Agroecology
A science to support food security and sustainable agriculture

Agroecology, a scientific approach

With growing demand for food and fiber driven by population growth and lifestyle changes, the challenge of achieving food and nutrition security sustainably is at the heart of current policy debates on agriculture. The issues at hand are complex and require a multi-pronged approach to finding solutions that are locally adapted and support productivity while maintaining environmental sustainability and promoting rural livelihoods.

Agroecology emerged in the 1960's as a discipline focused on the study of the interaction between crops and the environment[1]. It helped bring greater understanding of the impact that agriculture has on its environment and how the specificities of different ecological zones and the agroecosystem affect productivity and agriculture practices.

Agroecology, in that sense, is an important component of building sound agricultural policies and practices as it helps localize and specify needs and best practices in different contexts. With the growing concern about climate change, increasing attention has also been paid to how local situations influence what constitutes 'climate smart' agriculture practices. Understanding the interaction between crops and their environment is an important part of that, along with detailed information on other dimensions, such as soils, weather pattern, and water availability.

What role for agroecology?

The ongoing challenge of realizing food security has recently led policy-makers and scientists to seek a broader approach to policy-making in agriculture, to take into consideration not only the technical elements of agronomy but also the other dimensions that affect the ability to achieve food security in different context. This includes consideration for a wide variety of issues, such as access and control over resources, how to inform and provide access to technology choices, trade issues, regulatory environments, and food distribution networks.

This wider and often interdisciplinary approach is positive and needed to address some of the shortcomings of previous efforts to achieve food security and sustainability. The use of bottom up and "learning by doing" methods in training, focusing on the needs and preferences of different farmers, and particularly women farmers, integrating traditional knowledge with scientific practices, and taking on landscape-level approaches are all key elements in ensuring that agriculture supports food security, sustainability and rural livelihoods.

In this context of 'broadening', several ideological approaches to farming have emerged. Some schools of thought are now reframing the original concept of agroecology to cast it as a farming 'practice' of its own or even a social movement, as described by Wezel et al[2]. The authors note that the understanding of the concept has evolved over time, in part in reaction to changes in food production systems and the increase in uptake of certain tools, such as hybrid crops and fertilizers, since the 1970's. As a result three different interpretations of the term co-exist today – agroecology as a scientific discipline, an agricultural practice, or a political or social movement – causing confusion among scientists, policy-makers and practitioners. It is important for the purpose of using agroecology to guide and inform sustainable agriculture to ensure there is

[1] OECD glossary - https://stats.oecd.org/glossary/detail.asp?ID=81

[2] Wezel et al, "Agroecology as a science, a movement and a practice", Agronomy for Sustainable Development, Dec 2009, Vol 29, Issue 4, pp 503-515

coherence in how it is used and understood. A common understanding is needed on the meaning of agroecology that builds on science and evidence to ensure farmers receive information and knowledge that is useful.

Agroecology – a scientific discipline, an agricultural practice or a social movement?

In its broadest interpretation as a political and social movement, agroecology is stripped of its scientific basis. For example, Francis et al. define agroecology as 'the integrative study of the ecology of the entire food systems, encompassing ecological, economic and social dimensions, or more simply the ecology of food systems'[3] thereby encompassing not only physical elements but also consumers and producers as part of the 'system'. In this interpretation closer to that of a social and political movement, agroecology is generally used as opposition to current agriculture practices with claims to stand for agricultural systems that are more beneficial to farmers and society than existing ones. Broadly speaking, it is opposed to the use of external inputs, favors low-technology practices and professes to be more equitable in its outcomes. It is sometimes equated with organic agriculture and claims the label of sustainability for a specific way of cultivation, denying the contribution and value other practices can make to sustainability and productivity.

This interpretation is unhelpful as it precludes dialogue and presumes that there is a single approach or 'silver bullet' which can be applied across context to successfully achieve sustainable production.

The most useful understanding of agroecology is a scientific discipline, as defined by OECD: an important tool for informing best practices and policies alongside other scientific analysis, rather than as a farming system and there are no "agroecological practices" as such. For example, in a guide developed for rice farmer field schools, FAO mentions the need for farmers to carry out 'agroecosystem analysis' to help inform their implementation of integrated pest management. This is an example of how agroecology, as a science, helps inform farmer decision making in support of sustainability and productivity[4].

However, many of the practices promoted under the heading "agroecological farming" are already existing best practices, such as crop rotation or soil fertility management, which can be applied in a variety of contexts and farming systems.[5] For instance, Altieri presents crop rotation, crop cover and the use of manure and compost to improve soil quality as agroecological practices. While certainly these practices do contribute to maintain soil quality, they are used in a range of farming systems, including conservation agriculture.

Local context and needs must drive practices

To meet current and future demand for agricultural goods sustainably, we must not preclude any options and instead focus on what is most effective and most appropriate in any given context, grounding decision on sound scientific observation and evidence. This means that a mix of practices, tools and technology need to be tailored to each situation. Many practices, such as precision agriculture, conservation farming, drip irrigation, crop rotations, and integrated pest

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[3] Francis C., Lieblein G., Gliessman S., Breland T.A., Creamer N., Harwood, Salomonsson L., Helenius J., Rickerl D., Salvador R., Wiedenhoeft M., Simmons S., Allen P., Altieri M., Flora C., Poincelot, R. (2003) Agroecology: The ecology of food systems, J. Sustain. Agr. 22, 99–118.

[4] FAO *Curriculum for farmer field school on integrated pest management and aquaculture in rice-based farming systems in Guyana and Suriname*
http://www.fao.org/3/a-ba0031e.pdf

[5] For example see Altieri's description of agroecological practices: http://nature.berkeley.edu/~miguel-alt/principles_and_strategies.html

management, are supportive of and compatible with the goals of sustainability and food security. Yet many may be excluded by the new 'brand' of agroecology being promoted.

As policymakers debate the best path forward to achieve food security, it is important to use agroecology as a scientific and analytical tool that helps us to understand the impacts of different practices on crop productivity and the local environment and thus aids farmers to choose the best options, but also to recognize that it is not as such a farming 'practice' or social movement. Recent publications demonstrate how agroecology, as a science, can play a part in informing decisions. For example, Ferede et al. in a recent article discuss the importance of specific agroecological conditions in different parts of Ethiopia in influencing how climate change will impact crop productivity in the country[6]. The "save and grow" paradigm developed by FAO to support sustainable crop production intensification (SCPI) also incorporates elements of agroecological analysis but it does not preclude the use of technologies and other practices and is rooted in the need to sustainably increase production[7]. Another recent paper, prepared for the High-Level Panel of Eminent Persons on the Post-2015 Development Agenda on the theme "Opportunities and Solutions for Sustainable Food Production", similarly highlights the need to increase productivity on existing land while reducing footprint, by shifting to a knowledge-intensive form of agriculture which build on the social and biophysical contexts of each farm to design appropriate set of practices[8]. The paper notes that "agroecological intensification primarily implies to implement good agronomic management principles in a local context" and that "there are multiple technology choices and paths for improving productivity, economic and environmental performance of agriculture".

The System of Rice Intensification (SRI) was developed building on agroecological observation and developed into a flexible set of principles to support sustainable and productive rice cultivation in many countries. The SRO system built on agronomic knowledge and agroecological knowledge but also builds in technology and tools, such as improved rice breeds, improved irrigation methods and other tools[9].

As the global community moves towards a new development agenda, supporting the targets set out under Sustainable Development Goal 2, will require that practices, programs and policies be judged on the basis of whether they meet the joint objectives of improving productivity, maintaining environmental sustainability, and supporting farming livelihoods. Agroecology as a science can contribute to the effort to develop such locally-adapted policies. But other considerations, for example climate change (mitigation and adaptation) dimensions, along with other issues, also need to inform decisions and the most adapted mix of tools, practices and technologies must be chosen to meet each situation.

[6] Ferede, T.; Ayenew, A. B.; Hanjra, Munir A. (2013). Agroecology matters: impacts of climate change on agriculture and its implications for food security in Ethiopia. In Hanjra, Munir A. (Ed.). Global food security: emerging issues and economic implications. New York, NY, USA: Nova Science Publishers. pp.71-111. (Global Agriculture Developments) - http://hdl.handle.net/10568/37209

[7] http://www.fao.org/ag/save-and-grow/

[8] Doberman, A. and Nelson, R. (2013) Opportunities and Solutions for Sustainable Food Production. Background paper for the High-Level Panel of Eminent Persons on the Post-2015 Development Agenda. http://www.post2015hlp.org/wp-content/uploads/2013/05/Doberman-Nelson_Solutions-for-Sustainable-Food-Production.pdf

[9] http://irri.org/news/hot-topics/system-of-rice-intensification-sri