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Combining systemic and pragmatic approaches for the holistic diagnosis of a farm in agroecological transition in a health context

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Introduction: Today, agriculture and livestock farming are facing environmental, social and health challenges. The agroecological transition is a possible response to these challenges. It requires changes in practices but also an evolution in farmers' ways of thinking and relationships with living things. Some diagnostics of farms, such as the global analysis of farms, behaviors and practices.

Methods: We therefore propose a holistic approach combining a global analysis of farms and a pragmatic approach to understand the functioning of agricultural production systems. This pragmatic turn enables to integrate the ways in which the farmer's reality is established, the performance of the system, the associated metrics and the farmer's relationship with life.

Results and discussion: Using the example of a farm in transition, we show that it is the combination researcher's stance and allows for a renewed dialogue between research and farmers in the field.

KEYWORDS

methodology, pragmatism, livestock systems, agroecology, farm health, farmer's reality

1. Introduction

In Western countries, agriculture has undergone many changes since WWII. The objective of self-sufficiency based on the control of biological processes and environmental hazards (Hubert et al., 2013) led farmers toward increased productivity. This modernization of agriculture has been supported by advisory systems, research and education, and backed by public policies. It has led to a standardization of production methods (simplification of crop rotation, etc.,) and a specialization of production systems and areas (Meynard et al., 2013; Duru et al., 2014).

Agroecology is a promising alternative to this type of modernization (Guzmán and Woodgate, 2013; Silici, 2014) and its negative impacts (Lamine and Dawson, 2018; Frison and Clément, 2020). This global concept proposes to redesign farming practices and systems (Gliessman, 1990). In a strict sense, agroecology relies on a better integration of ecological processes in agricultural systems, replacing chemical and energy inputs by natural processes and building on biogeochemical cycles (minerals, energy, water) to reduce

environmental impacts (Nicholls et al., 2020). In a larger sense, some authors like Wezel et al. (2009), consider agroecology a "science, a practice and a movement" oriented to a reconfiguration of the whole food system (Francis et al., 2003; Lamine and Dawson, 2018; Nicholls et al., 2020). Following this broader conception, agroecology cannot be implemented only with simple technical changes. It also requires deep system shifts, as well as an evolution of farmers' values and ways of thinking (Hazard and Lacombe, 2016; Cayre et al., 2018). Consequently, agroecological transition can follow different complementary pathways (Tittonell, 2020). Particularly, McGreevy et al. (2021) have shown that individual agroecological farms can act as "lighthouses" to amplify the uptake of agroecological principles and practices by other farmers. Thus, to foster this farm-to-farm amplification of the agroecological transition (Nicholls et al., 2020), a specific agroecological diagnosis of farms is essential. This diagnosis should no longer be based on analytical thinking (Hubert et al., 2013) like it was during the modernization of agriculture period.

To address these growing sustainability issues, practitioners developed new methodological approaches based on "system thinking" that deal better with the complexity of farms. They also wanted to provide farmers with more adapted decision-making tools (Marshall et al., 1994). These methods have evolved over time to include a diversity of indicators (Zahm et al., 2008; de Olde et al., 2017) and a better understanding of farm adaptive capacities and resilience (Darnhofer et al., 2012). Building on these developments, researchers designed specific tools for the diagnosis of agroecological farms. For example, Nicholls et al. (2020) have recently proposed multidimensional indicators and evaluation criteria to assess the level of application of agroecological principles.

However, Hazard and Lacombe (2016) show how the creation of a diagnostic tool can come up against the complexity and singularity of the situations that must be transformed. Analysis and evaluation grids designed by researchers and experts can differ widely from farmers' own ideas about performance and sustainability. It is more than a question of analytic tools: it is an epistemological issue. Agronomy is part of the field of "modern sciences" that aim to find universal laws for explaining the world and its biological processes. The evolution of agronomy has led to a gap between knowledge and techniques in agriculture (Hubert et al., 2013) and a fragmentation of knowledge, objects of study and disciplines (Hazard and Lacombe, 2016). The knowledge generated by the scientific method is mobilized by farmers, but farmers also produce their own knowledge (Darré, 1984; Demeulenaere and Goulet, 2012). Indeed, there is always an irrational and unpredictable part—which escapes scientific rationality and measurement (Cohen, 2021). Thus, agronomy excludes what is subjective, what are human beliefs or perceptions - which are situated and can neither claim to be universal, nor be measured. Moreover, farmers can hesitate to expose their ways of thinking and their personal values that orient their practices if they fear being judged by a high authority figure. To access what Scott (1990) names the "Hidden Transcripts", one needs to design a specific system for collecting information through interviews. This distance between agronomy and a farmer's reality can be the cause of misunderstandings that limits the capabilities of using the results of scientific analysis for co-designing relevant adaptations for and with farmers (Ludwig et al., 2022). In the perspective of amplifying the transformation of food systems and accompanying farmers around issues of ecological and sanitary crises, the changes in farmers' practices, their knowledge and their different visions must be better considered - without giving up scientific rationality and the knowledge of agronomic sciences.

In this way and considering that agroecological transition is an indeterminate situation and an open-ended process, Hazard and Lacombe (2016) took a "pragmatic turn", shifting from evidence-based to value-based transition. While farmers know what they cannot do, what they should do is gradually redefined as the problematic situation evolves. Thus, pragmatic enquiry (Dewey, 1925, 1938; Lorino, 2018) seems particularly relevant for managing the agroecological transition. In addition to identifying what is no longer appropriate, the aim of the interview is to produce a better understanding of the problems encountered and how farmers find ways to solve them. In order to reach this goal, the interviewer analyses the problems and solutions to be implemented by examining past or future actions from their practical and moral consequences through the farmer's point of view. The pragmatic approach allows moving from a diagnostic approach to a dialogue between peers.

However, one question remains. How can one motivate farmers to sincerely participate in this dialogue? Due to the overall context outlined above, we believe that health is a good entry point. Health defined as "*a state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity*" (WHO, 1948) is a crosscutting issue. Agriculture draws drastically on natural resources to ensure high levels of production and was responsible for 20.6% of greenhouse gas emissions in France in 2020 (Citepa, 2022). These elements negatively affect what some authors in the environmental sciences call ecosystem health (Schaeffer et al., 1988; Rapport et al., 1998). At the same time, animal health and welfare issues are developing. While initially animal health was characterized solely by the absence of physical pathologies, since the Lisbon Treaty in 2009, animals have been defined as "sentient beings". This new definition demonstrates a change in the status of animals, which are now recognized as being capable of feeling emotions and attaining a certain degree of consciousness. Agriculture is also responsible for negative effects on human health with the appearance of zoonoses and the contribution to antibiotic resistance (Graham et al., 2008; Jones et al., 2013; Woolhouse et al., 2015). The links between production methods, human health and environmental health are well established (Patz et al., 2012; Vieweger and Döring, 2015; Roger et al., 2016). Health is thus becoming a concern for both farmers (their own health, the health of their animals…) and consumers. Moreover, the notion of health also allows access to the relationship with living beings. This awareness of the relationship between human health, animal health and the health of the planet has contributed to the development of integrated approaches such as One Health and EcoHealth (Lerner and Berg, 2017). As health is a good entry point to establish a dialogue between science and farmers, we follow Bloksma and Struik (2007) who propose to consider health a conceptual tool for the analysis of farming systems and for their redesign. However, to our knowledge, a pragmatic approach has not been formalized and applied yet.

The objective of this article is to present a new holistic method that can help us better understand the underlying functioning of an agricultural production system in transition, using integrated healthcare as a lens. We will present our new method and then illustrate it by taking the example of a farm transitioning to agroecology.

2. Method: An approach combining systemic diagnosis and a pragmatic characterization of farm health

The proposed approach combines two elements: (1) a systemic diagnosis; (2) a pragmatic logic with an anthropological focus. In this section, we first present the two elements separately, and then their integration into a holistic diagnosis through the lens of farm health.

2.1. Systemic diagnosis

The Overall Approach to Farming (OAF—"Approche Globale de l'Exploitation Agricole") (Sébillotte, 1974; Le Moigne, 1990; Le Gallou, 1993) is a very common method in France for analyzing the biotechnical and financial functioning of the farm in relation to the decision system and its environment.

Originally developed in the 1980s to overcome the limits of modernization, OAF is a systemic grid that considers the farm as a system, where all its constitutive elements are in dynamic interaction, according to a goal (De Rosnay, 1975). It consists in considering a system as a complex whole, composed of interacting subsystems, which themselves interact with the outside world.

The practical implementation of an OAF on farms is based on the construction of a model of the farm, which represents the following elements:

- The history of the farm allows for the understanding of the background and the career paths of people working there, providing elements of analysis for a possible project on the farm;
- The environment, including a biophysical component (climate, pedoclimatic context, etc.), as well as a social and societal component and an economic component. Characterizing the environment with its different components is essential to understand the assets and constraints of the farm;
- The social system corresponds to the social organization on the farm, i.e., the actors on the farm or close to the farm and their role;
- The decision-making system corresponds to the goals, strategic rules and strategic decisions. These rules are usually represented in the form of a diagram that help understand the management of the farm;
- The operating system describes the technical functioning of the farm, which is seen as a system composed of different sub-systems: the forage system, the livestock system, the crop system, the processing system, etc. Each sub-system is analyzed technically and economically using indicators to assess the achievement of the production objectives, and then these sub-systems are linked to each other. These technical and economic indicators are compared with a local reference or a typical case, close to the type of the analyzed system.

In the recent history of agricultural development, systemic thinking has been a powerful innovation to overcome some limits of modernization (Marshall et al., 1994). To sum up, OAF makes the analysis of a system possible, of its technical and economic performances and provides farmers with references, enabling them to compare themselves with others. These indicators are generated using the scientific method, in a register of axiomatic proof (Chateauraynaud and Dubois, 2019). OAF emphasizes the importance of a comprehensive understanding in order to modify systems, to determine the strengths and weaknesses of the farm and to analyze its coherence. It recognizes that the farmer has "reasons for doing what he does" (Brossier et al., 1997), and these reasons are not only driven by a maximization of the profit. Moreover, this approach considers that a farmer is not an isolated individual who makes decisions without considering his social and environmental surroundings. However, the OAF cannot consider everything because an irreducible part of reality escapes it. There is always a gap between the theoretical model and practical reality because any model, even a systemic one, is necessarily a simplified representation of reality, from one (subjective) point of view. The phenomenological approach, on the other hand, allows us to be concerned with the practical reality of the farm from the perspective of the person who acts.

Actually, the background of OAF rationality is deeply influenced by a modern conception of the relation between human beings and all the other beings that surround us. As anthropologist Descola (2015) summarizes it, this modern conception, which he named "naturalism" separates human from nature, with human controlling it. On the one hand, this way of thinking is inherited from the Christian religion that considered that God gave us Nature to serve our needs and allowed us to dominate it. Only human beings have the capability to formalize their intentions and to make conscious choices. On the other hand, the scientific rationality has given a powerful meaning to reinforce this wish of nature domination, by considering that natural processes follow general natural rules that can be revealed by scientific research. However, other conceptions of human-nature relationships can be found around the world, especially in indigenous communities (Manuel-Navarrete et al., 2004; Aikenhead and Ogawa, 2007; Kealiikanakaoleohaililani and Giardina, 2016).

2.2. Pragmatic approach

OAF produces knowledge and enables to understand an agricultural production system according to a rationality and approaches rooted in scientific practice. This methodology has its own measurements and control instruments. However, whatever the virtues of this academic approach, it does not always correspond to farmers' perspectives and practices. Farmers have indeed their own methods, tools, and metrics.

Although farmers mobilize scientific knowledge, that circulates within professional groups and training courses, they can also experiment on their own. Their understanding of reality operates above all *via* daily practices and temporalities, that differ from those of the academic scientific approach. Farmers have their own ways of constructing reality, according to their daily experience on the farm (Cayre et al., 2018). This reality can thus differ widely from the one proposed by the academic world and agricultural advice—called axiomatic (Chateauraynaud and Dubois, 2019). Every day, in contact with things, through the involvement of their bodies and their senses, they apprehend the regularities and variations of the beings with which they work and interact. In a cyclical temporality of their own—every day they have to milk the cows, to lead the animals to grasslands, every year they have to harvest hay, etc.—they appreciate and evaluate their work by a set of signs and indicators that may be very different from those of science (Cayre et al., 2018). These indicators can have a subtlety and a sensitivity that cannot be tested or measured in the academic agricultural sciences and have thus been relegated to the "subjective" or even the irrational part of their practices. Moreover, farmers generally do not reduce beings such as animals or grasslands to their biological and production properties alone. They confer on them social and anthropological attributes forged during their experience. These attributes guide their work and the kinds of relationships they have with these beings, the attentions and signs by which they are affected (Demeulenaere and Goulet, 2012).

What the scientific method cannot objectify or measure is discarded. Thus, certain metrics, immaterial entities, escape scientific understanding and are not integrated into the analysis of agricultural operations. The very fact of analyzing a farm in terms of aims, strategy and performance (as OAF invites us to do) imposes some kind of "managerial" way of thinking that is not necessarily that of the farmer. Moreover, such a systemic approach by itself fails to integrate the colors, smells, affects and experiences collected and combined by farmers through time. In fact, science itself is not a transcendent entity but a specific way to observe, to describe, to build and to understand reality as a social practice (Maniglier, 2021).

Pragmatism, in the sense of Dewey (1938), is thus particularly well suited to agricultural interviews, since for these authors, action is the basic material (whether present or past) and knowledge is constructed through action. Truth does not exist a priori but is revealed progressively through experience, thanks to concrete observability (Dewey, 1938). We consider that in order to identify problems and to implement solutions, one has to analyse them by examining past, present or future actions in terms of their practical and moral consequences (Barthe et al., 2013). The logic of pragmatic enquiry leads actors to believe that the relationship between means and ends must be regularly re-examined in the course of action (Hazard and Lacombe, 2016).

It is therefore necessary to monitor these experiences by following "the actors and the action in the process of being carried out" (Latour and Woolgar, 1992). Conducting pragmatic enquiry involves taking seriously all of the actors' justifications, the elements to which the interviewee pays attention. Investigations must then not only identify the facts, but also characterize all the entities (living beings -human or non-human-, material - inputs, harrowing, feed- and immaterial things—moon, energy flow, animal communication, etc.,) that are involved in these facts. The properties—the way in which the facts are qualified—that are attributed to entities should also be investigated. These attributions reveal the kinds of relationships and attachments that farmers may have with these entities. Thus, pragmatism is interested, as Darré et al. (2007) proposes, in practices, but goes beyond that by integrating farmers' reasons: it is a question of understanding how farmers compose their world. For this, the actor-network theory is a particularly suitable approach (Lamine and Dawson, 2018). Actor-network theory is concerned with "actors", whether human or non-human, and the ways in which they relate to each other within networks. These interviews make it possible to see what the world of the breeders consists of, by characterizing the ways in which both human and non-human entities that make up this world relate to each other and are deployed according to various modes of existence—biological, ecological, political, social, economic, etc. This approach thus allows an ethnographic look at farmers but also at the objects to which they are attached, such as their animals, grasslands and fodder. The provided pragmatic posture, as presented here, allows for anthropological attention to be paid to all entities, human or not.

Pragmatism is therefore not, as such, a method for analyzing agricultural production systems, but proposes a research stance that adds an additional perspective to economic and technical analysis.

2.3. Farm health

Health connects people, animals and ecosystems. These links are particularly highlighted by the current ecological and health crises (Vieweger and Döring, 2015; Roger et al., 2016; Duru and Therond, 2019). In this systemic context, agriculture occupies a central place, especially within ecosystems. Agriculture specifically influences three elements described separately in the literature: soil health, plant health and livestock health (Duru, 2018). Agriculture also affects human health - both of farmers and consumers. On the one hand, it is a question of ensuring the protection of farmers' health in the workplace (e.g., by reducing exposure to toxic substances). On the other hand, it is a question of providing healthy food and also guaranteeing the preservation of water quality (nitrate content and plant protection products) or limiting zoonoses and antibiotic resistance. Various concepts proposing a global approach to health have thus been defined (Global Health, Planetary Health, One Health, Eco Health, "Santé Unique") (Koplan et al., 2009; Beaglehole and Bonita, 2010; Vieweger and Döring, 2015; Roger et al., 2016; Lerner and Berg, 2017; Duru, 2018).

The application of a health approach at farm level requires the existing concepts to generate practical recommendations that can be easily implemented on farms. However, this is not really the case with the different existing health concepts. The implementation of a holistic approach to health, at the farm level, has therefore not yet really been implemented. The concept of 'Santé unique' (Duru and Therond, 2019) proposed their own framework for a holistic approach to health, combining the concepts of One Health, EcoHealth and Planetary Health. This framework links

seven domains of health: ecosystems at the landscape, biome and biosphere scales; soil; plant; animal and human. This breakdown into specific domains This breakdown into specific makes this concept most operational for application at the farm level.

Lacombe and Hazard (2016) have proposed a definition of agroecosystem health: it is an agricultural system "that has found a balance between stability and resilience: that is to say, a system capable, depending on the situation in which it finds itself, of maintaining a form of continuity in its functioning and of reorganizing itself in the face of major disturbances in order to re-establish its primary functions". A healthy agroecosystem is therefore a system that is autonomous (both in terms of input use and decision-making), resilient and optimizes ecological processes to produce ecosystem services. The application of a holistic approach to farm health thus requires addressing soil, plant, animal and human health. Its operationalisation requires the ability to measure the health of these four pillars in an objective manner and therefore to define assessment indicators. These authors also stress the need for the managers of these systems, including farmers, to get involved in the construction of monitoring and evaluation indicators: if these people use the indicators and give them meaning locally in their daily actions, they can themselves become actors in maintaining this health. Given the lack of knowledge on the functioning of agroecosystems, and the difficulties in developing effective participatory research, the concept of agroecosystem health remains relatively inoperative to date (Hazard and Lacombe, 2016). The second necessary point, to study farm health, is the integration of the field and its stakeholders so that the health assessment indicators have a meaning in the daily actions of the farmers and so that the latter become actors in maintaining this health (Bunch and Waltner-Toews, 2015; Bardosh et al., 2017).

The notion of health refers, for farmers, also to the notion of care ("taking care of the animals", when talking about feeding for example). This echoes the ethics of care, which proposes to value moral characteristics such as attention to others, solicitude, concern for others. This notion of care thus allows access to the relationship between the farmer and his herd, other living beings and nature (Pigott, 2021). The notion of health, associated with care, thus favors the understanding of the reality of the farmers, as proposed by pragmatism.

Farmers interact daily with the notion of health, particularly their own (their well-being, their physical condition) but also the "economic health" of their farm and the health of their herd (a herd must be healthy to produce). This notion must therefore speak to them and enable them to study the system by looking at the health of the farmer, the herd, the soil and the plants (Bloksma and Struik, 2007).

2.4. Methodology: Combining systemic diagnosis and a pragmatic approach

The pragmatic approach makes it possible to grasp elements of the farmer's reality to which the OAF does not have access. Our methodological approach aims to combine these two ways of understanding and interpreting the world: the systemic approach, rooted in an academic approach to agronomic sciences, and the pragmatic approach, which involves interpreting reality through the eyes of the person who acts. Thus, all the information collected within an OAF is included (analysis of the different subsystems, links, social and economic environment...) but we integrate the following additional elements:

- Indicators and metrics used by farmers to assess health.
- The relationship between humans and nature through an anthropological attention to all elements of the system that make sense for the farmer. More precisely, we pay attention and collect all the information that we need for qualifying what matters to the farmer, in particular how he or she qualifies and gives attributes to the entities that populate his or her world and how these attributes help specify the kinds of relationships he or she has with them.

We apply the notion of health as a key entry point to all the elements of the system, which makes it possible to maintain a systemic approach. Moreover, it allows us to access the Human-nature relationship, thanks to the links between animal health and human health or between soil health and animal health. Therefore, health questions contribute to integrate the farmers' goals other than production and economic rationality into the systemic analysis of the functioning of the farm. Finally, health appears as a relevant lens to combine the two approaches described above.

The interview–conducted by an animal science researcher who is used to short closed or semi-open questions- begins with a history of the farm—as proposed by the OAF—in order to know the projects, objectives and decision-making strategy of the farmer. It also puts the farmer at ease and encourages him/her to be more relaxed and talkative in the following interview. Then, using healthcare as a lens, we question the farmer about his definition of farm health and from the elements mentioned (for example the health of the farmer, animal health...) the interviewer asks the farmer to specify his personal definitions of these different elements. In a second phase, based on each farmer's health definition, we decided to add some additional questions about:

- the metrics and indicators he or she uses (how do you evaluate the health of your farm? what are the indicators that allow you to evaluate it? etc.),
- the management and practices he or she implements (what practices do you implement to promote health? what interventions do you carry out on the grasslands? what do you do as a preventive measure? as a curative measure? etc.),
- the reasons for choosing these practices (why?),
- the links between his or her different categories of health (do you make links? which ones? how do you observe them? etc.).

The justifications for the used indicators and for the implemented practices play a central role in understanding the farmer's vision of the world and his relationship with nature. Even if certain elements are not integrated into the farmer's definition of farm health, the notions of herd health, grassland health, soil health, and farmer health are systematically addressed in order to understand why the farmer does not integrate them into his definition of health.

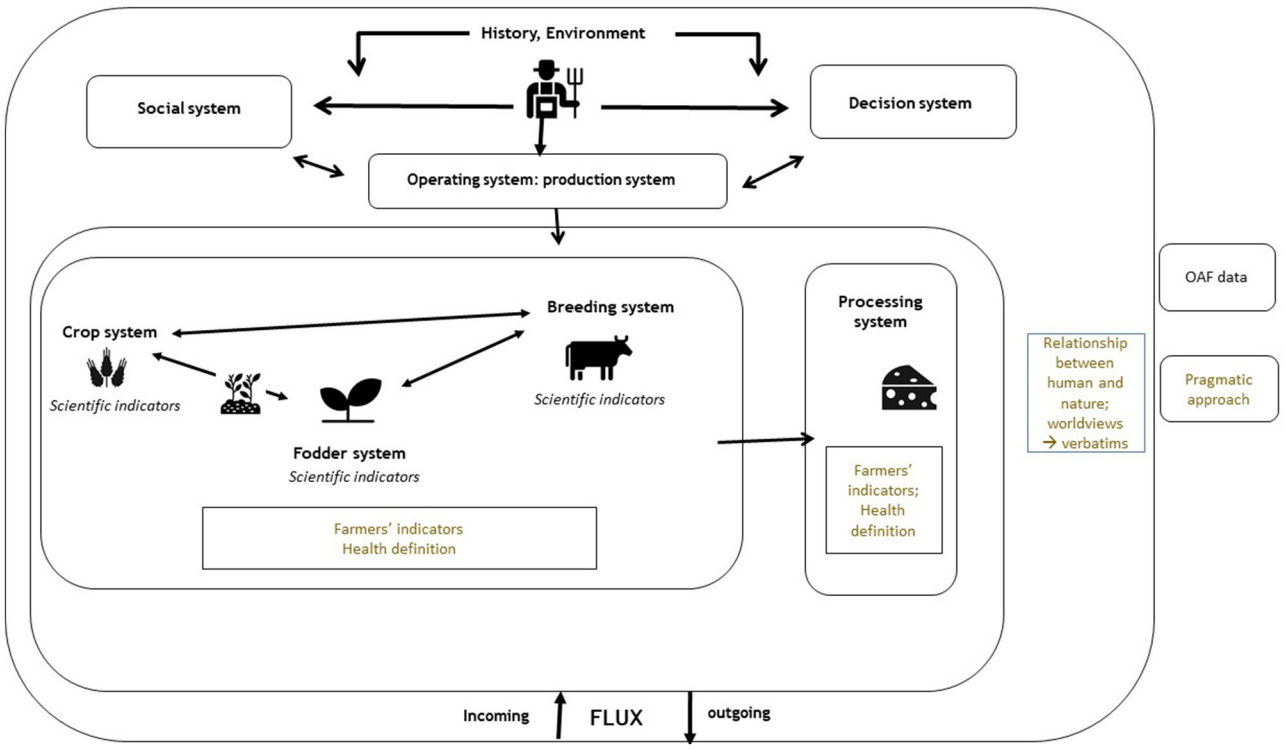

FIGURE 1
Methodology combining Overall Approach to Farming and pragmatism posture.

Finally, we asked them to give us more precise quantitative elements in order to evaluate the health of the system (milk production, renewal rate, number of veterinary interventions per year, for example). The quantitative elements concern both the scientific indicators referenced by the OAF and the indicators used by the farmers to analyse the health of their system. This sequence, from the most systemic approach to the most precise one, starts with qualitative aspects that make it possible not to influence the farmer's answers and let him choose the order of the discussed health concepts. The interview is conducted in such a way as to let the farmer talk as much as possible. The interview grid that we constructed ensures that all the elements necessary for the study are covered and that the questions are asked in the same way so as not to create bias.

The Figure 1 illustrates this methodology combining OAF and pragmatism.

This survey methodology makes it possible to access the elements of the OAF (analysis of the operating system, links between the elements of the subsystems, decision system, technical and economic indicators, etc.) with additional elements: the indicators used by the farmers and the link that the farmer establishes to Nature in a health vision.

Practically, the pragmatic enquiry can be made through one or several interviews (as necessary), preferably in the context of the farm. It is essential to build with farmers an authentic relationship based on trust. This goal takes time so that farmers can be assured that they will be taken seriously. In our approach, the pragmatic enquiry is made in conjunction with the systemic diagnosis (OAF), which is used as a first support to start a deeper discussion. As a "proof of concept", we decided to record the entire interviews and then to transcribe verbatim for one exemplary farm. In the future, the process can be simplified to cope with the practical constraints of a research project or any advisory diagnosis. Within the transcripts, we identified the objects/entities in which the farmer had an interest. For each entity, we added in a table the main verbatim related to health (what the farmer says about these entities), the quantitative elements, the signs, and the indicators evaluating them. From this table, we drew up a map of the farmer's world, making it possible to represent all the entities and elements described above, to which are added the modes of relationship—logical links between the entities—defined as precisely as possible. This drawing helps reconstruct the farmer's cosmology in a way that any sociologist as well as any animal scientist can understand (Figure 1).

3. Results: Application to an agro ecological farm

We applied our methodology to an agro ecological farm (the farmer claims to be an agroecologist, with an evolution from intensive system to organic production), located in France in the Massif Central Mountain. The herd's diet is based solely on permanent grassland and the farmer uses many alternative management practices to manage the herd. This is a farm within the regional average with satisfactory technical results. Figure 2

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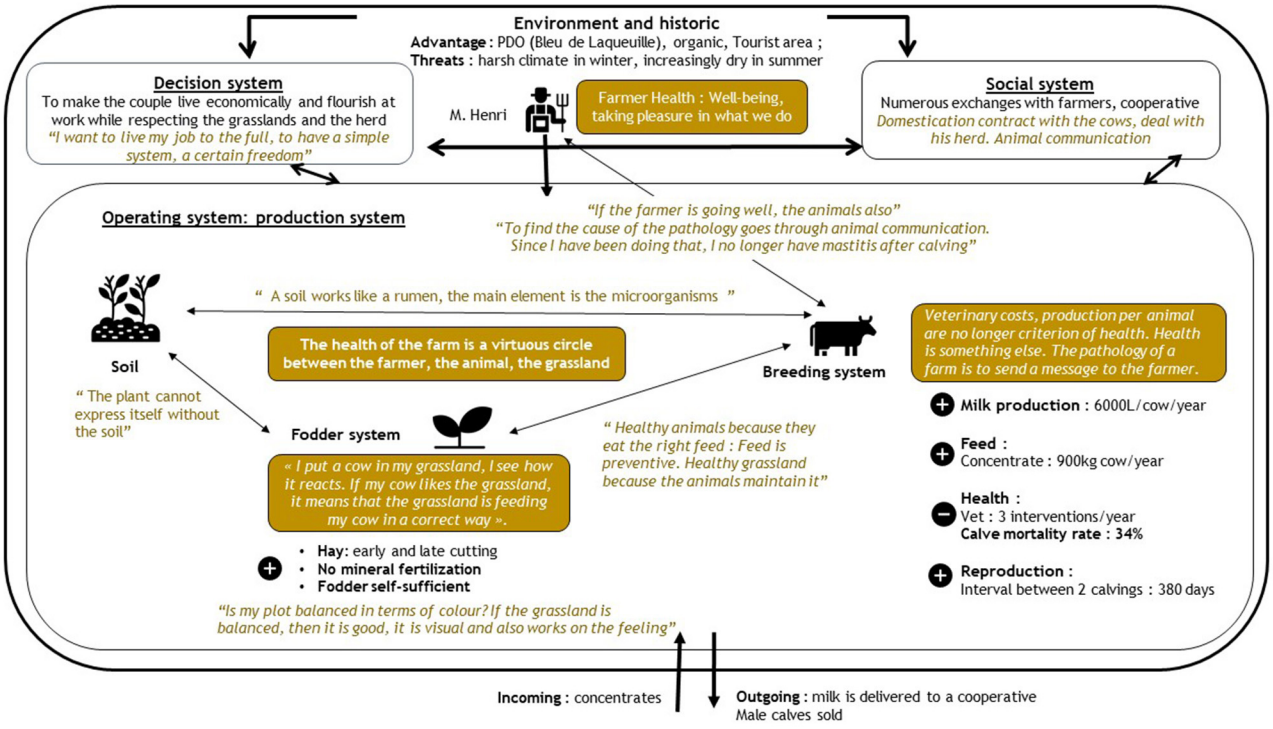

FIGURE 2
M. Henri's farm analysis combining Overall Approach to Farming (in black) and pragmatism posture (in gold).

illustrates the analysis of M. Henri's farm using our methodology combining AOF and pragmatism.

3.1. Environment and background of the farm

The farm of M. Henri—the name has been changed to maintain confidentiality-, which is located in the Massif du Sancy, 50 km west of Clermont-Ferrand, the major city of the Auvergne Region, is composed of two labor units (husband and wife). The farm is evolving with 35 dairy cows raised on 50 ha. M. Henri converted his farm to organic farming in 2016. After a conversion period, he delivers the milk as organic milk to a local dairy. At an altitude of 1,025 m, the farm evolves in a mountain climate, with cold and snowy winters and increasingly dry summers. The land is exclusively permanent grassland. This production system has therefore adapted to the constraints of the environment by using the milk to produce a local organic cheese in a green tourism area, without taking charge of the milk processing.

3.2. Decision and social systems

M. Henri runs his farm with the aim of supporting he and his wife with due respect for his work, his animals and his meadows. His system is built around this goal.

To achieve this, M. Henri has chosen to work inside a farmers' network who agree to implement alternative management practices that promote the wellbeing of meadows and herd. He is strongly involved in this network. In addition, Mr Henri is a member of the board of the dairy to which he delivers his milk. He is a volunteer fireman and has had a role in the management of the township (municipal councilor).

From an economic point of view (Table 1), the results are satisfactory and contribute to the achievement of the objective: the remaining income for the farmers is about 1,600€ per work unit (minimum wage at €1,521). This is satisfactory for the farmers and contributes to their financial health with a correct workload (35 h /week). The economic analysis following the OAF methodology shows an efficient, viable and sustainable farm.

M. Henri and those of his network refute some indicators traditionally used in farm analysis. For example, concerning the farmer's well-being, he says: "*At one time, holidays were a criterion of the farmer's well-being, today, I would turn it more in the other direction... As I feel good on my farm, I don't necessarily have an extraordinary need for holidays*."

M. Henri wants "*to be able to live (economically) while respecting the grasslands and the herd*", and "to *have a self-sufficient system*". Moreover, his definition of the health farm is "*a virtuous circle between the farmer, the grasslands, the herd*". The protection and care of animals are the main concerns of the farmer. He takes care of his grassland not for the grassland itself. For him, it is one of the best ways of maintaining the animals' good health and of taking care of their well-being.

TABLE 1 Economical and technical figures of M. Henri's farm.

Social system	Gross operating profit	54,000€
	Gross operating profit/products	0.44
	Annual payments and financial costs	11,000€
Breeding system	Renewal rate	20% (French mean = 35%)
	Total livestock unit	54
	First calving	2.5 years
	Dry period	1.5 month
	% mastitis	2.5%
Production	Protein content	30 (31.8 in typical case)
	Fat content	36 (40.5 in typical case)
Forage and crop system	Number of days of grazing	200
	Only grazed	44 %
	Mixed use	56 %

3.3. Operating system

3.3.1. Breeding system

An average of 40 dairy cows of Holstein and Normande breeds are present on the farm during the year to produce milk. On the farm, the reproduction of Holsteins is done with a bull, while both natural reproduction (Holstein bulls) and artificial insemination (AI) are practiced for Normande cows. The animals are culled at an average age of 10 years, whereas in France, the average lactation period of a cow is 2.6 years. This management practice, consistent with the low renewal rate (Table 1), allows the breeder to give his cows a longer life on the farm. The calving interval (380 days, close to the national average (400 days) and the reproduction indicators show a good management of the animals' reproduction.

The average milk production is 60,00l per cow per year that is higher than in the typical case (Table 1). The cell count is 219,000 C/ml, respecting the standard required by the dairy company. This milk production is made possible by a summer ration based on grass, a winter ration based on hay and regain and a small amount of hay and concentrates (900 kg/year). The management of the milk production with regards to the proposed ration is efficient compared to the grassland systems of the area (5,500 L of milk/cow/year with 1,240 kg of concentrate/year).

In terms of health, the veterinarians only visit the herd three times a year. There are no preventive or curative treatments, no antibiotics and no vaccinations. Health management is carried out with the help of alternative medicines and animal communication. Veterinary costs amount to 8.38€/head per year, which is very low compared to the group. Only one point of vigilance stands out: the management of calves. Thirty four percent of the calves <1 month old died, compared to 8% in the typical case. This high mortality rate of calves within 15 days after birth indicates a seemingly severe health problem.

The management practices implemented in the breeding system are in line with the desired objective. Indeed, the milk production is high, taking into account the grass management with a low use of concentrates. The indicators show a herd in good health, with few or no health problems and which ages well. However, the analysis of the operation of this farm with the OAF highlights a poor performance in terms of calf health. This high calf mortality rate raises questions, while technical tools exist to solve this problem.

However, using the pragmatic methodology and establishing a relationship of trust, when we questioned the farmer about this high calves' mortality rate, he explained to us that he did not have any problem with this rate. Indeed, usually the male dairy calves are sold at 3 weeks to be fattened in Spain, but this practice does not correspond to the ethics of this breeder.

Finally, M. Henri gave us the following justification: "*It is not a problem. I decide that the male calves should die before going to the fattening center. I don't want to give them that future which explains this high calves*" mortality rate of 34% before they are one month old. Moreover, he told us that he did not want to lie to his cows, and by a specific way of communicating that he developed with them, he "obtained" their agreement. This negotiation about death with calves' mothers makes death management an intrinsic part of his farming system. For him, domestic animals living on a farm are all bound to die; not only calves but also cows when they are culled. However, as Mr. Henri says, the animals are "workers" with whom he has a "contract" and he must respect their lives and their wellbeing in exchange for their work. In the last years, the farmer started to move his system toward longer lactations. From a scientific perspective, one could interpret this high rate as an indicator of reproduction problems that should be solved if one wants to rationalize the technical performances.

This high mortality rate of calves and its justification by M. Henri show the emergence of a different rationality, based on a specific relationship with living beings. This is also revealed in the definition of animal health: "*Veterinary costs and production per animal are no longer criteria for health. Health is something else. The pathology of a farm is to send a message to the farmer*." M. Henri does not pay attention only to production criteria but also pays careful attention to care and protection of the animals and grasslands. As he considers that the psychological dimension contributes to the triggering of pathologies (a stressed animal will more easily trigger a pathology), his relationship with his animals has considerably evolved. As the personal rationality of M. Henri is also to reduce this tension between life and death, he changed his practices to reduce the number of calves born per year.

More widely, he makes "Deals" with his animals and sets up an immaterial communication. "*To find the cause of the pathology I go through animal communication. Since I have been doing what I call communication with my animals, I no longer have mastitis after calving, which could be due, for example, to the separation of the mother from her calf*". This new way of considering each animal leads him to give his animals a specific accompaniment toward death, by thanking them.

The analysis of M. Henri's farm shows another way of interpreting reality based on his daily experience on his farm with the identification of new metrics. The indicators that he uses to assess the health of the animals can be similar to those used by animal husbandry scientists (lameness, variation of milk production…) but some are also constructed by this farmer. As an example, M. Henri assesses animals' health by observing

their behavior, their droppings, and by studying visible body signs on their coats (licking, greasy skin, hair color...), on their noses (discharge), and on their eyes (presence of crust). Thus, the rationality of feeding does not only concern the balanced supply of energy and proteins. M. Henri includes also elements of animal behavior, food signs (dung, nose, eyes, hair, etc.), and pay attention of the quality of the forage and its fibrousness that play an important role for keeping the animals' microbiota in a good state. The use of health as an entry point therefore also highlights M. Henri's holistic vision.

3.3.2. Forage and crop system

There are 50 ha of permanent grassland in organic farming; there are no crops on the farm. The farm is self-sufficient in fodder, only concentrates are purchased. The corrected stocking rate is 1.08 LU/ha slightly higher than the typical case (1.0 LU/ha). Only hay and second cut are made on the farm for the winter ration. No mineral nitrogen is added, only 30 m^3 of liquid manure are spread every 2 years in autumn on the meadows, whether they are grazed or mixed. The grasslands are also harrowed. The yield (6–7 ton of dry matter per hectare) and the diversity are satisfactory for M. Henri.

M. Henri designs his forage management by including the notions of care and adaptation, which is reflected in the implementation of cut at different stages. He explains that the late cut and the rather slow speed of rotational grazing are seen as a means to regenerate grasslands naturally so to increase grassland 'health. According to the farmer, these decision rules allow a balance between production, forage quality and biodiversity. Cutting at different stages thus promotes animal health (fiber in the ration) and grassland health (biodiversity). This link between animal health and grassland health is particularly important: "*the animals are healthy because they have the right diet. And the grasslands are healthy because the animals keep them healthy*".

The indicators that he uses to assess the health of the grassland can be similar to those used by scientists (e.g. botanical diversity of grasslands, forage yields, etc.,) but some are also constructed by this farmer. For example the cows' behavior are directly used as indicators: "*I put a cow in my meadow, I see how the cow reacts. If the cow is happy in this meadow, it means that the meadow is feeding my cow in an ultra-correct or correct way and therefore that the meadow is healthy*". Furthermore, the color of the meadow is becoming a key visual element for assessing its health, as M. Henri noted that "*when you start to have white [(flowers)] in the meadows, you are in balance*". The assessment of grassland health is therefore based on "*the visual and the feeling when you are in the field*".

While the materialist paradigm considers mainly the flows of materials, our deep interview helped us discover that M. Henri's paradigm integrates information flows and exchanges with other entities, like the moon. Thus, when M. Henri harrows his grasslands, it is not only for aerating the ground. From his point of view, he gives his meadow a piece of information. In return, his grasslands will answer him in spring by giving him more grass. M. Henri did not invent this informational paradigm all at once but he put it in place through a series of experiments, based on observations and comparisons and adjustments of his practices.

4. Discussion

Yet, the case of Mr. Henri demonstrates that the diversity of human-nature relationships is not a specificity of indigenous people. In fact, Mr. Henri's rationality is partly inscribed in naturalism but not completely. When he says that he establishes "contracts" with his cows, he considers that they have their own capability of expressing opinions and taking decisions. When he communicates with his meadows, he considers that he is not totally different to these living beings, even if they are not human. This attitude is very similar to what Descola (2015) described as an "animist" attitude: nature, plants and animals are endowed with the same interiority as humans and each human has to make deals with all of them if he wants to obtain what he wants. When M. Henri uses homeopathy to heal his animals, he applies an "analogist" way of thinking (the world is composed of an infinite number of singularities, the world is hierarchical through a deployment of links). This diversity of relationships to nature is close to the observations made by Foyer et al. (2020) with biodynamic winegrowers. Foyer (2018) introduces the notion of "syncretism" to describe how some farmers (like Mr. Henri or biodynamic winegrowers) are able to combine different ways of thinking in their farming practices.

It is the combination of two ways of understanding and interpreting the world—the OAF that is rooted in an academic approach to agricultural sciences and the pragmatic method in which reality is interpreted through the eyes of the farmer—that makes it possible to reveal different coherences of the system. On the one hand, the materialistic one: does the system produce the expected productions in quantity, in quality, in regularity? On the other hand, the ontological one: what is the coherence between what the farmer thinks, what he expects, and how he works in reference to which indicators? The metrics—identified thanks to the pragmatism approach- corresponding to each conception can be combined as it seems relevant to farmers and researchers. Different combinations between the different indicators exist, combining systemic relevant indicators with pragmatic ones. Animal sciences have provided a good overall knowledge of systems and are therefore necessary, but they must evolve to rely on new combinations of indicators for incorporating other essential dimensions associated to agroecology. Knowledge co-constructed by farmers and research are considered necessary in agroecology (Utter et al., 2021; Frank et al., 2022).

The proposed methodology adopts the concept of health as an entry point of interviews. Indeed, the concept of health allows for the integration of multiple issues, and the identification of practices that can promote the health of farms. Health makes it possible to establish links between the elements of the system, to access the relationship to the living being of the farmers and thus "to the world" of the breeder. Moreover, health is a notion that no one opposes and that allows a large number of farmers to adhere to it. Following a systemic approach like OAF, health on the farm is typically assessed through indicators like mortality rates. Moreover, in OAF the health of the different components of the farm can be studied quite separately and independently: The health of farmers, animals and environment are not directly related (for example, calves' mortality rate does not depend on farmer's

wellbeing in any straightforward way). The case of Mr. Henry demonstrates that farmers can have a very different conception of health: for him, the health of the different components of the farm are closely intertwined with each other through a relationship of care and respect. Moreover, in line with the holistic health approach proposed by Bloksma and Struik (2007), the interconnections between physical, socio-cultural and mental health are essential for Mr. Henri to take action on his farming systems.

Within the proposed approach, an appropriate researcher's stance and attitude are essential since he conducts the interview from the farmer's point of view without judgment. A dialogue is established between the interviewer and the farmer. The interviewer accepts that his interlocutor may think differently: all the farmers' statements and practices are taken seriously. Nevertheless, this way of working requires time. The interviewer cannot start the interview by asking questions. He has to convince the respondent that he will not be evaluated or judged, that this interview is a dialogue between two people on an equal footing. And it is not so easy to obtain. The interviewer should adopt a specific attitude, comprehensive, respectful, and considerate, and for that, he needs specific skills that develop with practice.

5. Conclusion

This approach makes it possible to reconsider metrics previously disqualified by the scientific approach by a dialogue established between the interviewer and the farmer. This dialogue allows animal sciences to open up to new forms of indicators that include non-humans. Farmers therefore discover certain tools and indicators generated by the scientific approach, and some of them become imbued with them, even if researchers and farmers do not always agree on the substance. Moreover, the approach we propose aims to co-construct knowledge, which is increasingly recognized, used and considered necessary, particularly within agroecology. This approach, which brings farmers and academics into dialogue, could also help to understand why some farmers do not engage in the agro-ecological transition. More specifically, it could help to highlight the aspects related to farmers' beliefs and rationality that might be holding them back. In our case, the farmers have been involved in the project since the beginning. This is essential in farmers' commitment to respond to questions and problems that affect them. This methodology is useful for farmers and research because it allows all of these actors to step back from their current way of thinking and develop reflexivity. We propose a method that not only allows the analysis of production systems on a common ground but also brings together people who think differently to engage in a transformative dialogue.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

Written informed consent was obtained from the individual(s) for the publication of any potentially identifiable images or data included in this article.

Author contributions

MC: methodology, investigation, writing-original draft, and writing-review and editing. AM: conceptualization, methodology, investigation, writing-review and editing, supervision, and funding acquisition. PC: conceptualization, methodology, writing-review and editing, and supervision. BM: writing-review and editing. CR and YM: writing-original draft and writing-review and editing. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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