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AGROECOLOGY AS AN ONTOLOGY TO GUIDE AGRICULTURAL AND FOOD SYSTEMS

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Summary

Current agriculture and food systems worldwide jeopardize the ability of future generations to live a good life by contributing to major environmental and social crises: soil fertility and biodiversity loss, climate change, malnutrition and inequalities. These problems are, in part, related to how agricultural and food systems have developed into industrialized systems. These were built on a foundational Western worldview, characterized by the Cartesian divide between Man and Nature. The IPES 2016 report on food systems calls for a shift from low input traditional and industrial agricultural systems to diversified agro-ecological systems. More than a change in practice, such a shift implies a redefinition of the conceptualization of agricultural and food systems and their evaluation. The paper is built on the premise that such a shift in farming and food systems requires a new foundational worldview, a new mental model to guide their conceptualization and design. Inspired from a reading of farming through a political ecology and feminist economics lens, the paper proposes elements of an ontology for alternative food systems in the wider sense (incorporating farming systems) – namely, reproduction as the aim of the system's activities and egalitarian power relations within the system. It then confronts these ontological principles with observations of agroecological farmers in three case studies. The rise of agroecology raises questions about the values that shape agricultural and food systems and engenders a “new” target: the reproduction capacity of our societies.

Keywords

Agroecology, Feminist Economics, Power Relations, Reproduction, Socio-ecological Systems, Sustainable Food Systems, Worldviews.

1 Introduction

Agriculture is at a crossroads (IAASTD, 2009). As José Graziano Da Silva summarized in the FAO symposium on agroecology in 2018: We have “to get out of the trap of conventional, high-resource input systems with increasing productivity at any social and ecological costs, still not leading out of hunger for over 800 million people”. CAPRA (1984) understands the numerous environmental problems as the expression of a single crisis of perception. It “derives from the fact that we are trying to apply concepts of an outdated worldview – the mechanistic worldview of Cartesian-Newtonian science – to a reality that can no longer be understood in terms of these concepts.” (CAPRA, 1984: 15-16). According to CALLICOTT (1988:3) a culture's agriculture reveals its “fundamental metaphysical beliefs and values. Thus, worldviews are fundamental in the transformation towards a sustainable agricultural and food system. Many actors of the food system, including large agencies such as the FAO (2018) or panels of experts such as the HLPE (2019), but also the former representative at the UN DE SCHUTTER (2017), the IAASTD group (2020), and a growing number of researchers, activists and civil society groups around the world consider agroecology as a very promising alternative to the mainstream farming and food systems.

Yet, if agroecology can become a paradigm or at least serve as boundary object for the realization of an alternative paradigm for agricultural and food systems, then some basic values, representations and aims, underlying all design principles and contributing to form the “agroecology ontology”, may and should be identified.

The paper has both a theoretical and an empirical component. First, using a political ecology perspective and one concept from feminist economics (the *Oikonomia*), we propose a conceptual framework featuring two underlying principles for an alternative mental model enabling a shift away from the reductionist Cartesian industrialized worldview on farming systems. Second, the paper turns to empirical case studies as a source of observations for confirmation or further evidences of the egalitarian and reproductive grounding principles in the practice of agroecology. Thus, the paper presents three case studies of existing agroecology groups, confront the theoretical principles to observed mental models, discourses, or data, and empirically qualifies the principles.

Current dominant modern/Cartesian/Western worldview

The beliefs characterizing Western Culture are “the emblematic faith in technology, the doctrine of progress, the centrality of instrumental reason, the sanctity of individual freedom, the denial of the sacred”, according to LITFIN (2003: 30; CITED IN DOMPTAIL ET AL., IN PREP.). A first consequence of the Western worldview is that we, humans, strive to reach an objective description of nature (MURACA, 2016), outside of ourselves. Second, the goal of scientific activity became to dominate and control nature (CAPRA, 1984:55-56; KIRSCHENMANN, 2005). The mechanistic view of nature, which still dominates today, enabled the rationalizing of agricultural production; that is transforming its conceptualization from a cyclical process into a linear sequence of production steps - some of which substituted by external inputs - disconnected from the functioning of the producing socio-ecological system (CALLICOTT, 1990). In this way, it became legitimate to focus on increasing agricultural yields and simplify production systems by rationalizing labor hours and financial capital within these linear production steps to realize economies of scales (PERS. COMM PROF. NUPPENAU, 2021). This view of farming systems held no consideration for work conditions, the meaning of work to humans, and the links of the production processes to the environment as sink, source and embedding system. It is nevertheless still presented as natural and unavoidable in the feed-the-world-discourse (SANDFORD, 2011:289 IN DOMPTAIL ET AL., IN PREP).

The problem is that the mechanistic worldview is too narrow. Science, as well as groups and networks from the practice in the field, are seeking new principles and paradigms for their organization (CAPRA, 1984). Several environmentally-friendly-farming currents have arisen in the last 25 years. Some are still anchored in a reductionist mechanistic worldview where production is to be maximized under additional environmental constraints. Other alternatives, such as agroecology, claim to be fundamentally different: they claim to develop on systems’ thinking and based on a different worldview.

Defining agroecology

One of the difficulties in defining agroecology seems to lie in the fact that agroecology is not a tangible set of practices or criteria, contrary to what organic agriculture has become today (GUTHMAN, 2004). At the level of agricultural practices, agroecology designates a systems’ thinking approach and an endeavor to manage the farming system so as to close ecological cycles (NICHOLLS ET AL., 2017). At the level of food systems, the FAO coined ten elements of agroecology, making agroecology an *approach* to agricultural and food systems rather than a *type* of agricultural or food system. The FAO elements describe food systems as complex socio-

ecological systems including ecological and socio-cultural principles (FAO, KNOWLEDGE HUB).

The second difficulty in defining agroecology is precisely this extension of system thinking from the ecological sphere (ecology of farming systems) to a more complex and broader *socio-ecological* system, both at the farm and at food system levels. BARET (2017, cited by CERDAN ET AL., 2018) states that, originally, agroecology rested on both the management of ecological processes on the farm and on social dimensions. CERDAN ET AL. (2018) transfer the concepts of weak and strong sustainability, well-known to ecological economics (GOWDY, 2001), to the agroecology approach. They propose that ‘weak’ agroecology focuses on ecological processes and practices at the farm (or one can imagine, at the landscape) level. ‘Strong’ agroecology, on the other hand, would encompass both ecological and socio-economic as well as political processes. According to CERDAN ET AL. (2018), the strong agroecology approach seeks to break from the current dominant model of agricultural and food production and organization, “as it relies on alternative food systems that are in opposition to the dominant model”. ‘Strong’ agroecology goes beyond environmental friendliness to question the current structures of the food system, described as a global corporate food regime by MCMICHAEL (2009). ‘Weak’ agroecology does not, according to CERDAN ET AL. (2018), but rather seeks to improve the environmental outcome of the current system, without contesting the legitimacy of its economic and political structures nor worldview. Which underlying values and aims characterize the opposition given by strong agroecology to the current dominant food regime remains unstated, at any rate inexplicit, in most studies about agroecology. In the second section of this paper, we propose a conceptual framework to conceptualize farming systems in their political-economic context.

2 Conceptual framework: Identifying structures and aims of alternative ontologies for farming systems by reading agroecology through a political ecology lens

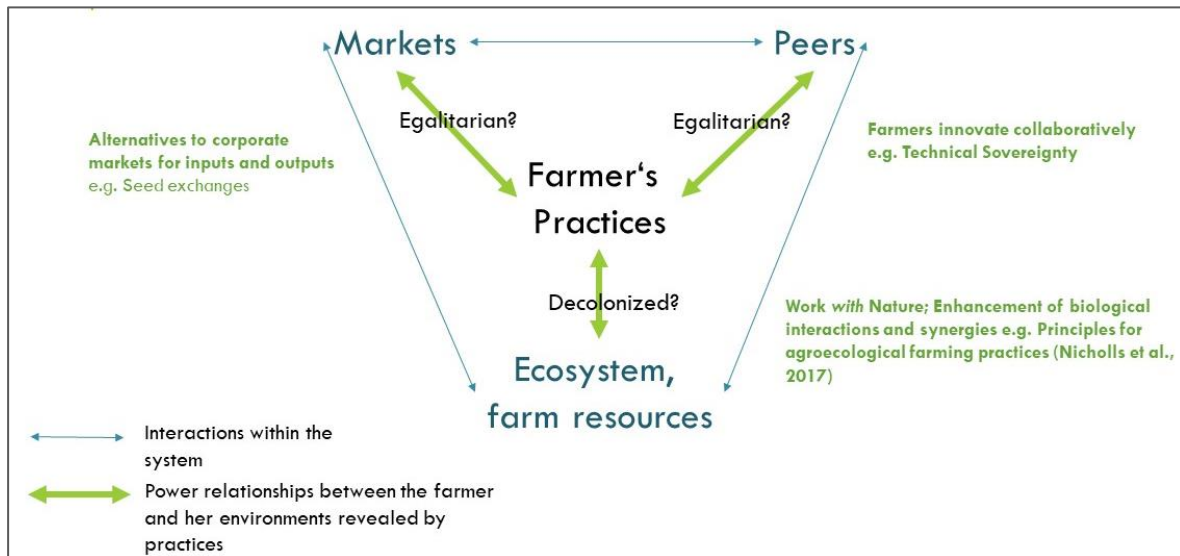
2.1 Agricultural systems as systems of (power) relationships

At first, I propose viewing the farmer as the center of the system she manages, deploying relations to all other elements of the farm and the embedding food system (Figure 1). In any system, of course, the farmer entertains relationships to the natural resource or ecosystem she manages and produces from, relationships to her peers, network and other social environments, as well as to her economic environment, put simply here the input and output markets. I see each practice as the enactment of these relationships. Each practice adopted has effects on multiple relationships. As in any system, one change triggers others. For instance, the purchase of seeds from a seed company establishes a relationship between the farmer and the company, where the company has some power over the farmer through its production and delivery of the manufactured seed. The choice and type of seed also has consequences on the way the land will be cultivated, and hence shapes the relationship of the farmer with her ecosystem (with nature). Finally, the farmer will not rely on seed exchange with her peers, but will rather depend on accumulating information about the purchased seeds. The seed choice thus also shapes the farmer’s network and her relationship to her peers. Thus, all practices shape relationships within the ecological, social and economic environment. Power relations between the different entities involved characterize the relationships.

In the context of the current global corporate food regime, from which agroecology is said to break out, power relations are considered to be in favor of corporations (MCMICHAEL, 2009), leaving little space for manoeuvre to farmers (VAN DER PLOEG, 2009). My proposition is thus that strong agroecology approaches would seek to redefine farmers’ relationships with nature,

with peers and with the market (input, outputs) to their political and ethical benefit and especially towards more even power relations (PATEL, 2009).

Figure 1: Farming systems as the enacting of farmer-environments relationships



Source: Authors.

The farmer-market interactions: Agroecology and food sovereignty

The Nieleny declaration claims that “agroecology does not exist without food sovereignty and food sovereignty cannot be accomplished without agroecology; these are two sides of the same coin”. The statement depicts a ‘strong’ agroecology where socio-political aims of sovereignty appear inherent to agroecology. The inherent systems’ behavior referred to in this quote illustrates that as both inputs and products affect their relationship to Nature, in which they constrain the farming practices, which have various impacts on the environments. Vice versa, certain practices rely on given inputs and markets for their doability. Thus, egalitarian power relationships with the market and corporate sphere of the food system may enable farmers to abandon practices, which do not represent agroecological farmers’ values nor deep aims. They replace them by practices enabling them to enact their values and respond to their actual needs. PATEL (2009) presents the struggle for sovereignty as the desire of farmers to gain more power in farming with crops and practices that make sense to them, helping them feel self-empowered to choose their farming practices, and beyond that the corresponding lifestyle. Food sovereignty reclaims power especially in relationships with other actors of the food system, such as retailers and input providers in order for farmers to gain more control over the type of inputs they want to use and products they want to sell. *In fine*, the outcome Patel points out (and questions) is one of egalitarian relationships among actors, farmers and corporations, beyond empowerment for farmers within the food system.

Relationship to peers: agroecology and solidarity

The collaboration among agroecology actors appears as essential to create an environment in which they can strive, since the state and, in general, the corporate food system as a embedding environment is seemingly not conducive to the adoption of agroecological practices.

For instance, farmers rely on the community and one another to generate knowledge. As knowledge stemming from the cooperate food regime does not sufficiently support agroecology (e.g. few agricultural school teach agroecology, and if then, only as a minor addition, except in a few specialized schools), farmers need a community in which knowledge is produced and exchanged (NICHOLLS ET ALTIERI, 2018) so as to develop practices which enact their values. A second example is the development of appropriate technologies. Some farmers design their own tools for special cultures (e.g. Poppy cultivation by Jung-Energy farm in Pohlheim, Germany), or develop technology groups to develop and care for machines, aiming to reach what is called technical sovereignty. Building alliances can also of course be handy to reach (specific organic) markets or to access inputs, especially land, as is the case of the Bündnis für Junge Landwirte, a farmer Alliance in Brandenburg, Germany. Lastly, solidarity among agroecological farmers is essential to reduce a feeling of isolation and sole fighter, leading some farmers to burn-out (Podium Discussion agroecology Forum, 2017, Lyon, France).

The farmer-nature interactions: power relationships and the Human-Nature divide

The third value domain, of course, is the relation to Nature. In Western Europe, farmers are embedded in a secular culture. This culture is characterized by a worldview where Man and Nature are separated and opposed, where the end production of food, rather than the process of food production, is central to current food systems. The dichotomy between Man and Nature is central in the exploitative and instrumental usage of nature, which characterizes the Man-Nature relationship today. This separation of Man and Nature and the ensuing instrumentalization of Nature remains intact (MURACA, 2016) in the forms of environmentalism that have developed as a response to the ecological degradation: enclosures such as natural parks from which humans are excluded is one of them. A second trend is precision agriculture, climate-smart agriculture, nutrition agriculture and the like (OEHEN ET AL., 2015), practices which aim at using resources more efficiently.

Yet, a third popular trend of environmentalism, termed Environmentalism of the poor by GUHA AND MARTINEZ-ALIER (1997) refers to the struggles of small farmers, women and indigenous people to preserve their collective livelihoods as well as their vision of a self-determined and sustainable life in their community. Their language and narratives express a radically different understanding of the relation of people to their 'territory,' with all its inhabitants included in interconnections among the ecological, human and supernatural levels of the territory (MURACA, 2016, IN DOMPTAIL ET AL., 2020). ESCOBAR (2008:154) considers this a decolonial view on nature that "calls for seeing the interrelatedness of ecological, economic, and cultural processes that come to produce what humans call nature" (quoted in MURACA, 2016: 35). In the decolonial view, Man does not attempt to control and use nature as a substrate but understands his activity as part of the ecological system, creating flows of material and energy, as other species do (MOORE, 2015). DE SCHUTTER (2017) and before him several environmental anthropologists such as LITFIN (2003), MURACA (2016), or CAPRA (1984) perceive the agroecological approach to be rooted in a newly defined and decolonized relationship with Nature. MURACA (2016) associates this worldview of people interconnected with the territory and being part of the territory with the practitioners of strong agroecology. Agroecological movements too claim that their practices are based on a holistic worldview of nature; these have not been explored yet.

2.2 Agroecology and feminist economics: the aim of reproduction

Feminist science offers a useful sociological lens applicable to a diverse range of fields and research topics (HARDING, 2016), including ecological economics and the Man-Nature relationship. JOCHIMSEN & KNOBLOCH (1997) make visible the contribution of the environment

and of unpaid or invisible work as inputs to the economic activities. In their representation, the reproduction of the social sphere and of the environmental suprasystem appears elementary to the economic activity.

Reproduction activities can be conceptualized within the physical (environmental) domain, the social and the household domains (PALTASINGH & LINGAM, 2014). They include care for people, meaningful work, production and food choices, care for nature, maintenance of soil fertility, etc... . Reproduction activities englobe the administration of the whole economy (understand management) of the household, the farm and of their maintenance in time. They correspond to the Aristotelian “*Oikonomia*” guiding the good life concept, and not the economy of the accumulation of wealth (MARTINEZ-ALIER, 2009).

Agroecology farmers (e.g. La Via Campesina) claim that they produce food and not commodities, that they support livelihoods and not markets. Could it be proposed that the primary aim of agroecological farming systems is to maintain, care and reproduce the farm and the household on the long term so that their functioning and economy sustainably “fulfills the food, health, education, housing” (MARTINEZ-ALIER ET AL., 2010) and environmental needs of the people? This thought, already present in de-growth literature, can serve to guide investigations of agroecology and its effect on the *oikonomia* (maintenance of the household) of the farms practicing it.

3 Case studies of agroecological farming initiatives

This section attempts to link our theoretical framework with field reality and evaluate whether existing agroecological farmers and their practices succeed in expressing and enacting the two main principles suggested, namely egalitarianism and reproduction. Table 1 presents the main characteristics of the farmer case studies. The first case study adopts a moral economy perspective to investigate the motivations of three farmers of the vicinity of Frankfurt (Germany) to enter and manage a Community-Supported-Agriculture scheme (CSA). The second one focusses on the Man-Nature relationship, and explores the worldviews of four agroecology farmers of central Hesse, Germany. The third case study investigates the relationship between the belonging to an agroecology group, household and social reproduction activities and food status, among farmers of one agroecology group in Imo state, Nigeria. The data was collected between 2018 in Germany and 2021 in Nigeria.

Although none of the farmers interviewed in any of the case studies names herself agroecological farmer, we hold farmers as true agroecological practitioners on the following basis:

- The farmers follow agroecology farming principles as described by e.g. Nicholls et al. (2017),
- The farmers interact in a community of ‘strong agroecology’ interest
- The farmers practice agroecological farming to survive, improve their well-being and maintain their existence
- The farmers build alternative links to input and output actors in order to survive.

Table 1: Characteristics of three case studies of agroecological farmers in Germany and Nigeria.

Case study	A	B	C
Country, region	Germany, Hesse	Germany, Hesse	Nigeria, Imo
Interviewed Actors	Farmers (men and women)	Farmers (men and women)	Women farmers
Income sources for the household	Farming	Farming	Farming and other activities of husbands
Embedding structure	Community-Supported Agriculture (CSA)	Working group of Peasant farmers (Arbeitsgemeinschaft Bäuerliche Landwirtschaft; ABL)	Agroecology Farmer Group
Farm size (trend)	Less than 100 ha	Less than 100 ha	Less than 5 ha
Main products	Horticulture	Meat, Cereals, Horticulture, Seeds, Education	Horticulture, self-subsistence
Main markets	CSA + retailers + own shop (1 farmer)	Crowing-butchering, organic retailers, local schools	Own household, neighbors, local town market
Form of data collection	Face to face Leitfaden-guided interviews	Face to face Narrative interviews	Key informants Survey
Sources	SCHILLING, 2019, SCHILLING ET AL., IN REVIEW	DOMPTAIL ET AL., IN PREP. , HIRSCH, IN PREP.	UME ET AL., 2021

Source: Authors.

3.1. Case A: Agroecology: redefining dependency on the market

The three agroecological community-supported agricultural schemes (SOLAWIs, CSAs) in the vicinity of Frankfurt, Germany show that farmers have two major interests in CSAs: the first one is related to the structure of CSA. Through contracts fixed yearly, regular payments and risk sharing with a group of consumers, farmers gain an additional and less volatile pillar for their livelihoods. Second, and more strikingly, farmers engage in building such communities because it increases their agency in shaping a sphere of exchange; an economy, based on their own values, which they also share with their consumers. These include environmental friendliness and especially support for peasant structures. Finally, it enabled the farmers to increase their well-being by reducing the monotony of work through an increased crop diversity. All three aspects strengthen the farmers (and consumers') food sovereignty, that is, empowers them.

These results illustrate that the agroecological market is an attempt by farmers both to loosen the relationship to the main market, which was constraining the practices and to create relations, which are closer to their values and more egalitarian between them and the workers, or the consumers.

3.2. Case B: Agroecology and a decolonized relationship to nature

Our empirical investigation of the worldview of individual agroecological farmers in Hesse, Germany, does reveal evidence of a decolonized worldview, which transcends the western utilitarian view of nature as conserved or exploited to come close to the concept of environmentalism of the poor (MARTINEZ-ALIER, 1997), characterized by the perception of dependency on nature (DOMPTAIL ET AL., IN PREP).

Indeed, the human-nature relationship appearing in farmers' narratives is one of respectful collaboration and egalitarianism with nature. Amazement towards the powers of nature, humility towards the wisdom of nature and inspiration from the diversity of nature are three key aspects of the relationship between the agroecological farmers interviewed and nature. The diversity and complexity in nature are key guidelines for the farming practices and farm design by farmers whose systems understanding is very deep.

In addition, the life-basis concept, framed in the interviews as soils, water, air, biodiversity and complexity, is seen as a key to reconciling views of nature as wild versus tamed. This concept provides a new aim for agricultural activity, based on the idea that agriculture can mean crafting nature into a life-support system for multiple species. Maintaining the life-basis is a redundant principle in the choice of practices. The life-basis concept put forward by the farmers testifies that (crop) production does not seem to be only an end in itself. Rather, the production process plays a role, in securing the maintenance of a life basis as a primary aim. One concept stemming from feminist economics helps qualify this belief in the Life-basis and the worldview of agroecological farmers integrating it: this is the concept of *reproduction* and the broadening of the focus of economics, as further explored in the next case study.

3.3. Case study C: Agroecology groups: reproductive activities and Inter-dependency

While agricultural production has increased over the last decades in Nigeria, rural hunger has remained the same. UME ET AL. (2021) investigate the case of a smallholder group in the state of Imo, which was created in 2016 by an extension officer and researcher dedicated to diffusing agroecology techniques of production (EMEANA ET AL., 2019). A first descriptive assessment of the agroecology group (AEG) revealed that the group acts as a network for the provision of inputs of all kinds to its members: cash, seeds, and even land. In addition, the group is the locus of collective learning thanks to regular on-farm meetings. In an on-going qualitative analysis by the authors, the respondents stress that the group officiates as a solidary family, in which goals are shared. These differ from the technology, knowledge and markets, which are transported by other groups and federations such as the world-bank Fadama project, to which the AEG farmers also have access. The AEG and agroecology practices appear to help them achieve other goals by adopting specific activities.

Through a structural equation modeling study, UME ET AL. (2021) show that farmers of the AEG invest more resources in reproduction activities, both the reproduction of the farm and the reproduction of the household. In more detail, AEG farmers invest more resources in nurturing their soils and environment on the farm. Thereby, they nurture the life-basis function of their farming land as an ecosystem and its physical reproduction capacity. In addition, farmers adopt practices of diversification and complexification of cropping patterns, which raises the availability of diverse foods in the households, as well as their nutrition, thus contributing positively to the household reproduction. Because of the revealed co-variance between activities serving the environmental and the household reproduction, we interpret that adopting agroecology practices empowers farmers to invest more resources into household reproduction activities that go on at the home. In other words, practicing agroecology for the AEG farmers is a way to invest in their own reproduction, as farming households. Further qualitative investigations will deepen our analysis.

4 Disucssion

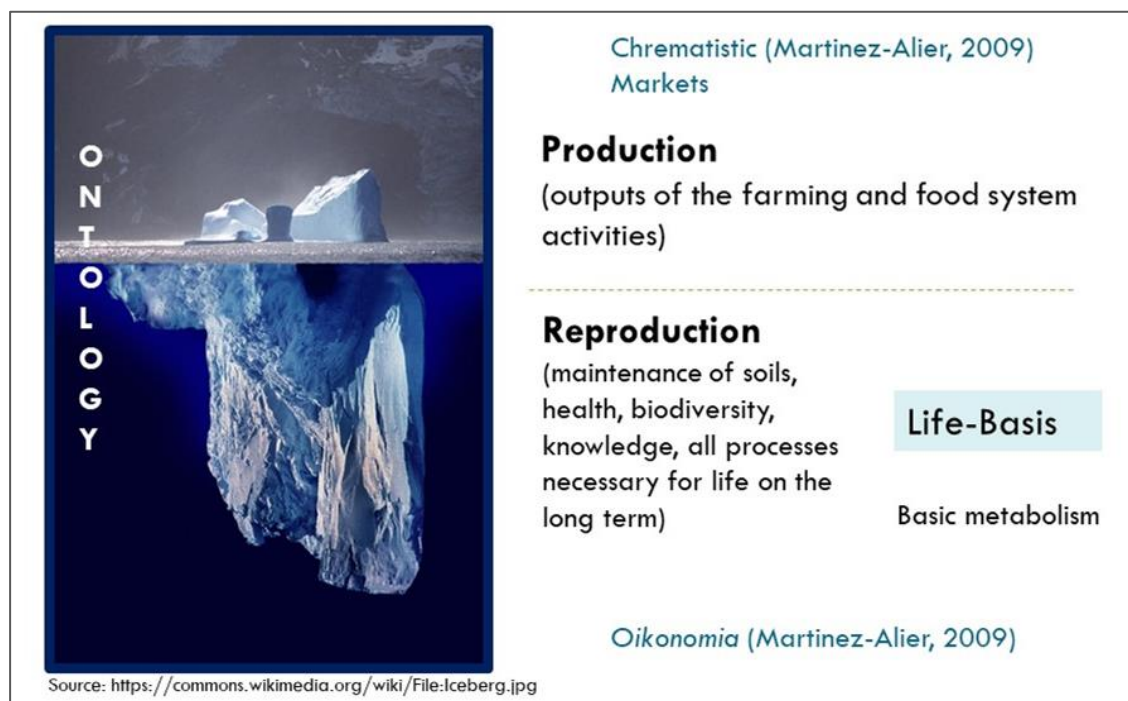
The analysis of the worldview of agroecological farmers in Germany suggests that agroecological farmers strive to achieve reproductive and egalitarian principles and values. These apply to their relationship to the land, peers and input/output markets, which shape their farming systems and the food system they are embedded in. Politically, these principles can be interpreted as a struggle to maintain sovereignty and act upon one's own values. The rise of agroecology raises questions about the values that shape agricultural and food systems and engenders a "new" target: the reproduction capacity of our societies.

We propose a conceptual framework for the study portraying agroecology as the redefinition of the relationships of farming households with nature, markets and peers towards more egalitarianism. Through these new relationships, the farmer would acquire agency, for in this framework, we investigate the possibility that the aim of farmers in taking part in the agroecology network and practices is the reproduction of the farm and household, thereby including soil fertility, food security and education as the major constraints to be satisfied by the management of the farm.

Yet, if we look at how agricultural economics tends to conceptualize agricultural production, it becomes clear that production is often considered independently from the social (household, community, country) and environmental system the production process is embedded in. At best, impacts on the social and environmental sphere integrate the analysis in the form of externalities. This concept of course ignores the feedback relationship which JOCHIMSEN AND KNOBLOCH (1997) suggest exists between the economic, the social and environmental spheres.

Economic analysis tends to focus on the production side only. Taking the analogy of the iceberg depicted in Figure 2, production sticks out of the water, is visible and analyzed. This corresponds to chrematistic economics and its aim is perceived to be the generation/accumulation of wealth. The bottom part of the iceberg kept invisible in common production analyses would be all activities serving the sustenance of the production system in time; differently said, the reproduction of the system for its maintenance (and integrity) in time. The bottom of the iceberg represents the need to maintain a basis metabolism, as life-basis, for the production to take place. This corresponds to a neglected sphere of the economy, complementary to the chrematistics, which Joan Martinez-Alier (2009) terms the *Oikonomia*, the economics of the household, in the literal sense. In the metaphoric one, it points to the necessity to maintain the production system and life-basis as a first and foremost goal for all human activities and to consider (sustainable) production as directly dependent of the reproduction capacity.

Figure 2. The concept of the iceberg: a redefinition of the boundaries and aims of agricultural and food systems



Source: Authors. Picture from Wikipedia commons.

5 Conclusions

To conclude, I would like to summarize the proposition for an alternative ontology of the agricultural activity: An ontology in which Man's relationship with Nature, with peers and with the market (input, outputs) is redefined as decolonized relationships, egalitarianism and the achievement of both reproduction and production goals rooted in a long-term perspective of stability.

Yet, if reproduction goals rather than chrematistic goals are to be attributed to farm and food systems in the future, then their role as a vector of development must be questioned. What will be the aim of farming and food systems tomorrow? The formulation of indicators and tangible objectives for nurturing reproduction in the agricultural production and food systems can become a genuine support for the definition and design of sustainable systems.

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