



How Agroecology is an Alternative to Avoiding the "Hunger Pandemic" and Climate Change?

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ABSTRACT

The crisis plaguing the world has weakened the globalization that has been underway for several decades. Trade, movement of goods and people are affected. Food security is threatened. Consequently, the recourse to a production-consumption policy which underpins the viability of ecosystems and human societies is more imperative than ever. Based on its potential, agroecology is proving to be an alternative since it is in many ways an expression of the population mainly made up of non-executives in society.

Keywords: *Agroecology; capitalism; economic resilience; climate change mitigation; human-society-environment balance; food security.*

1. INTRODUCTION

The crisis caused by the corona virus (COVID-19) pandemic has struck an unexpected,

unpredictable blow with heavy and inestimable consequences on the world economy. Trade, the movement of goods and people are blocked. Agricultural producers and farmers are

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witnessing unprecedented losses and some do not see the end or even the possibility of resilience. Food security, already worrying in “underdeveloped” and “developing” countries, is further weakened while that of “developed” countries are beginning to falter. This is the case of France and Canada, whose agricultural production largely employs seasonal external labor, who sense the risk of loss of harvests on the one hand and the danger to lag behind on the another hand. Start of cultivation operations is disrupted due to the blocking of the travel of this labor force from its country of origin to the countries of employment. For some countries the food supply, the importation of the latter is unthinkable in this time of crisis and for others the export of local production is hypothetical. This calls into question the global system that has been sustained for decades. The COVID-19 crisis forces us to turn our eyes to other production-consumption policies, in particular those which take into account the truly sustainable balance of the vital human-society-environment triangle and encourage local production, close collaboration between producer and consumer in a perspective of good living for all now and for posterity. However, a critical analysis of the human journey since the beginning of modern time raises questions in this time of confinement imposed by the crisis. Is the question of the reorganization of the production-consumption system new? How have we handled ourselves in the past? Are we right to believe in other approaches?

2. WHY DID YOU NOT SUPPORT AGROECOLOGY?

The change experienced by the contemporary began to undergo another turning point in the 1920s. In fact, in 1928, an article was published for the first time which linked biological and abiotic factors [1,2,3]. It was the birth of agroecology. Several studies followed until the 1930s. However, Wezel and Soldat [1] do not identify any studies between 1940 and 1978. Certainly some would say that it was during and just after the Second World War. Yet the agrarian revolution was born in the 1960s. During and after the war, hunger raged in the world. Agroecology should have everyone's attention and financial support to get us out of this situation. But this approach did not interest the capitalists [4, 5, 6, 7] for the simple reason mentioned by Lanata [8], "the agroecological approach subordinates economic arbitration to an imperative of general interest: the viability of

ecosystems and human societies". This paradigm undermined their imagination of development or progress as long as it revealed the balance between humans, society and the environment; it aligned itself with the logic of degrowth or growth limit. In its place the aspirants of economic growth have set up, financed, acclaimed and politically supported the Green Revolution. With it scientists, farmers, peasants, intellectuals, rich, poor and common people see in broad daylight, in front of their homes and departure and others from the road, changes take place. Labor is replaced by heavy machinery thereby reducing employment opportunities; large tracts of land are sown to cultivate a single crop, chemical fertilizers are buried in the soil to accelerate the growth of the sown crop, pesticides are spread in the fields to fight against harmful plants, etc. Humans are eyewitnesses to the transformation of natural resources and social relations into market goods and services mirrored in the single slogan: fight against hunger and poverty. From those years to date at least 3.9 billion people (or 52% of the world's population) are somehow malnourished [9]. This reality was already foreseen as early as the 1960s. The impacts of the agricultural revolution led to the emergence of environmentalist movements on the one hand. On the other hand, the search for prospects that can replace industrial agriculture has reached all social strata.

3. DIFFERENT MEANINGS OF AGROECOLOGY

Like many words that have been debated in human history, agroecology is no exception to this reality.

For Wezel and Soldat [1] agroecology is a scientific discipline, a movement and all practices.

Agroecology is the integrative study of the ecology of the entire food system, integrating ecological, economic and social dimensions [10].

According to Glissman [11] agroecology is the science of applying ecological concepts and principles to the design and management of sustainable food systems. It is a global network of production, distribution and consumption.

"Agroecology is a disciplinary set fed by the intersection of agronomic sciences (agronomy, zootechnics), ecology applied to agro-

ecosystems and human and social sciences (sociology, economy, geography). It is the integrative study of the ecology of the entire food system, encompassing ecological, economic and social dimensions [10,12].

From the negative impacts of the agricultural revolution to the emergence of social movements, the definitions of agroecology are contextualized according to how it is understood or how it is experienced. The practical issues of green agriculture including loss of soil fertility, decrease in plant pollination, etc. [13,14] have guided the farmers towards other cultivation practices or towards the use of old techniques. The complexity of the problems resulting from industrial agriculture has sharpened scientists' sense of observation and research on the interaction of components of the biosphere. This shows that this approach is experienced differently but its debate is unifying: it is an alternative to development. But what is universal there to gain everyone's consensus?

4. CONTRIBUTION AXES OF AGROECOLOGY

At the environmental (biological) level, agroecology optimizes the genetic diversity of biological resources. Shafts of different heights are integrated into the system. This increases its horizontal diversity. The rotation or alternation of crop species over time enriches it in temporal diversity. These two diversities put together increase the system's capacity to sequester atmospheric carbon, fight against water and wind erosion of the soil and allows its capacity for water retention (especially runoff). This last advantage helps to control the pollution of downstream rivers. Plants of different stratum / height are associated creating vertical diversity. The diversity of tree heights makes it possible to reduce the wind speed, an element responsible for the transpiration of crops and consequently for water loss. The integrated system of agroecology increases ecosystem service (pollination, etc.).

"In Asia, for example, integrated systems combine rice cultivation with other types of production (fish, ducks or trees). By maximizing synergies, integrated rice systems dramatically improve yields, dietary diversity, weed control, soil structure and fertility while providing habitats for biodiversity and participating in pest control. [15]. Pastoralism and extensive grazing systems manage the complex interactions between

populations, multi-species herds and varying environmental conditions, which builds resilience and contributes to ecosystem services such as seed dissemination, habitat preservation and soil fertility "[16,17].

At the social level, cohesion between producers is strengthened by the sharing of cultural experiences, in situ and ex situ conservation methods for seeds, for example; producer-consumer, consumer-consumer affinities are consolidated, in particular through the exchange of experiences including those related to the preparation of food, etc. Family-job reconciliation is hassle-free.

On the educational side, the agroecological approach is experiential, and promotes other skills in addition to language and logical-mathematical skills. Knowledge transfer occurs on the job, through observation and immediate practice [18]. The assimilation takes place at the pace of the learner without constraint or Cartesian obligation.

From an individual point of view, there is an affirmation of one's human, individual and collective identity: learning to be, to learn, to relate, to situate oneself, to assume oneself, to assert oneself and to express oneself, to take care and answer for oneself [19]; humans are resilient and live with peace of mind, guaranteed employment which improves psychological and physical health.

With regard to food and health, the major innovations stand out. Eating habits are changing. Food is fresher and healthier. Nutritional intake is improved. ETC [20] reported that at least 15% of food calories produced by industrial agriculture are lost during food transportation, storage and processing, and about 8% of food calories are not consumed and end up in the trash. FAO [21] reports that nearly two billion people worldwide suffer from micronutrient deficiencies. Furthermore WHO [22] reports that obesity and diet-related diseases are spreading at a tremendous rate: 1.9 billion people suffer from overweight or obesity, and non-communicable diseases (cancers, cardiovascular pathologies, diabetes) are the leading cause of death worldwide.

On the economic side, it is resilient in agroecology. Indeed, the local species used and the integrated system of resources have an optimal adaptability which attenuates the

fluctuations of production losses due to climate change. If the yield of one species should drop for one reason or another, the others maintain or increase theirs, hence the relevance of the association of crops is strongly underlined in agroecology. In addition, the recycling of agricultural waste on site and the reduction of external inputs allow the producer to lower his production cost.

In terms of climate change, vertical, horizontal and temporal diversities help mitigate their impacts. The height diversity and biological richness of the fields mitigate drought by reducing plant evapotranspiration and soil water retention, and increasing the ecosystem's capacity to sequester atmospheric carbon. The short circuit of goods and the non-use of agricultural mechanization reduce the emission of greenhouse gases which escape from the smoke of the machines.

"The energy used to produce lost or wasted food accounts for about 10 percent of global energy consumption, and the food waste footprint is equivalent to 3.5 gigatonnes of carbon dioxide per year, in the form of greenhouse gases "[23].

Agroecology offers efficiency and a recycling capacity that benefits the environment and the producer. Its integrative nature facilitates access to inputs which are readily available and biodegradable. The producer-consumer circuit is reduced (local production and consumption). By strengthening biological processes and recycling biomass, nutrients and water, producers can have less reliance on external resources, lowering costs and negative effects on the environment (pollution, etc.). Reduced dependence on external resources gives producers additional resources by increasing their autonomy and resilience in the face of natural or economic shocks.

5. BRINGING TOGETHER AGROECOLOGY WITH ECO- DEVELOPMENT AND *Buen vivir*

Two approaches, eco-development and *Buen Vivir*, have proven to be particularly innovative. On the one hand, they both call for concerted action by all social actors and a rebalancing of powers for the benefit of civil society. On the other hand, they involve starting from the territory and local deliberation processes to address fundamental issues: environmental sustainability, social inequalities, transformation of the

productive system, participatory democracy [24].

The analysis made by Figuiere and Matereau [25] on Sachs's work in connection with eco-development first reveals three pillars before the Brundtland report:

- "The autonomy of decisions (self-reliance) and the search for endogenous models specific to each historical, cultural and ecological context.
- Equitable management of the needs of all men and of each man; material and immaterial needs, starting with that of fulfilling oneself through an existence which has meaning, which is a project.
- Ecological prudence, that is to say the search for development in harmony with nature".

Second, after the publication of the Brundtland report in 1987:

1. "The first is the most important: it combines the social relevance and the equity of the solutions proposed since the finality of development is always ethical and social".
2. "The second concerns ecological prudence: (...) the survival of the human species is at stake and therefore it is no longer possible to externalize the environmental effects of our actions without worrying about them."
3. "The third dimension aims at economic efficiency which is only instrumental. (...) It is a question of better situating the economy and measuring its efficiency against macrosocial criteria and not simply microeconomic profitability".
4. "A fourth dimension is cultural. The solutions proposed must be culturally acceptable, which brings us back to one of the most difficult problems for the "developer": that of proposing change in cultural continuity by avoiding imposing exogenous models but, at the same time, by refusing to shut himself up in immobile traditionalism".
5. "Finally, there is the dimension of territoriality, the need to seek new spatial balances, the same human activities having different ecological and social impacts depending on their location. Socio-economic planning and land use planning must be considered together".

In view of these analyzes and seen according to Berr and Diemer [24], agroecology is an approach of decentralized cooperation actions taking into account the skills and know-how of local populations, then making the income from the activities developed sustainable. It encourages the community to be at the base of its own development and gives them the necessary means. It breaks with the dominant logic, inspired by a Rostowian vision, which encourages the generalization of the Western development model to the whole planet [24].

Apprehended in the cosmovision of Buen Vivir, agroecology is an alternative to development. In it the notion of progress, of "developed and underdeveloped" as phases and stages of the path to progress is non-existent.

"Nor are there concepts of wealth and poverty determined by the accumulation and lack of material goods. Rather, there is a holistic vision around what should be the goal or mission of all human labor which is to seek and create the material and spiritual conditions to build and maintain 'buen vivir', which is also defined as 'life in harmony' "Viteri in [26]"

Agroecology is the expression of the interactional fullness between person, society and the environment. It underpins a holistic view of life where all components are integrated and in balance in time and space. Seen like Cliche [26], it is the culmination of a series of critiques and practices of resistance to extractivism, productivism, the concentration of resources and wealth and in general to dominant development policies.

6. CONCLUSION

Agroecology is polyconceptual. It is a scientific discipline of which the outlines of studies dates back to 1928. It is a movement claiming the population against the abuses of industrial agriculture against nature, society, the economy and the environment. It is also a technique for adapting farmers in response to the adverse impacts of the agricultural revolution.

The integrative approach of agroecology allows it to overcome the problem of climate change, remedy the food problem and support experiential out-of-school education. Its efficiency in the use of external inputs in agriculture strengthens the economic resilience of the

producer, gives him the status of full-time employee, which gives him psychological balance and self-assertion. Its cosmovision brings all living and non-living together with a community whose individuals understand that they are the actors of their own development in an environment that belongs to them and from which they come and belong; hence the natural mutual respect and the preservation of a harmonious cohabitation. This brings it closer to eco-development and *Buen Vivir* and allows it to offer an alternative for our society after the COVID-19 pandemic to avoid the risk of the "pandemic of hunger" which threatens the world.

COMPETING INTERESTS

Author has declared that no competing interests exist.

REFERENCES

1. Wezel A, Bellon S, Dore´ T, Vallod D, David C. Agroecology as a science, movement or practice. *Agronomy for Sustainable Development*; 2009. Available:<https://www.researchgate.net/publication/41699743>
2. Calame M. *Understand agroecology. Origins, principles and policies*. Charles Leopold Maters; 2016.
3. Silici L. *Agroecology: What it is and what it has to offer*. International Institute of Environment and Development Issue Paper. London; 2014.
4. Abraham YM. *Save nature*; 2015. Available:https://www.academia.edu/28107506/Faire_l%C3%A9conomie_de_la_nature
5. Abraham YM. *To finish with nature*; 2011. Available:https://www.academia.edu/23966023/Pour_en_finir_avec_la_Nature
6. Morin É. *Put an end to the woes of ecology*; 2020. Available:<https://www.liberation.fr/auteur/7443-edgar-morin>
7. Petrella R. *Education, victim of five traps*. Catholic University of Louvain; 1998. Available:<http://attac.org/fra/list/doc/petrella.htm>
8. Lanata XR. *Agroecology: Hard core of an alternative to capitalism*; 2013. Available:<https://www.cairn.info/revue-projet-2013-1-page-63.htm>
9. ETC. *Who will feed us? The peasant food web and the food chain*; 2017. Available:www.etcgroupe.org

10. Francis C, Lieblein G, Gliessman S, Breland TA, Creamer N, Harwood R, Salomonsson L, Helenius J, Rickerl D, Salvador R, Wiedenhoef M, Simmons S, Allen P, Altieri M, Flora C, Poincelot R. Agroecology: The ecology of food systems. Journal of Sustainable Agriculture. 2003; 22(3):99-118.
11. Gliessman SR. Agroecology: The ecology of sustainable food systems, CRC Press, Taylor and Francis, New York, USA. 2007;384.
12. Tomich TP, Brodt S, Ferris H, Galt R, Horwath, Kebreab E, WR, Leveau JHJ, Liptzin D, Lubell M, Merel P, Michelmore R, Rosenstock T, Skow K, Six J, Williams N, Yang L. Agroecology: A Review from a Global-Change Perspective; 2011. Available: <https://www.annualreviews.org/doi/pdf/10.1146/annurev-environ-012110-121302>
13. ETC. Forcing agriculture. How genetically engineered organisms could strengthen industrial agriculture and threaten food sovereignty; 2019. Available: www.etcgroupe.org
14. ETC. Gene drive under influence. A review of the evidence on biases and conflicts of interest in the IUCN report on synthetic biology and genetically forced organisms; 2019. Available: www.etcgroupe.org
15. FAO. Scaling-up integrated rice-fish systems - Tapping ancient Chinese know-how. South-South Cooperation; 2016. Available: www.fao.org/3/a-i4289e.pdf
16. FAO. Ecosystem services provided by livestock species and breeds, with special consideration to the contributions of small-scale livestock keepers and pastoralists. Commission on genetic resources for food and agriculture, background study no. 66, rev. 1; 2014. Available: www.fao.org/3/a-at598e.pdf
17. Krätli S, Shareika N. Living off uncertainty: the intelligent animal production of dryland pastoralists. Eur. J. Dev. Res. 2010;22: 605-622.
18. Redfield R. So-called primitive society; 1965. Available: http://classiques.uqac.ca/contemporains/redfield_robert/societe_dite_primitive/societe_dite_primitive_texte.html
19. Sauvé L. From interdisciplinarity to transversality: For a politico-educational project, resolutely ecological. In Darbellay F, Moody Z, Louviot M, Interdisciplinarity at school - Success, Resistance, diversity, Geneva: Éditions Alphil Presses Universitaires Suisse. 2019;69-88. Available: <https://www.alphil.com/index.php/l-interdisciplinarite-a-l-ecole.html>
20. ETC, Biofuelwatch and Heinrich Böll Stiftung. The great climate fraud. The case against geo engineering; 2018. Available: https://www.etcgroup.org/sites/www.etcgroup.org/files/files/etc_bbf_mai2019_us_fra_v3.pdf
21. FAO. The future of food and agriculture. Trends and challenges. Rome; 2017.
22. WHO. Obesity and overweight; 2015. Available: www.who.int/mediacentre/factsheets/fs311/fr/.
23. FAO. Food wastage footprint full-cost accounting: Final report. Rome; 2014.
24. Berr USA, Diemer A. From eco-development to buen vivir, or how to put local knowledge back at the heart of decentralized cooperation processes in the countries of the South. Developing Worlds. 2016;44(30):175.
25. Figuiere C, Matereau R. Eco-development and food sovereignty: What are the challenges for the South?; 2012. Available: <https://halshs.archives-ouvertes.fr/halshs-00778040/document>
26. Cliche P. Sumak kawsay and buen vivir, an alternative to development; 2017. Available: http://redtac.org/possibles/files/2017/10/vol41no2_Sumak-Kawsay_Cliche.pdf

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