

AGROECOLOGY AND ANIMAL HUSBANDRY

HISTORY AND EXPANSION OF AGROECOLOGY

Agroecology considers ecology the key element of agricultural processes and uses holistic methods to study agroecosystems. Although much more visible in the last 20 years, agroecology has a long history. The word “**agroecology**” emerged at the beginning of the 20th century by Bensin, a Russian agronomist, who suggested the term *agroecology* to describe the use of ecological methods in research on commercial crop plants. Thereafter, both its definition and scope evolved significantly.

From the 1970s, partially as a consequence of the unexpected impacts of industrialised agriculture after the Green Revolution, agroecology continued to be defined as a **scientific discipline**, but also gradually emerged both as a **movement** and as a **set of practices** beginning in the 1980s. This period was marked by an increasing interest of an ecological point of view on agriculture. Concept of **agroecosystems** emerged in the 1970s. It was suggested by the ecologist Odum (1969)¹, who considered them as ‘domesticated ecosystems’, intermediate between natural and fabricated ecosystems. Since the beginning of the 1980s, with Altieri (1989)² and Gliessman (1997)³ agroecology became defined as a way to protect natural resources, with guidelines to design and manage sustainable agroecosystems.

Gliessman⁴ defines agroecology as the **science of applying ecological concepts and principles to the design and management of sustainable agriculture and food systems**.

Finally, agroecology went through a strong change, moving beyond the field or agroecosystem scales towards a larger focus on the **whole food system**, defined as a global network of food production, distribution and consumption. Agroecology seeks to improve agricultural systems by **imitating nature**, creating beneficial biological interactions and synergies among elements of the agroecosystem where producers and consumers are seen as actively connected parts of the system⁵. A recent definition of agroecology shared and promoted by Agroecology Europe⁶ is “**the integrated study of ecology of the whole food system, which includes ecological, economic and social dimensions, or simply the ecology of food systems**”

TODAY’S AGROECOLOGY CONCEPT

Today, agroecology is either a scientific discipline, political or social movement and agricultural practice. It includes the entire **food system** from the soil to human society. Concerning agroecology as a scientific discipline it prioritizes research, holistic and participatory approach and interdisciplinary aspects across different fields of knowledge (two disciplines from which agroecology is derived, agronomy and ecology, but also to other disciplines such as zoology and botany/plant physiology, and their applications in agricultural and environmental issues). As a set of agricultural practices, agroecology seeks ways to improve agricultural systems by harnessing natural processes, creating beneficial biological interactions and synergies amongst the

¹ Odum E.P., 1969. The Strategy of Ecosystem Development. *Science*, 164, 262-270.

² Altieri M., 1989. Agroecology: A new research and development paradigm for world agriculture. *Agriculture, Ecosystems and Environment*, 27, 37-46.

³ Gliessman S.R., 1997. *Agroecology: Ecological Processes in Sustainable Agriculture*, CRC Press, Taylor & Francis, New York NY

⁴ Gliessman S.R., 2007. *Agroecology: The Ecology of Sustainable Food Systems*, CRC Press: Boca Raton, FL, USA.

⁵ Altieri M.A., Nicholls C.I., 2012. Agroecology scaling up for food sovereignty and resiliency. *Sustain. Agric. Rev.*, 11, 1-29.

⁶ www.agroecology-europe.org

components of agroecosystems, minimizing synthetic and toxic external inputs and using ecological processes and ecosystem services for the development and implementation of agricultural practices, valuing farmers' local knowledge and practices.

As social movements, agroecology intend to be a solution to modern crises such as climate change and malnutrition, contrasting with the dominant industrial agricultural model based on the use of external inputs. The aim is to transform agriculture to build locally relevant food systems that strengthen the economic viability of rural areas based on short marketing chains, and both fair and safe food production. This involves supporting diverse forms of smallholder food production and family farming, farmers and rural communities, local knowledge, social justice, local identity and culture.

AGROECOLOGICAL PRINCIPLES AND ELEMENTS

Today, agroecology is associated with a **set of principles** for agricultural and ecological management of agri-food systems as well as some wider ranging socio-economic, cultural and political principles:

- Enhance positive ecological interaction, synergy, and complementarity amongst the elements of agroecosystems (plants, animals, trees, soil, water).
- Secure and enhance soil health and functioning for improved plant growth, particularly by managing organic matter and by enhancing soil biological activity.
- Preferentially use local renewable resources and close as far as possible resource cycles of nutrients and biomass by recycling existing nutrients and biomass in farming and food systems.
- Maintain and enhance diversity of species, functional diversity and genetic resources and maintain biodiversity in the agroecosystem over time and space at field, farm and landscape scales.
- Supports climate adaptation and resilience while contributing to greenhouse gas emission mitigation (reduction and sequestration) through lower use of fossil fuels and higher carbon sequestration in soils
- Eliminates the use of and dependency on external synthetic inputs by enabling farmers to control pests, weeds and improve fertility through ecological management Reduce or eliminate dependency on purchased inputs.

Agroecology is rooted in the culture, identity, tradition, innovation and knowledge of local communities. Agroecology is knowledge-intensive and promotes horizontal (farmer-to-farmer) contacts for sharing of knowledge, skills, and innovations, together with alliances giving equal weight to farmer and researcher. Contributes to healthy, diversified, seasonally and culturally appropriate diets.

THE ROLE OF LIVESTOCK IN AGROECOLOGY

As in organic farming, the **integration of animals in an agroecosystem** can often make the difference in realizing **long-term ecological sustainability**. Such integration allows for better management of nutrient flows and of landscape structures, with beneficial effects, for example, on biodiversity. Achieving integration and greater diversity, for instance by combining different animal species with differing feed preferences on the same pastures, or using integrated crop-livestock-forestry systems, can lead to higher productivity and reduce the use of inputs, while improving the overall economic performance. Integration of cropping and livestock farming systems allows better regulation of biochemical cycles and environmental fluxes to the atmosphere and hydrosphere through interaction among farm units, and mobilizes biodiversity to supply ecosystem services.

Animal husbandry on an agricultural farm is important because it:

- Closes the ecological cycle of the farm;
- Provides manure, soil improver, and is a major source of organic substances in organic farming;
- Requires areas for growing fodder thus preventing short crop rotation and improving fertility.

PRINCIPLES FOR AGROECOLOGICAL LIVESTOCK PRODUCTION

To extend ecological thinking into animal production systems, the principles are:

- work in closed-loop production systems designed to use local resources;
- reduction of the use of animal feed concentrates, using integrated crop-livestock-forestry systems;
- decrease pollution by optimizing the metabolic functioning of farming systems;
- preserve biological diversity in agroecosystems by adapting management practices decrease the inputs needed for production;
- minimize the use of fossil fuel energy;
- adopt management practices aiming to improve animal health, meeting animals' species-specific behavioural needs and strengthening their resilience;
- choose local breeds adapted to specific environments;
- animal-health management should be based on disease prevention; natural medicines and treatments (e.g. phytotherapeutic products) can be though the preventive use of chemically synthesised.
- adopt interdisciplinary approach to farm management that includes animal and veterinary science;
- develop information and training systems to increase the awareness of benefits in consumers of organic animal husbandry.

CONSUMER PERCEPTIONS OF SUSTAINABLE FARMING PRACTICES

In recent years a new sensibility has arisen that values origins of raw material that are used and production methods that respect the environment and animal welfare. These considerations are increasingly determining choices of what to purchase and consume. The predominance of intensive livestock production did not eliminate other methods such as non-intensive and organic and many other certified products (in Italy, DOP and IGP) which are concentrated in marginalized areas unsuitable for intensive farming. There is a consumers segment who do not want to give up meat consumption, while being concerned with the environmental effects of intensive livestock farming and animal welfare, which has resulted in an increase in organic livestock. **Organic animal husbandry is the method of raising livestock closest to the general principle of agroecology and arises from ethical and social concerns.** It incorporates a systemic view of humans and animals as part of a larger ecological system, and incorporates climatic, cultural, traditional, and social conditions of the surroundings. There is a new producer-consumer relationship based on the guaranteed verification and transparency of the food cycle. The food cycle includes production, preparation, transport, merchandising and enhancing the preservation of unique and natural territorial products. **It is necessary for the consumer to acknowledge the fair price of sustainable animal husbandry, based on agroecological principles:** consumers should be ready to pay an additional price to assert their values by supporting agroecological farming. It is necessary that institutions set up adequate consumer information strategies to promote awareness of the benefits of organic products, which is essential for an ecological transition of animal husbandry.

CONCLUSION

Global food systems are largely based on an agricultural model that has lost touch with its ecological and social base. Instead of a system of farming that is sustainable and diverse, as called for in the Agenda 2030, the dominant form of agriculture – at least in industrialised and emerging countries – is intensive, industrial-scale agriculture. This type of farming leaches soils, destroys rainforests, pollutes watercourses, threatens biodiversity, causes pesticide resistance and harms the health of producers and increasingly consumers as well. Finally, it increases greenhouse gas emissions and so makes a significant contribution to global climate change. Transitioning towards agroecological systems is central in achieving the multiple interlinked objectives of the SDGs. By switching to agroecological practices, we can improve soil quality, reduce negative externalities on the environment and support farmers in adapting to climate change. Further, indigenous and diversified crops promoted under agroecology are typically more resilient to extreme weather conditions. Agroecology offers a **unique and systemic approach** to food systems and contributes to meeting the needs of future generations while ensuring no one is left behind.