issue; Gliessman et al. 1981) work in the Mexican tropics in the 1970s and 80s, which focused on understanding the ecological bases of traditional Mexican agriculture, and which drew from the scholarship of Efraím Hernández-Xolocotzi. This empirical information, based on observation and practice, and which also integrates cultural aspects, was viewed as a source of knowledge to conceptualize and apply agroecology. More recently, the Universidad Intercultural Maya de Quintana Roo, Mexico, has institutionalized agroecological teaching and research through the concept of interculturality (<http://www.uimqroo.edu.mx/>). This approach is based on a platform for knowledge exchange and collaboration under conditions of mutual respect between cultures and knowledge systems (i.e., Maya and Western based), crucial for applying both participatory and transdisciplinary approaches. This incorporation of local or farmer-generated knowledge is an important component of this particular type of agroecological thought and practice.

## Participatory and Principles-Based Approaches in Agroecology

An increasing interest in participatory and action-oriented research is evident in a variety of fields, such as ecology (Whitmer et al. 2010), several disciplines in the social sciences (Fals-Borda and Rahman 1991; Greenwood and Levin 1998; Stringer 1999) health (Minkler and Wallerstein 2008), natural resources (Castellanet and Jordan 2002; Fortmann 2008), geography (Kindon et al. 2007), and agroecology (Guzmán-Casado et al. 1999; Uphoff 2002; Snapp and Pound 2008). Participatory action research (PAR) and related approaches seek to involve a diversity of stakeholders as active participants of an iterative process that integrates research, reflection, and action, and which seeks to provide voice to actors that have been traditionally excluded from the research process (Bacon et al. 2005; Kindon et al. 2007).

Agroecological approaches that have sought to integrate farmer knowledge into research and outreach fit well with the PAR approach. In the last decade, an increasing number of studies have combined agroecology with participatory approaches in different ways. For example, graduate students and professors at the University of California at Santa Cruz collaborated in a participatory project involving coffee communities of Mexico and Central America, which yielded a variety of outcomes. These ranged from direct actions in coffee communities to research studies and academic publications. A key academic product of this work was an edited book on the coffee crisis (Bacon et al. 2008), while action-oriented projects and outreach were mostly channeled through the Community Agroecology Network (CAN; <http://www.canunite.org/>). A similar trajectory can be observed in Andalusia, Spain, where researchers, professors, and extensionists associated with the International University of Andalusia's graduate program in agroecology, have worked with a diversity of family farmers in southern Spain (Guzmán-Casado et al. 1999; Guzmán-Casado and Alonso-Mielgo 2007; Guzmán and Alonso 2008; Sevilla-Guzmán 2006a, 2006b; Cuéllar-Padilla and Calle-Collado 2011). In Brazil, agroecologists have worked with the Landless Rural Workers Movement (MST, in Portuguese) and La Via Campesina to support the incorporation of agroecology into these social movements (Altieri and Toledo 2011).

Participatory approaches in agroecology tend to adhere to a common set of principles associated with PAR. Not surprisingly, these principles share substantial overlap with an evolving set of agroecological principles that help define the field and unite different perspectives (Altieri 2000; Gliessman 2007). Table 1 summarizes selected and overlapping principles from both participatory action research and agroecology. A more complete list of the principles of agroecology and sustainability can be found at [http://agroecology.org/Principles\\_List.html](http://agroecology.org/Principles_List.html)

Like agroecology, participatory action research approaches in agriculture involve farmers, community members, and partner organizations. The process values the collaborative definition, implementation, and interpretation of research, including different forms of knowledge, people's

**TABLE 1** Comparison of selected participatory action research and agroecological principles

Participatory action research principles	Agroecology principles
PAR foregrounds empowerments as community partners play key roles in defining the research agenda.	Agroecologists work with farmers, food consumers, communities, agricultural ministries, food advocates and others to empower people.
PAR processes are context dependent as they bring together interdisciplinary teams responding to stakeholder aspirations.	Agroecology establishes farming and food systems that adjust to local environments.
PAR research processes inform action at multiple scales for positive social change.	Agroecology seeks to manage whole systems.
PAR processes deepen as long-term relationships are formed and multiple iterations of this cycle occur.	Agroecology develops strategies to maximize long-term benefits.
PAR processes listen to a diversity of voices and knowledge systems to democratize the research and social change processes.	Agroecology implies processes to diversify biota, landscapes and social institutions.

Sources. Modified from Bacon et al. (2005) and [http://www.agroecology.org/Principles\\_List.html](http://www.agroecology.org/Principles_List.html)

diverse aspirations in the design of research agendas and transitions toward collectively defined goals. Processes of empowerment are complex, uneven, and require attention to the formal and informal exercise of power, as well as critical reflections about the intersection of access to resources, privilege, and identity (Fox 2005; Minkler and Wallerstein 2008).

The final two principles listed for both agroecology and PAR concern approaches to temporal and diversity related issues. While researchers are aware of their own professional needs and pressing theoretical questions within their academic fields, these priorities do not often align with needs of farmers and other social actors (Fox 2005). Instead of predetermining a project and then asking non-research partners to sign off, PAR collaboration should begin at the earliest stages of the research process. Partners work through a mutual, iterative dialogue to arrive at a project proposal that harmonizes stakeholder needs, capacities, and methods. Through this dialogue, the researcher and other participants have a clear understanding of project expectations and potential challenges and benefits. The dialogue must also be linked to action, thus, creating a praxis—or an ongoing iterative process of reflection and action (Freire 2000). After an action is taken, the context shifts and this is when the longer-term partnership often becomes more important, as both the researcher and other partners have learned from the first cycle and then continued with follow-up iterations. The agroecological principle of maximizing long-term benefits suggests multiple considerations, such as efforts to:

- maximize intergenerational benefits, not just annual profits;
- maximize livelihoods and quality of life in rural areas;



- facilitate intergenerational transfers;
- use long-term strategies, such as developing plans that can be adjusted and reevaluated through time;
- incorporate long-term sustainability into overall agroecosystem design and management;
- build soil fertility over the long-term.

The principle of recognizing, learning from, and engaging social and ecological diversity is among the most important for linking participatory action research with an action-oriented agroecology. The participatory action research approach calls for greater attention to a wider diversity of voices, especially those that are frequently marginalized by mainstream society (e.g., farm workers, smallholders, indigenous groups, and rural women). This suggests the need to create the time and space for deeper listening and identification of strategies that use human diversity as a source of innovation. The principle of diversity as seen through an agroecological lens is no less profound as it directs analytic attention to the domains of biota, landscape, and social institutions. Examples of farm and plot level management of diversity include intercrops, crop rotations, polycultures, and the integration of animals, cultivars, and genetic diversity. At the landscape scale, one must consider issues such as buffer zones, forest fragments, rotational grazing, and contour and strip tillage. The important point is not simply the presence of a wide diversity of species or agricultural practices, but the way they interact to provide critical ecosystem services (i.e., pollination, pest control, and nutrient cycling) that support agricultural production and farmer livelihoods (Kremen et al., forthcoming). The social domains of diversity encourage agroecologists to consider multiple forms of farmer organization, government regulation, and the many different types of markets and alternative agro-food networks that constitute agro-food systems (Goodman et al. 2011). The presence of alternative distribution systems and the diversity of social institutions and economic relations in agriculture, such as farmer's markets, community-supported agriculture, cooperatives, and production for both subsistence and sale, offer several important incentives that could be coupled with an enabling policy environment (Iles and Marsh, forthcoming). Together, these related strategies could contribute to a transformation of the current agro-food system into one that prioritizes ecological and human health at all stages, and integration among the interacting components of the system leading to greater long-term resilience.

### Toward Transformative Agroecology

A transformative agroecology incorporates a critique of the political economic structures that shape the current agro-food system (see Holt-Giménez and Altieri, this issue, and González de Molina, this issue). It is explicitly

committed to a more just and sustainable future by reshaping power relations from farm to table. This view requires that agroecologists move beyond the farm-scale to consider the broader forces—such as market and government institutions—that undermine farmers' cultural practices, economic self-sufficiency, and the ecological resource base. In part, agroecology as a field of study emerged in response to the social and ecological costs generated by agricultural industrialization and the implementation of Green Revolution technologies (Shiva 1989; Hecht 1995). Narrow approaches that reduce agroecology to an ecologically sensitive agronomic science have disregarded the influence of social concerns as part of the field's development. An agroecology-as-natural science perspective tends to privilege positivist science and Cartesian reductionism over other ways of knowing (e.g., indigenous or local knowledge), and, thus, risks producing research that is not appropriate to local contexts and which ignores the larger power structures that impact farmer livelihood strategies.

The transformative agroecology we propose has continued to develop a more holistic approach to the science and practice of agroecology in close dialogue with critiques of rural development put forth by academics, practitioners, and social movements. Political ecologists, in particular, have shown how external forces at the international, national, and regional level impact local practices. For instance, Blaikie and Brookefield's (1987) landmark study on soil degradation demonstrated how social marginalization, rather than maladaptation (i.e., in need of modernization), shaped farmers' land management practices. This was a crucial shift in perspective that emphasized a multi-scalar analysis to articulate local social and ecological phenomena to regional and global forces (Paulson et al. 2003). In short, political ecologists draw attention to the power relations that govern natural resources, often leaving farmers, due to their class, gender, or ethnic position, with a lack of access to productive resources (Rocheleau et al. 1996; Peet and Watts 2004). If farmers cannot access the resources they need, often dispersed within a surrounding territory and governed by overlapping power structures, they cannot continue to maintain or develop sustainable agroecosystems. A politically engaged agroecology considers the complex challenges, both social and ecological, that smallholders face in the transition toward sustainability (see González de Molina in this issue).

The connection between agroecological practice, equitable distribution of resources, and self-determination has been made explicit by marginalized communities demanding justice through food sovereignty (Holt-Giménez and Altieri, this issue). Ecological sustainability has become central to demands made in defense of rural livelihoods and culturally specific ways of life. These ways of living are increasingly at risk due to the deepening of capitalist relations that turn people into labor and nature into resources (Carruthers 1996; Grueso et al. 2003). Agroecologists are aptly positioned to contribute to these struggles by participating in a creative process of

knowledge production with farmers. This requires a broader understanding of knowledge and learning as a community of practice that involves both farmer scientists and university-trained scientists (Kloppenborg 1991; Thomas-Slayter et al. 1996). Agroecology, through its parallel development as a science and social movement, is an apt site to construct relevant agroecologies that address asymmetrical power relations.

## DESCRIPTION OF THE SPECIAL ISSUE

This special issue integrates 10 diverse contributions that share a commitment to integrating transdisciplinarity, participatory, and/or action-oriented approaches within an agroecological framework. In this introductory article we have sought to set the stage by assessing the current state of the field, and briefly examining the contemporary debates that surround it. We introduce the issue through a discussion of our perceptions of the existing and differing agroecologies, and presenting the tenets of an agroecological approach grounded in transdisciplinarity, participation, and action. The subsequent six articles represent conceptual contributions that, in different ways, embrace this perspective. These contributions are followed by three case studies that discuss the opportunities and challenges of applying this particular agroecological approach to different themes, geographies, and socioecological contexts.

Our introductory article is followed by a contribution from Steve Gliessman, which undertakes a historical analysis of his role in the development of agroecology through the study of traditional Mexican agriculture in the 1970s and 1980s. His reflection examines the development of the agroecosystem concept, which drew from the work of Efraím Hernández Xolocotzi, at a time when governments and international agencies were fully supporting the implementation of the Green Revolution in developing countries. The following article, by Sevilla-Guzmán and Woodgate, explores several social, political, and economic processes, such as agricultural modernization and environmentalism, as part of the foundations from where agroecology developed as both "scientific discipline" and "agrarian social movement." Although Sevilla-Guzmán has published important agroecology work in Spanish, this is his most recent in the English language. The next piece by González de Molina proposes a stronger integration of political ecology into agroecology, a subject introduced in section four of this article. González de Molina argues for the need to better incorporate instruments directed at the development of political and institutional aspects of agroecological research and practice. The author proposes the development of a "political agroecology" to better understand and engage with the power dynamics inherent in the social interactions and institutions that are part of agro-food systems. In the following paper, Francis and coauthors discuss

“phenomenon-based learning” as a new paradigm to “bridge academia and society.” Their work is firmly grounded on a problem-based, transdisciplinary agroecology program at the Norwegian University of Life Sciences (UMB), which engages students in real world situations with rural communities. This article offers conceptual insights and an example of an innovative pedagogical model for agroecological teaching and learning. Subsequently, Vandermeer and Perfecto explore, in-depth, the theoretical underpinnings of integrating farmer knowledge with ecological science. Building on their extensive trajectory in analyzing ecological processes in agroecosystems, they propose that this integration could lead to the “generation of knowledge that is simultaneously deep and broad.” This is followed by Holt-Giménez and Altieri’s article, which integrates the food regime and food sovereignty concepts to examine agroecology’s role in the face of what they term the “new Green Revolution,” which is being advocated by corporate food and international development actors. They emphasize the need for strengthening smallholders and their organizations as the backbone of alternative food systems, and caution of the danger of agroecology being co-opted to strengthen the existing powers behind the new Green Revolution.

The last three articles of this issue present analytic case studies of the evolution of agroecology in different geographies and contexts. Petersen and coauthors provide a historical examination of how agroecology influenced and developed in Brazil’s universities and state agricultural agencies. Their analysis provides insights into the opportunities and challenges that the field has encountered in a context where industrialized agriculture has expanded considerably. On the other hand, opportunities have been opened through partnerships with farmer movements and a steady interest from academics and extensionists. Fernandez and coauthors undertake a similar exercise in the United States, by analyzing the evolution of agroecology and its specific interaction with food and sustainable agriculture movements. The authors find that although principles have been shared between the academic agroecological perspective and on-the-ground movements, an explicit collaboration is still elusive. The article concludes by providing specific recommendations for partnerships that can better integrate the strengths of agroecology as a participatory research approach and the experiences and advocacy power of food and sustainable agriculture movements. In the final article of the special issue, Guzmán-Casado and coauthors discuss the need for an agroecological approach that goes beyond technological change. They propose participatory action research (PAR) as the means to “collaborate with local communities and advance in the restructuring of physical flows, economies and information that support local farming.” These arguments are illustrated through an examination of a case study with farmers in Andalusia, Spain. The authors conclude that despite some challenges associated with resources and longer time periods, PAR proved to be an adequate approach to foster an agroecological transition by farmers and other actors.

The contributions of this special issue were carefully selected with the goal of encouraging and advancing constructive agroecological debates, as well as presenting some of the challenges and opportunities associated with a specific agroecological perspective. We hope that they provide inspiration for others seeking to embrace an agroecological approach that is transdisciplinary, participatory, and action oriented.

## NOTE

1. The IAASTD is a high-profile report commissioned by the World Bank, the United Nations, and the World Health Organization, sought to direct research and development policy solutions to the issues of global hunger, poverty, and sustainable agricultural development. It brought together hundreds of scientists and institutions from all regions of the world over a seven-year period. It is considered by many as the agricultural equivalent of the highly profiled International Panel for Climate Change (IPCC) reports.

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