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From multifunctionality and ecosystem services to a just transition of agri-food systems

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Abstract

Purpose – We aim to compare multifunctionality, ecosystem services and just transition as overall conceptual approaches to understand agri-food systems.
Design/methodology/approach – This is a theory-motivated literature study.
Findings – This paper argues that the concepts of multifunctionality and ecosystem services are unsuitable for considering the systemic complexities of today's food system in order to tackle its grave environmental and social problems. Furthermore, these two concepts tend to neglect the negative externalities of food systems and overemphasize the positive ones. The notion of just transition puts justice and sustainability at the center of agri-food studies and defines targeted systemic interventions in food systems.
Originality/value – While the approach of just transition is only starting to be widely applied to the agriculture–food nexus, we argue that it is better suited to re-orient diets, production processes, the value chain and labor conditions in a more sustainable direction. The just transition approach is also useful in drafting systemic policy innovations.
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1. Introduction

During the early years of their discipline, agricultural economists submitted to the neoclassical notion that there is no need for active policymaking in the farming sector (Koester, 1973; Wirth, 1970). In the last quarter of the 20th century, however, it has increasingly become clear that sustainable development is required to include the integration of ecological and social aspects in the economy (WCED, 1987) and that the farming sector as well as the overall food system have specificities that make them unsuitable to regulation by mere market supply and demand (Brunstad *et al*., 1999; Pretty *et al*., 2001; Whitby and Hanley, 1986). To take this fact into account, scientists have used numerous concepts when trying to conduct appropriate analysis and development of agricultural policies, of which two have obtained more coverage

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than others: entering "multifunctionality" and "agriculture" into ScienceDirect as one of the most accessible literature databases (under "any field") produces 25,000 results, entering "ecosystem services" and "agriculture" even 40,000 results. Building on existing criticism (Muradian and Gomez-Baggethun, 2021; Wynberg *et al*., 2023), this paper argues that these two concepts do not incorporate the advances that have been made in the systemic understanding of the challenges of the food and agriculture sector in the first quarter of the 21st century. Therefore, and going beyond the analysis by Huang *et al*. (2015), our study suggests an approach that builds on the concept of just transition, which we call – for want of a better term – systemic policy innovations.

The paper proceeds by indicating weaknesses of the two dominant concepts that criticize the tech-fix and the market-fix paradigms. It starts by briefly summarizing the concepts of multifunctionality and ecosystem services. Section 3 introduces more recent, systemic approaches to the shortcomings of the food system in terms of environmental sustainability; it also outlines why the frameworks of multifunctionality and ecosystem services miss important aspects in this respect. The same is done in Section 4 with regard to social sustainability, which suffers from an even bigger lack of appropriate theorization. Section 5 then indicates an alternative framework by introducing the notion of just transition, which is better suited to define the targeted interventions needed to redesign the global agri-food system. Section 6 illustrates how systemic policy innovations can be framed based on the idea of a just transition. Finally, Section 7 concludes the paper.

2. Conceptualizing the impact of food systems

2.1 Multifunctionality

When intensive agriculture's severe environmental problems caught society's attention in the developed world in the second half of the 20th century, e.g. through Rachel Carson's book "*Silent Spring*" (Carson, 1962), most scholars did not have an immediate answer. Environmental economists had always recommended targeted measures. However, to take the example of nitrate leakages, nitrogen taxes (particularly in Europe) showed that such measures could not solve this and other similar environmental problems (Rougoor *et al*., 2001). When European policymakers suggested a broader approach to support environmentally friendly agricultural production (Fischler, 2001), this was gratefully taken up by agricultural economists. They embedded the concept into a theoretical framework [Organization for Economic Co-operation and Development (OECD, 2001)], thereby justifying a new generation of payment schemes that reimbursed farmers for conservation measures (Banks and Marsden, 2000), essentially rewarding other functions of the land besides agricultural productivity.

Wiggering *et al*. (2003) have noticed that multifunctionality has been defined in many different ways. While this is true, the core content of the concept is jointness, which is illustrated, for instance, by the necessarily joint production of lamb meat and wool. Landscape and biodiversity have been the most frequently used examples of this jointness (Knickel *et al*., 2003).

Overall, the main merit of the multifunctionalists in the debate about agricultural policy has been the acknowledgment of the complexity and multidimensionality of natural production processes and their effects on nature and society (Fantini, 2023; Jiao *et al*., 2022). If one concedes the "ubiquity of externalities" (Mann and Wüstemann, 2008), it is easy to see that policy interventions are needed to internalize the different effects of different farming systems.

In the following sections, we critically review the above-mentioned concepts and suggest linking or transitioning them to more relational concepts.

2.2 Ecosystem services and multifunctionality

Mooney and Ehrlich (1997) traced back the concept of ecosystem services to the 19th century; however, its popularity has risen in parallel with the notion of multifunctionality. In a systematic comparison of the two approaches, Huang *et al*. (2015) found that multifunctionality focuses on

functions, whereas the discourse around ecosystem services looks more specifically at the services provided by nature and how to distribute them in order to satisfy human needs.

The notion of multifunctionality originated in policymaking and had strong effects on it, particularly in Europe. In contrast, the ecosystem services helped enhance the scientific understanding of natural processes in agricultural systems as well as their significance for and distribution of related "services" among humans. In their review paper, Torres *et al*. (2021) found that the conservation of biodiversity and landscape planning have been the two most frequent topics in the analyses of the ecosystem services literature.

Both the concept of multifunctionality and that of ecosystem services emphasize (a) the agricultural part of food systems and (b) the positive contributions that agriculture, if designed appropriately, can make to ecosystems and society, implicitly neglecting both most parts of the food system and the large number of negative externalities. As a further shortcoming, the concept of ecosystem services focuses on the environmental dimension of sustainability and neglects socioeconomic aspects.

The following two sections will argue that this approach is insufficient to meet the grave environmental and social challenges of the food chain.

3. Systemic environmental shortcomings in today's food value chains

Studies of multifunctionality and ecosystem services have typically compared different agricultural production systems (Blanco-Canqui and Wortmann, 2020; Montanaro *et al*., 2017; Sandhu *et al*., 2010). The results of these comparisons have favored extensive over intensive production systems due to their lower negative impacts on resources such as water, air and landscape (Brady *et al*., 2012; Desta, 2021; Ricard, 2016). Indeed, studies of single value chains indicate that the variances in primary production can be considerable and can exceed the possibility of steering sustainability in other parts of the chain (Froborg *et al*., 2022).

However, a study by Pedolin *et al*. (2021) compared the environmental impact of different production intensities of different products. They showed that within-product variances in environmental footprint are pale compared to the differences between products. It is also no coincidence that their result ("cattle, milk and pig fattening were associated with the highest environmental impacts per functional unit, followed by potatoes, vegetables and fruits") finds a clear distinction between animal and crop production. This evidence echoes that of other studies (Detzel *et al*., 2022; Kucuvar *et al*., 2019; von ow *et al*., 2020) that show a systematically worse environmental footprint for animal products compared to crops. This applies also to fish, which produce 1.1% of global calories but 9.9% of the global environmental footprint (Halpern *et al*., 2022).

There is a relatively intuitive explanation for the systematic difference between crop and animal production in terms of the logic of production. As humans, non-human animals rely on the calories produced through crops. Most of these calories are used for metabolic activities such as breathing and walking, while a minor part is transformed into muscles, eggs or milk. So, if the reference unit is human nutrition, it is obvious that humans should eat the crops themselves instead of giving them to animals, which "waste" a major part of them.

While this form of "waste" weighs heavily on the environmental footprint of consumers, the waste produced in today's kitchens may be an equally strong factor in hampering environmental efficiency. Chen *et al*. (2020) have documented the grave ecological impact of the food thrown away by consumers.

These and many other aspects are not captured by the multifunctionality and ecosystem services perspectives, which tend to focus on single parcels of land and the environmental amenities delivered on the land. The question of whether maize for pigs or rice for humans is grown on the land usually falls outside the scope of both the multifunctionality and ecosystem services approaches, as does the question of what happens to the maize or the rice after harvest.

In a critical appraisal of the ecosystem services approach, Kosoy and Corbera (2010, p. 1228) claim that "narrowing down the complexity of ecosystems to a single service has

serious technical difficulties and ethical implications on the way we relate to and perceive nature." Ecosystem services scholars' focus on the payment schemes that reimburse the public goods provided by farmers has been described and challenged from many different perspectives. Examples are the commodification critique (Martin-Ortega *et al*., 2019); the utilitarianism and/or exploitative critique (Muradian and Gomez-Baggethun, 2021), the "green grabbing" critique (Fairhead *et al*., 2014) and the anthropocentrism critique (Schroeter *et al*., 2014). Schröter *et al*. (2014) comprehensively summarized these critiques and added counterarguments to each. However, as outlined in Sections 4 and 5, the literature also shows that a transformative approach to agri-food systems will need to account much more for the many dimensions of power and justice, which are largely absent in the Ecosystem Services (ES) and multifunctionality literature.

The large and still growing debate about digitization in agriculture is a good illustration of this weakness. It has repeatedly been shown that digital technologies allow a more precise, demand-oriented allocation of pesticides and fertilizer, which can be environmentally beneficial (Pedersen *et al*., 2019; Sharma and Nauni, 2020). However, the literature on the factors that influence farmers' adoption of these technologies suggests that payments by the government play only a limited role (Späti *et al*., 2023). The uptake of digital technologies depends considerably more on farmers' expertise (Wuepper *et al*., 2021) and the role distribution in agricultural production. In small-scale systems, contractors are much more likely to reach the economies of scale required for the most advanced technologies as they use the technologies for numerous farms; thus, their role in the farming system will be decisive for the degree of environmental efficiency (Wang *et al*., 2022). Stone (2022), for instance, expresses concerns about surveillance agriculture and farmers' autonomy in relation to appropriation and substitution and a "new frontier of commodification." Furthermore, Johnson (2016) shows how industrial agriculture technologies trace back to war technology for the example of nitrogen fertilizer, and similar trajectories were shown for pesticides (Hayes and Hansen 2017), machinery (Szalay *et al*., 2024), unmanned aerial vehicles (Lucia and Vegni, 2023), Geo Information System (GIS) (Ghimisi, 2021) and precision farming more generally (Kuch *et al*., 2020).

The comparison between digital technologies and traditional ones and the comparison between crop production and animal production do not seem to have too much in common. However, both require a systemic perspective to fully comprehend the differences in terms of path dependencies, environmental impacts and potential benefits. More importantly, both require systemic approaches to improve the environmental performance of the food system, an aspect that will be discussed in more detail in Section 5.

4. Systemic social shortcomings in today's food value chains

Chaudhary *et al*. (2018) looked at the agri-food system's most pressing social shortcomings by using indicators such as food accessibility, poverty levels, child labor, gender equity and community rights. They concluded that there is a major gap between the Global South, where these indicators ranked worst, and the Global North. At the same time, as Hickel *et al*. (2022) showed for the year 2015, the Global North extracted goods and services from the South that were worth more than USD 10 trillion, equivalent to 25% of the gross domestic product of the Global North. It is always important to remember that the agri-food system is embedded in an economic system that leads to the exploitation of both human and natural resources (Gomez-Baggethun and Ruiz-Pérez, 2011). This implies that systemic solutions for the agri-food system are needed – ones that acknowledge and account for power asymmetries and resulting disequilibria (Samoggia and Fantini, 2023).

Ecosystem services are by definition focused on the environmental component of sustainability; this is not true of the concept of multifunctionality. The proponents of this approach have always emphasized that the social functions of agriculture are an integral part of multifunctional farming (van Huylenbroeck *et al*., 2007). However, it was only recently that Nowack *et al*. (2022) structured the social components of multifunctionality in a systematic

way. The authors suggested the need to distinguish between the farm level (with a focus on the institutional unit that contributes to society), the activity level and the functional level.

However, none of these three levels is suitable for tackling the grave social problems mentioned above, including existing trade-offs with the environmental dimension (Borras and Franco, 2020). For instance, 60% of all working children work in agriculture [International Labor Organization, ILO, 2010)]. Furthermore, agriculture underperforms because women lack equal access to resources (Quisumbing *et al*., 2014) and the poorest part of the world's population works in agriculture (Gunnarsson and Wingborg, 2018), be it as peasants who cannot produce profitably (Ketema and Tennhardt, 2021) and see their land grabbed for other purposes or as laborers facing precarious conditions (Souza-Queiros, 2022). Dialog ethicists emphasize the vast importance of fair and eye-level relationships (Ballard *et al*., 2016; Coles, 2019). Neither is this acknowledged in the farming sector with its grave power asymmetries, nor is it tackled by the ecosystem service approach.

While the multifunctionalists argue that agricultural policies should acknowledge the non-market contributions of farmers to society (Cairol *et al*., 2009), they tend to neglect problems related to the underlying power asymmetries that arguably cause the severe social problems connected to the sector. Contributions that suggest the need to empower the most vulnerable groups in rural regions, such as youths (Geza *et al*., 2022) and peasants (United Nations, 2018), will do more to improve the system's sustainability.

5. Just transition: towards targeted systemic interventions

(1) It is obvious that the discourses surrounding ecosystem services and multifunctionality are advancements from the neoclassical perspective and therefore justified in the societal process to fully understand the food system. At the same time, they are too limited for the challenges the food system faces. An approach that has emerged more recently, agroecology, explicitly includes social aspects (Anderson *et al*., 2019) but usually treats them as secondary to the environmental component of transformation (Biondo and Bonoventura, 2014).

An alternative framework that acknowledges both the negative and positive effects of production and takes a systemic stance is "just transition" (Just Transition Centre, 2017; Routledge *et al*., 2018; Wang and Lo, 2021; Kaljonen *et al*., 2023). This framework has been used primarily outside agriculture. It links the fight against climate change, biodiversity loss and other environmental problems with the struggle for better working conditions or, more holistically, with distributional, procedural and recognitional justice (Schlosberg, 2007). Many of the contributions inspired by a just transition have focused on the energy sector, where the shift to renewable sources of energy and the improvement of social conditions can be easily combined (Burke, 2020; Oyewo *et al*., 2021). Recently, scholars have started to explore how this framework could be applied to the farming sector (Kaljonen *et al*., 2021). Blattner (2020), for example, has suggested that the just transition framework means we have to move away from animal production. In contrast, Murphy *et al*. (2022) have focused on the misalignment between Irish beef farmers and powerful key actors in the sector, criticizing power asymmetries. The fact that animal farmers face severe power asymmetries certainly supports the position by Murphy *et al*. (2022). This evidence calls for measures to systematically strengthen the position of such farmers through empowerment in the value chain, as suggested by Wright and Annes (2016) and Desiana and Aprianingsih (2017). However, the considerable negative systemic externalities of animal production make a strong case for Blattner's (2020) argument. It has been repeatedly emphasized that these negative externalities must be internalized through taxes, quotas or restrictions (Caro *et al*., 2017; de Boer *et al*., 2011; Mann, 2022). At the same time, their costs should be equally distributed so that the most vulnerable actors in the value chain do not bear the brunt of them.

Tribaldos and Kortetmärki (2022) have taken a more systemic approach to the issue of a just transition in agri-food systems. They have expressed the need to overcome deeply unsustainable and unfair structures and outcomes and have proposed a set of principles and criteria for the analysis of sustainability transitions, backed by a moral philosophy analysis. This implementation-oriented framework is based on the human right to food, labor justice, just food-chain structures, livelihood opportunities, global fairness, intergenerational justice, ecological integrity, animal justice, fair processes, access to relevant information, respectful pluralism and esteem recognition, non-discrimination and capacity building.

This understanding of sustainability and justice in food system transformations moves away from the simplification of complex socio-ecological systems and human-nature alienation by focusing on structures, relationships, agency and outcomes from the viewpoint of vulnerable human and non-human actors. It also implies another important and transformative point: the need to move away from top-down sustainable development interventions and towards the co-creation of knowledge and collective action, which is also referred to in procedural justice concepts (Chambers *et al*., 2021; Jacobi *et al*., 2021; Rist *et al*., 2007). Collective action is understood here as a concerted effort by a group of people to achieve a common goal (Ratner *et al*., 2013). For instance, Llanque *et al*. (2021) described a six-year action-research project on food system sustainability, where partners from six countries worked together to apply and contextualize a co-created framework of food sustainability that covers the human right to food, food security, environmental integrity, poverty and inequality and socio-ecological resilience (Tribaldos *et al*., 2018). This participatory action-research process started with a joint definition of the food system in question as well as the topic to be analyzed and transformed. The partners then rated the food system together and defined joint actions for its improvement (Rist *et al*., 2021). This method has been used in at least eight countries so far (always based on local initiatives) and has led to several significant transformational outcomes (Llanque *et al*., 2021). As a unifying framework for food system transformation, agroecological principles (Wezel *et al*., 2020) have been helpful as a vision for the just transition process in these examples (Llanque *et al*., 2021).

This opportunity can be illustrated best using the example of labor conditions. Many just transition scholars have emphasized the need to improve working conditions in the Global South (Pucheta *et al*., 2021; While and Eadson, 2022), while others show the necessity to smoothen power structures in labor markets in general (Velicu and Barca, 2020; Vachon, 2021). Given the tremendous social shortcomings of the farming sector, these perspectives can and should contribute to systematically transforming labor relations in agriculture.

Taken together, the main strength of the concept lies in providing both a clear vision and requiring a just transition pathway towards this vision.

6. Policy innovations

All these contradicting demands show that it is not sufficient to reimburse farmers for water and air quality, biodiversity or their positive contribution to rural social life. Instead, sustainability can only be achieved through a concerted societal effort that tackles the entire food system. This applies to grave social problems, such as poverty and exploitation, as well as to environmental degradation and global warming.

As scientific evidence and experience show, market-based approaches alone cannot effectively advance the global transition towards more sustainable food systems. In particular, private certification schemes tend to respond to the institutional logic of certification providers, include discriminatory aspects and inadequately mirror the realities on the ground (Baumgartner and Bürgi Bonanomi, 2021). Policy interventions are thus needed to strengthen private sector initiatives by assuring their quality and accountability and complementing them proportionately (Home *et al*., 2021).

When it comes to public governance, it is difficult and contested to draw a clear line between sustainable and unsustainable products. Therefore, policies should focus on enabling

vulnerable but highly sustainable food systems and disabling particularly harmful ones; achieving this requires a clear understanding of the objective that is to be pursued. While there is still some disagreement, an international, common understanding of what a sustainable food system should look like has emerged in recent years (Lang and Barling, 2012; Jacobi *et al*., 2020; McGreevy *et al*., 2022). This understanding is reflected in a series of international standards and norms (Giger and Musselli, 2023) that should guide policymaking in the future.

There is a need for policy action both at the domestic and international levels. With regard to inward-looking domestic policies, existing incentive and disincentive structures need to undergo policy coherence analyses based on the relevant common understanding of sustainable food systems. The aim should be to dismantle perverse incentives and design policy innovations that ensure not only sound transitions but also an equitable allocation of related costs.

There are now comprehensive frameworks for food system sustainability that cover (a) all relevant dimensions of sustainability and (b) all the components of food systems, including value chains and food consumption [Food and Agriculture Organization (FAO), 2014; Hebinck *et al*., 2021]. These are helpful tools for designing long-term strategies for food system transformation by considering the trade-offs and synergies between the environmental, social and economic dimensions of food systems (Arthur *et al*., 2022). The governance dimension has proven to be crucial for a successful transformation of food systems both at the national level and among individual operators (Ssebunya *et al*., 2018). Several analyses have documented substantial trade-offs and synergies among the different aspects of sustainability; it is important to consider these when designing value chain interventions to improve food system sustainability via a just transition (Blockeel *et al*., 2023; Tennhardt *et al*., 2022; Schader *et al*., 2021). These studies have shown that the private sector cannot solve fundamental sustainability challenges alone (e.g. through private certification programs); fundamental policy interventions are needed to foster a just transition in the food system. As shown above, it has become clear from food systems research that mere market-based approaches have failed to account for sustainability and justice in food systems. Approaches of the de-commodification of food bringing back other values besides monetary ones (Vivero-Pol, 2018), post-growth principles (McGreevy *et al*., 2022) and degrowth perspectives (Guerrero Lara *et al*., 2023) in food systems indicate transformative pathways moving away from mainly profit-driven to mainly well-being-oriented food systems. This will necessarily entail structural support for the disenfranchised groups in rural and urban societies.

Feminist approaches in science have long showed and taught that if we do not differentiate in our models and measurements, we only see the productive and monetary gain and not the non-remunerated reproductive work that makes it possible (Collard and Dempsey, 2020; Gibson-Graham, 1996; Mies, 1986). From a just transition perspective, such aspects would not be ignored anymore but become part of the analysis and search for solutions (Tribaldos and Kortetmärki, 2022).

Targeted interventions that address the entire food system include trade regimes that carefully differentiate among products based on processes and production methods. This differentiation can be included in bilateral and multilateral agreements (Bürgi Bonanomi and Tribaldos, 2020) as well as in domestic policies. Domestic trade measures include a variety of policy instruments, such as raising awareness among consumers, quality assurance of certification schemes, preferential treatment in public procurement frameworks, facilitation of market entry through recognition processes that are easy to access, conditioned tariff rate quotas and preferential tariffs. To a certain extent, the World Trade Organization (WTO) framework leaves room for this differentiation, provided it is shaped in a non-discriminatory, proportionate and context-adapted way (Musselli *et al*., 2022a, b). For years, countries have abstained from including these measures in their regimes for fear of retaliation for their exports by other countries. However, these production requirements are entering ever more often the public domain (Beatens *et al*., 2022). A group of Swiss scholars has shown how a domestic policy of agricultural trade differentiation could be best designed by presenting a hypothetical

legal act on sustainable trade in agriculture (Bürgi Bonanomi *et al*., 2023). At the international level, there is an ever more pressing need to redesign the WTO's Agreement on Agriculture [1].

7. Conclusions

The concepts of multifunctionality and ecosystem services did not only have the merit of clarifying the necessity of an active agricultural policy that supports the farming community in its provision of public goods but also proved extremely useful in practice for understanding the positive contributions of agriculture to society and justifying public interventions that paid farmers for delivering public services. However, globalization, with its tendency to increase inequalities (Piketty, 2014), global warming (Masson-Delmotte *et al*., 2022) and loss of agrobiodiversity (FAO, 2019), has shown that the scope of our discussions urgently needs to be widened. The two concepts, which have dominated many policy agendas, usually lack a systemic perspective and often turn a blind eye to the negative externalities of agricultural production.

The more recent framework of just transition addresses these disadvantages. However, it still has to find a wider application in the realm of agriculture, and more importantly, it needs to be transformed into appropriate policy measures. This applies to at least four important fields:

(1) The food on our plates needs to be transformed in such a way that rates of undernutrition and obesity go down; at the same time, its environmental footprint must be in accordance with available resources.

(2) Production conditions need to develop in a way that protects and regenerates natural resources by using co-created and culturally acceptable technologies (both old and new) and only environmentally sound inputs.

(3) Working conditions along the value chain need to be safe and must allow a decent living for those who provide, process and prepare our food.

(4) The co-creation of knowledge and collective action for more sustainable food systems will lead to transition pathways ensuring a fair distribution of burdens. The process should be designed sustainably in order to guarantee the strategic capacity to solve future challenges.

Both the environmental and the social shortcomings of today's food systems require that we set as our objective collective actions towards sustainable and just transitions. To achieve this objective and secure support at the policy level, policy coherence analysis needs to be undertaken. Current power asymmetries can only be overcome by decisive political steps, a crucial precondition for putting the concept of a just transition into practice.

Note

1. See for example https://www.wto.org/french/res_f/reser_f/agricsymp2020_f.htm.

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