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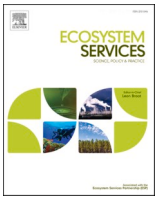

Value chain partnerships and farmer entrepreneurship as balancing ecosystem services: Implications for agri-food systems resilience

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ABSTRACT

Both in the European Union (EU) and worldwide, the resilience of agri-food systems depends on the human ability to balance between socio-economic and ecological trade-offs. Recent ecosystem services literature acknowledges that smallholder farmers' participation to stakeholder partnerships and continuous learning influences their balancing ability. Yet, little research has so far focused on how smallholders' participation in partnerships with other value chain actors - such as companies supplying or procuring from them - shape their learning processes and, in turn, how their mindset and behavioral change influences agri-food systems resilience outcomes. To address this gap, this conceptual paper advances a framework suggesting plausible linkages between: the organization of value chain partnerships; smallholder farmer entrepreneurship (meant as the ability to redeploy resources innovatively in and around farms); and agri-food systems resilience outcomes (such as stabilizing rural livelihoods, supporting ecological services and enhancing socio-cultural services). This framework suggests that value chain partnerships are more effective in supporting the smallholder farmers' entrepreneurial learning: when they pool more resources (both tangible, like financial or physical assets, and intangible as knowledge or market information) among partners; when they distribute decision-making rights over their use more evenly; and when they balance between formal and informal coordination mechanisms. On the basis of empirical examples, these conceptual arguments suggest that policy incentives – such as the new Common Agricultural Policy (CAP) in the EU – should be directed towards resource pooling, experimentation and learning to effectively support smallholder farmer entrepreneurship and their contribution to the achievement of agri-food systems resilience outcomes.

1. Introduction

In today's uncertain and turbulent markets - associated with complex and urgent challenges of food insecurity, poverty, inequality, ecological degradation and climate change – the importance of supporting the *resilience of agri-food systems* has gained traction in science, policy and civil society debate both in the European Union (EU) and worldwide. Resilience of socio-ecological systems refers to the ability of a social system, intertwined with an ecological system, to predict, cope and bounce back after a disturbance (Holling, 1973; Folke, 2006). Through participation and learning at multiple scales, processes of human organization may facilitate or hamper resilience (Ungar, 2018). Therefore, the notion of resilience remarks the necessity for humans – including all actors in agri-food value chains – to develop organizational arrangements and individual behaviours that, in contexts of unpredictable change and adversities, continuously *balance trade-offs between the use of natural resources and the generation of economic and social benefits* (Costanza, 2000).

Balancing these trade-offs between ecological and socio-economic valuations (Costanza, 2000) is particularly challenging for smallholder farmers: because their economic and ecological boundaries are particularly stringent; they struggle to preserve natural resources while creating cultural and social value (Ango et al., 2014). Yet, smallholders' ability to balance socio-economic and ecological trade-offs is critical for the resilience of the EU agri-food systems. Small farms represent the largest proportion of farms in the EU and contribute to territorial economic development, regional food security and ecosystem services of social and cultural value (Rivera et al., 2020). At the same time, smallholder farms face natural and economic constraints and disturbances that, if not managed and coped over time, may jeopardize the

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preservation of natural resources and the resilience of agri-food systems (Vignola et al., 2015).

In the face of this challenge, the literature on ecosystem services has suggested several ways in which agri-food value chain actors – i.e., actors either upstream farmers (i.e., suppliers of seeds, fertilizers, and other inputs) or downstream farmers (i.e., trading, manufacturing and retailing firms) – can effectively partner with other stakeholders to cope with these trade-offs (Reed et al., 2014; Benjamin et al., 2018; Laterra et al., 2019). In agri-food systems, *value chain partnerships* refer to long-term relationships among actors that produce, move, process and/or market goods or services from farmers to consumers – primarily with farmers (Trienekens, 2011). These partnerships have primarily the function of efficiently moving and transforming agri-food products from farm to fork, but they also have an important learning mission: they shape partnering individuals' mindsets and behaviors depending on how collaboration is structured (Dentoni et al., 2016; Salvini et al., 2018). This literature did not investigate how value chain partnerships should be organized to support smallholder farmers' learning on how to balance between ecological and socio-economic trade-offs (Costanza, 2000). This is a notable knowledge gap across the ecosystem services and agri-food value chain fields, because understanding collective processes of participation and learning is essential to support the resilience of socio-ecological systems (Ostrom, 2009; Ungar, 2018).

To contribute to this debate, this paper sheds light on three interconnected themes: 1) how smallholder farmers participate in value chain partnerships, 2) how they develop their mindsets and behaviors through participation and, ultimately, 3) how their processes of participation and learning help them balancing ecological and socio-economic trade-offs towards resilience. Specifically, this paper conceptually addresses the following research question: *when and how does the organization of value chain partnerships foster smallholder farmer entrepreneurship in ways that support their ability to balance ecological and socio-economic trade-offs?* The key argument of this paper is that development of smallholder farmers' entrepreneurial mindsets and behaviors – or, hereinafter, *smallholder farmer entrepreneurship* – represents an important learning goal of value chain partnerships for the resilience of agri-food systems. Smallholder farmer entrepreneurship refers to the process of effectively redeploying natural, financial, social and physical resources in and around farms to achieve benefits, reduce costs, or mitigate risks (Dias et al., 2019). While an unbalanced pursuit of economic benefits might have detrimental effects on socio-ecological systems (Niska et al., 2012), smallholders' effective deployment of their available resources helps them to balance ecological and socio-economic trade-offs, and thus support their agri-food systems to cope with adversities (Rosenstock et al., 2020; Kangogo et al., 2020). Furthermore, this paper delves into how value chain partnerships can be concretely designed or (re)organized – in terms of resource pooling, distribution of rights over the use of resources and coordination mechanisms – to stimulate smallholders' entrepreneurial learning processes in ways that help them balancing ecological and socio-economic trade-offs.

2. Conceptual paper design

To shed light on how value chain partnerships contribute to agri-food system resilience through smallholder farmer entrepreneurship, this conceptual paper is designed with a theory synthesis approach (Jaakkola, 2020). As a result, this approach involves integration of literature strands so far poorly connected. As a result of process of integration, a conceptual framework – in this paper, Fig. 1 – suggests plausible linkages on the basis of logically supported arguments, yet without the ambition of empirically verifying them (Cropanzano, 2016). This framework connects a set of propositions worth empirical testing and refining in future research because of their important policy and management implications.

In line with this approach, the research team has selected a set of articles that bridge, at least to some extent, the poorly connected strands of the literature in the context of agri-food systems. This involved first searching – across search engines *Google Scholar*, *Scopus* and *Web of Science* – for synonyms and dimensions (or features) of the three key concepts under study: value chain partnerships, farmer entrepreneurship and agri-food systems resilience. Based on the full read of the identified papers, when the literature in the context of agri-food was too thin to advance a compelling proposition, the research team resorted to studies outside the agri-food contexts (i.e., linking broader forms of collective action, entrepreneurship, and socio-ecological resilience). Ultimately, the selected articles are cited in the following sections, and

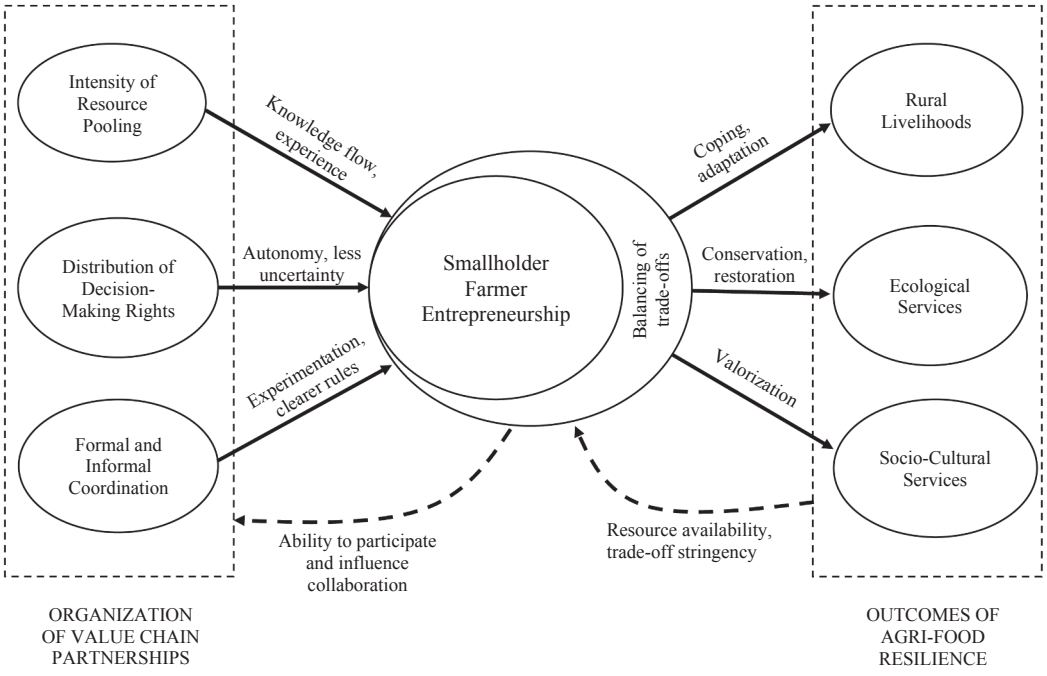

Fig. 1. Linking Organization of Value Chain Partnerships, Smallholder Farmer Entrepreneurship and Outcomes of Agri-Food System Resilience. Source: Authors.

propositions that compose the integrative framework were built based on evidence from these articles (in sections 3–4), and corroborated with empirical illustrations accordingly (in section 5).

3. Linking value chain partnerships to smallholder farmer entrepreneurship

On the basis of the reviewed literature, we argue that three key organizational features of value chain partnerships shape smallholder farmer entrepreneurship: 1) the pooling of resources (e.g., information, knowledge, land, seeds, fertilizers, or storage space); 2) the distribution of decision-making rights over the use of resources; and 3) the formality of coordination mechanisms among partners (Fig. 1). We explain how these features of partnerships with agri-food value chain actors influence smallholder farmer entrepreneurship as follows.

3.1. Intensity of resource pooling and smallholder farmer entrepreneurship

Value chain partnerships vary in terms of the extent to which individual partners resources - either tangible (e.g., financial, human, physical or natural capital) or intangible (e.g. information, knowledge, or reputation) – are pooled and thus jointly accessed among other partners (Ménard, 2004; Slangen et al., 2008). In the agri-food system, some partnerships pool and give access to a wide set of common resources (e.g., making a joint investment in a pre-harvest phase, such as irrigation, or in a post-harvest phase, such as storage space or a cooling facility). This is for example the case of partnerships between farmers' cooperatives and their marketing partners in fruit and vegetable value chains in Sub-Saharan Africa (Narrod et al., 2009). Other partnerships instead pool only a small set of resources (e.g. information, knowledge, but no physical or financial capital). This is for example the case of multi-stakeholder platforms designed to link farmers to potato traders and processors in Latin America (Thiele et al., 2011). Value chain partnerships in agri-food systems widely vary on their intensity of resource pooling (Miralles et al., 2017).

We argue that this intensity of resource pooling influences smallholder farmer entrepreneurship. The literature on agri-food value chains suggests that one way for value chain partnerships to influence farmer entrepreneurship is by enhancing knowledge flows (Grandori, 2013). The pooling of physical resources embodies knowledge and, through it, farmers expand their toolbox on which resources to recombine, and how. Farmers' knowledge acquisition through more access to pooled resources might be transaction-specific (Cholez et al., 2020) but, when farmers combine external interactions and internal communication, might also support farmers' ability to redeploy these resources innovatively (Lans et al., 2008). An example from rural Canada suggests that, when smallholder farmers access more pooled resources through their buying partner, they learn from each other how to scale up their business in ways that maintain their operations financially sustainable over time (Magnan, 2012).

Smallholder farmers are relatively resource scarce actors in the value chain. As such, along with knowledge flows with other partners, they build entrepreneurial mindsets and behaviors through the experience of accessing pooled resources. Access to a common pool of resources expands ways for recombining resources innovatively in uncertain situations (Foss et al., 2007). Experimentation, in particular, is a powerful mechanism for entrepreneurial learning (Chandler et al., 2011). As they have more room to re-organize resources in and around their farm, smallholder farmers learn over time how to redeploy them more effectively (Foss and Foss, 2001). For example, facilitation of farmer-farmer and farmer-buyer interactions through stakeholder meetings and 'training field days' may create opportunities to maximize entrepreneurial learning from the experience of pooling resources (Hinrichs et al., 2004).

Conversely, value chain partnerships that limit the intensity of resource pooling risk leaving smallholder farmers systematically at a learning disadvantage (du Toit, 2011; Ponte, 2010). With less access to resources, the most resource-scarce actors have fewer affordances to recombine resources innovatively, thus to experiment and learn (Dentoni et al., 2018). Hence, because of having fewer alternatives on how they recombine resources, they stick to routine habits with available resources (Sarasvathy, 2001) and become less prone to adaptive behaviors and mindsets as external circumstances change over time (Yaseen et al., 2018).

On the basis of this literature, we advance the following proposition:

P1. The higher the intensity of resource-pooling in value chain partnerships, the more smallholder farmers develop entrepreneurial mindsets and behaviors.

3.2. Distribution of decision-making rights and smallholder farmer entrepreneurship

Value chain partnerships vary also in terms of distribution of decision-making rights over the use of resources. This entails the set of rights – i.e., the right to use them, alter them, exclude others from their use, appropriate their returns, or transfer them – that direct the activities and use of productive assets over the pooled resources (Foss and Foss, 2001; Slangen et al., 2008; Ménard, 2004). These decision-making rights give, overall, not only access to resources but also voice and agency on using them for purposes that they consider beneficial for themselves and other partners (Grandori, 2013). For instance, many contractual arrangements between companies and smallholder farmers historically assign the majority of decision rights to the former ones: on the basis of their market power, companies decide which products and services farmers need to deliver, as well as when and how (Bogetoft and Oleson, 2002; Hu and Hendrikse, 2009). In these cases, the distribution of decision-making rights is low, as it strongly skews towards one partner only. In other cases, such as in recent sustainable cocoa initiatives in West Africa, companies deliberately expanded the terms of negotiation with farmer organizations to give farmers more room in decision-making (Nelson and Phillips, 2018). Yet, also in this case, the actual distribution of rights ultimately depends on democratic processes taking place within farmer organizations.

We suggest that the distribution of decision rights in value chain partnerships matters for smallholder entrepreneurship. A few empirical studies in the agri-food sector demonstrate that farmers' participation in decisions on how to use the pooled resources gives them the incentive to recombine those pooled resources autonomously. For example, Kilelu et al. (2014) found that onion farmers in Kenya learn how to better articulate their demands to partners, and thus redeploy resources in ways that create a balance between socio-economic and ecological trade-offs, when they participate more in partnership decision-making processes. Furthermore, cooperatives that collaborate with value chain partners in Eastern Africa show that farmers' distribution of ownership and access rights over resources rights stimulates their participation in entrepreneurship (Bijman and Doorneweert, 2008).

A peculiar pathway through which distribution of decision-making rights in value chain partnerships influences smallholder entrepreneurship is through ownership of resources. The general literature suggests that distributed resource ownership stimulates innovative thinking among members in organizations, because ownership makes them perceive less uncertainty over the outcomes of their innovation (Alvarez and Busenitz, 2007). In agri-food value chain partnerships, the ownership rights over land resources represents specifically a key determinant for smallholder farmer entrepreneurship. Ample evidence suggests that smallholders invest in new farm and non-farm activities and diversify agricultural production to mitigate risks and stabilize livelihoods when they co-own the land that they grow with other farmers in value chain partnerships (Anderson et al., 2006; Harper, 2013).

The opposite happens in situations where decision-making rights are

concentrated on only one leading partner (Crick and Crick, 2018). When smallholder farmers have narrow decision rights over pooled assets and key activities related to their core business, they are likely to follow routines due to pressures from partners that control the pooled resources (Wiltbank et al., 2009). Hence, their discretion to act entrepreneurially is limited because other leading players put strict instructions on the use of pooled resources and in farm activities at the expense of smallholder farmers' interests (Olson, 1971). For example, orange farmers in Northern India struggled to become more entrepreneurial as the local government and their buyers initially failed to engage them in decision-making processes over the use of market information and the organization of extension and training services (Choudhary et al., 2015).

In line with this literature, we suggest the following proposition:

P2: The wider the distribution of decision-making rights on pooled resources in value chain partnerships, the more smallholder farmers develop entrepreneurial mindsets and behaviors.

3.3. Formality of coordination mechanisms and smallholder farmer entrepreneurship

Value chain partnerships vary also in terms of how they implement and enforce the distribution of decision-making rights over the use of resources. These ways of enforcing rights are referred to as coordination mechanisms among partners (Ménard, 2004), as they constitute formal and informal rules and norms that guide partners' behaviors and expectations. In the agri-food industry, in particular, some partnerships organize mostly through formal mechanisms such as legal contracts, bylaws, or other types of written sets of rules) (Aiken and Hage, 1968). Others, instead, rely on informal mechanisms such as personal trust relationships, social capital (Lu et al., 2008).

We argue that smallholder farmer entrepreneurship varies depending also on how formal and informal coordination mechanisms are combined. A vast literature suggests that, when formal institutions are weak, trust relationships between farmers and their partners are essential for an effective use and recombination of pooled resources (Gao et al., 2017). When engaging informally, for example, farmers and their partners establish more adaptive ways of redeploying their assets (Pindado et al., 2018) and, among farmers, they better complement each other's resources (Mupfasoni et al., 2019). Trust, in particular, stimulate an eagerness to share knowledge and information among partners (Stahl and Sitkin, 2005) and create a learning environment more apt for experimentation (Jansen et al., 2005).

Too heavy reliance on informal coordination mechanisms, however, might exclude some less resource-endowed farmers from learning processes. For example, smaller, younger and less educated coffee farmers in Uganda were found at a learning disadvantage relative to others in partnerships driven mostly by social interactions (Barzola Iza and Dentoni, 2020). In general, more peripheral and less connected actors risk exclusion from entrepreneurial learning unless formal coordination mechanisms are also designed (Rae, 2017). Moreover, the presence of formal mechanisms acts as a safeguard for less powerful actors to prevent opportunism and free-riding by more powerful actors over the use of pooled resources (Chamberlain and Anseeuw, 2019). Finally, more formal coordination and control mechanisms reduce uncertainty as a result of clear rules, routines, and responsibilities of each party (Kim et al., 2003), thus making partners more comfortable in redeploying resources more innovatively. When coordination mechanisms are too formal, nevertheless, partners may not be prone to innovate anymore as they see limited room for recombination of resources, hence learning and experimentation may be hampered (Hjorth, 2004). In other words, formal coordination cannot fully substitute informal coordination in partnerships to support entrepreneurial learning processes. Hence, a balance between formal and informal mechanisms needs to be found (Šūmane et al., 2018).

Hence, we propose the following proposition according to the literature:

P3: The more balanced the use of formal and informal coordination mechanisms in value chain partnerships, the more smallholder farmers develop entrepreneurial mindsets and behaviors.

While these propositions suggest that the organization of value chain partnerships shapes their members' mindsets and behaviors, we realize that this influence might also take the opposite direction: smallholder farmers may influence the organization of partnerships (see feedback loop from entrepreneurship to value chain partnerships in Fig. 1). In line with the Giddens' principles (1984), members of organizations simultaneously influence, through their own agency, and are influenced by organizational structures. This is an important issue to take into account, because farmers that are *initially* more entrepreneurial in value chain partnerships might also be more active in taking decisions and accessing resources at the expense of other (less entrepreneurial) farmers, thus triggering processes of exclusion (Barzola Iza and Dentoni, 2020). This makes it vital for partnerships to design formal mechanisms of inclusion because, when leaving participation informal, exclusion of less active farmers occurs more frequently (Dentoni et al., 2018).

4. Smallholder farmer entrepreneurship and the resilience of the agri-food system

Processes of participative collaboration and learning are critical for the resilience of socio-ecological systems (Ungar, 2018), including of agri-food systems (de Kraker, 2017). However, the literature has not sufficiently explored yet how to support agri-food resilience through value chain partnerships and the development of smallholder farmer entrepreneurial mindsets and behaviors. By effectively redeploying resources in and around farming (Dias et al., 2019), we argue that smallholder farmers developing entrepreneurial mindsets and behaviors are more capable of balancing socio-economic and ecological trade-offs (Costanza, 2000). This act of balancing represents a challenge for resource-constrained actors yet it is vital to accomplish it also at small-scale and in decentralized ways (Ostrom, 2009), because disturbances affect (sub)systems in different yet interconnected ways at multiple scales. For instance, as they redeploy their livestock and assets in sustainable land grazing practices, small-scale agro-pastoralists seek a balance between supporting their household and community (sub)systems and, at the broader ecological ecosystem level (Bailey and Buck, 2016).

By balancing socio-economic and ecological trade-offs, we argue that smallholder farmer entrepreneurship supports the resilience of agri-food systems through three outcomes: rural livelihoods, ecological services and socio-cultural services. First of all, rural livelihoods are positively sustained when smallholder farmers have the ability to cope with sudden disturbances – either of ecological, e.g. a typhoon, or socio-economic nature, e.g. a civil unrest or market disruption – in a swift manner by recombining their resources (Chapin et al., 2006). Even in situations when access to resources is very constrained, small-scale actors with an ability to improvise and hustle resources effectively (Baker and Nelson, 2005) in the short-term can cope with shocks or persistent stresses (Holt & Littlewood, 2017). Beyond short-term improvisation supporting coping strategies, smallholder farmer entrepreneurship triggers rural livelihoods also through longer-term adaptation (Rosenstock et al., 2020). For example, small vegetable farmers in Ghana vary notably on their capacity to adapt farming practices such as fertilization, supplementary irrigation, intercropping and mixed farming in response to increasing temperatures and declining rainfall patterns (Williams et al., 2019).

Second, we contend that smallholder farmer entrepreneurship supports ecological services, hence supporting the resilience of agri-food systems, through two main pathways: conservation and restoration (Makate et al., 2019; Rosenstock et al., 2020). The former involves adopting practices that maintain ecological services; the latter to their recovery. Recent evidence shows that entrepreneurial coffee smallholders in Uganda, for example, are better positioned than others in

improving water and land efficiency interventions (Barzola Iza and Dentoni, 2020). Similarly, more entrepreneurial potato farmers in Kenya changed seed regimes, rotated crops, and engaged in minimum tillage as knowledge-intensive conservation practices (Kangogo et al., 2020). As an example of recovery, tea farmers in Tanzania were able to revitalize overexploited and nearly abandoned plantations by mediating between the market demand from their buyers and the natural rhythm (van Hille et al., 2019). Conversely, when showing less entrepreneurial mindsets, farmers refrain from ecosystem restoration initiatives as they perceive too tight trade-offs with their rural livelihoods (Hansson and Kokko, 2018).

Finally, through the balancing of socio-economic and ecological trade-offs, we suggest that entrepreneurial smallholders support agri-food systems resilience through the provision of socio-cultural services. Empirical evidence shows that farming plays a fundamental role in increasing the cultural valuation of ecosystem services. Through their investments, farmers play a vital role in moulding landscapes through valorisation of the human-nature nexus (Plieninger et al., 2014). For example, entrepreneurial olive oil smallholders in Italy engage purposively to balance the development of market relationships for their own farm with the socio-cultural evaluation of their landscapes through a myriad of interconnected networking activities (Dentoni and Reardon, 2010). At a larger scale than landscape, Obschonka et al. (2016) found – for example, in rural United Kingdom and United States – that regions with more prevalence of entrepreneurial mindsets are more socio-economically prepared for disturbances than others; even when their infrastructure development was the same.

Accordingly, as illustrated in the right-hand side of Fig. 1, we propose that:

P4: The more smallholder farmers develop entrepreneurial mindsets and behaviors, the more they support the resilience of agri-food systems through the balancing of (socio-economic and ecological) trade-offs.

Not only smallholder farmers' entrepreneurial mindsets and behaviors support agri-food system resilience but also, vice versa, farmers embedded in resilient systems might have higher chances to be entrepreneurial (Mcinnis-bowers et al., 2017). For example, indigenous communities in Costa Rica started collaborating to bring novel products to the market once their marginalization process from the rest of society had decreased; and not vice versa (Mcinnis-bowers et al., 2017). This means that the relationships between entrepreneurship and resilience are path-dependent: when resources available to smallholder farmers are less available, socio-economic and ecological trade-offs are more stringent and therefore more difficult to balance (Fig. 1; see feedback loop from outcomes of resilience to entrepreneurship). This path-dependency makes it even more important for value chain partnerships to design their processes in ways that purposively support smallholder farmers from escaping from this vicious cycle.

5. Empirical illustrations

5.1. Three illustrations of value chain partnerships in agri-food sector

To illustrate linkages between value chain partnerships, smallholder farmer entrepreneurship and resilience of agri-food systems, we provide three examples of value chain partnerships from Italy, Malawi and Zimbabwe. These cases all involve an agribusiness company partnering with smallholder farmers, as well as other stakeholders outside the agri-food value chain (e.g., research institute, NGO, farmer association, international donor), seeking to develop a pathway towards resilient agri-food systems through the balancing of ecological and socio-economic trade-offs. Yet, they differ in their position of the partnership in the value chain (i.e., upstream and downstream), agricultural sub-sectors, geographical location and, importantly, in their organizational features (Table 1).

A first example of value chain partnership is the Agrosat platform in Italy. Launched by Barilla, a global manufacturing company turning wheat and vegetables into a variety of pasta, sauces and meals, Agrosat platform aims to support and expand farmers' use of precision farming with the Italian National Research Council and local wheat and vegetable farmer associations in Apulia and Emilia-Romagna regions (Agrosat, 2018). This partnership aims to support farmers' adaptive use of agricultural inputs tailored to the specific and timely agro-ecological conditions of the farmed field, thus supporting the resilience of farmers and their ecosystem. Along with preserving the ecological value of ecosystem services, Barilla through Agrosat seek to balance a more efficient and higher quality supply of wheat and vegetables for their products (see Table 2).

The Agricultural Commodity Exchange for Africa (ACE) represents a second example from Malawi. Founded by a coalition of agricultural trading companies (including Cargill and Export Trading Group) and the Malawian National Smallholder Farmers' Association (NASFAM), with initial seed funding from US and several European development aid agencies (USAID, Germany's GIZ, and Netherlands' SNV), ACE aims to facilitate trade of maize and legumes (soybeans, groundnuts, common beans and pigeon pea) from farmers and traders to manufacturers and

Table 1
Value chain partnerships and pathways to support agri-food systems resilience.

Value Chain Partnership	Partners involved	Resources pooled	Balance between ecological and socio-economic trade-offs
Agrosat Platform	- Barilla - National Research Council of Italy (CNR) - 2 Farmer Associations in Apulia & Emilia-Romagna regions	- Technological expertise/ - information	- Support and expand - precision farming in Apulia and Emilia-Romagma region of Italy
Agriculture Exchange for Africa (ACE)	- Cargill - Export Trading Group (ETG) - Smallholders farmers in Malawian Smallholder Association (NASFAM) - USAID, GIZ, SNV	- Storage space - Finance/loans - Transport - Information - Extension advisory - Smallholder farmer trainings - Agricultural inputs - Third party guarantee system	- Enhance smallholder market participation in the maize and legume agri-food system of Malawi
Smallholder-managed LEgume SEed Production (SLESEP	- Zimbabwe Super Seeds(ZSS) - Smallholder farmers organised in Growers associations in Southern Zimbabwe - Local agro-dealers - UK- Department of International Development (DFID) - Local Banks (Agribank) - Zimbabwe Ministry of Agriculture Department of Research and Specialist Services – Seed Services Unit	- Trainings - Storage space - Transport - Social events e. g. Field days - Facilitation of learning tours - Water provisioning equipment - Land - Labour - Purchase space - Seeds - Agricultural inputs - Finance/Loans - Information	- Engage smallholder as active certified seed multipliers in the dry regions of Southern, Zimbabwe

Source: Authors.

Table 2
Organization of value chain partnership and smallholder entrepreneurship.

Value Chain Partnership	Intensity of resource pooling	Distribution of decision-making rights	Combination of formal/informal mechanisms	Partnership support to smallholder farmer entrepreneurship
Agrosat, Italy	Low: Weather information shared with farmers, and knowledge on how to adapt ag input use to local weather conditions. No other physical resources are pooled.	Low: Farmers have little influence on which and how information is shared.	High: Farmers and their associations bond with Barilla into a long-standing trust relationship beyond the Agrosat platform.	Low: Despite the strong trust linkages between farmer associations and Barilla, farmers' limited access to pooled resources and influence on partnership decisions limits their entrepreneurial mind-sets and behaviour.
Agricultural Commodity Exchange (ACE), Malawi	High: Facilitated access to agricultural inputs, storage space, credit through warehouse receipt system, market information and knowledge.	Low: Farmers and their associations have little influence on which and how agricultural inputs, storage space, trainings and services from rural advisors are shared.	Medium: Farmers have modest but increasing trust relationships with ACE managers and rural advisors. Despite geographical dispersion, ACE is organizing training platforms to underpin longstanding relationships.	Medium: Despite increased access to pooled resources through the partnership and building trust relationships, smallholder farmer entrepreneurship is hampered by the limited farmers' influence on partnership decisions.
Smallholder-managed Legume Seed Production (SLESEP), Zimbabwe	High: Information, knowledge, seeds, water access, inputs for seed multiplication are shared with farmers.	Medium: Through their associations, farmers voice and shape, to some extent, how and to who to sell the seeds that they multiply.	High: Farmers and Zimbabwe Super Seeds staff established trust relationships facilitated by the close geographical distance.	High: Despite the moderate influence of partnership decisions, smallholder farmers develop entrepreneurship because of their increased access to pooled resources and informal relationships with partners.

Source: Authors.

traders (ACE, 2020). Along with creating an economic benefit for the trading companies, ACE seeks to create viable conditions for farmer participation to trade and reduce their vulnerability. These include: safe storage space for commodities to be sold when seasonal prices increase; loans using the stored commodity as collateral or, in more technical terms, a warehouse receipt system; and an information system based on text-messaging farmers through their cell phones (Dentoni and Krussmann, 2015);

Third, the Smallholder-managed LEgume SEed Production (SLESEP) model represents a value chain partnership operating upstream of the value chain in Zimbabwe. Developed by the company Zimbabwe Super Seeds in cooperation with local agro-dealers and with support from the UK Department for International Development (DFID), SLESEP aims to engage smallholder farmers as active seed multipliers of certified seed and enhance their access to efficient water infrastructure and mechanized small-holder tillage systems (Genesis Analytics, 2018). For the company Zimbabwe Super Seeds, this represents a way to expand their procurement sources of improved quality seeds. At the same time, the SLESEP model intends to preserve ecosystem services, encouraging smallholder farmers to engage with seed production and water-use technologies that are more suitable to cope with climate shocks in their semi-arid region.

5.2. Illustrations of value chain partnerships and smallholder farmer entrepreneurship

Three examples illustrate how the organization of value chain partnerships might concretely relate to smallholder farmer entrepreneurship (Fig. 1). On Barilla's Agrosat partnership with CNR and two farmer associations, our conceptual framework (synthesized in the propositions P1-P4 discussed above) would question, for example, how the formal or informal mechanisms in this partnership facilitate the sharing of knowledge among the involved partners. For example, it would make a difference if Barilla and CRN provides a set of online information on what and how to use agricultural inputs given the local soil and weather conditions to farmers (P1). It would make a difference on farmers' mindsets and behaviors if there were interactive sessions – either online, in the field, or in a dedicated training space - for farmers to experiment with the information received, engage with partners and learn from their personalized feedback (P3). Moreover, it would impact smallholder farmer entrepreneurship if less resourceful (e.g., less educated, smaller, less technology-rich) actors of the farmer associations were able to interpret and use the information received through Agrosat. According to the theoretical arguments outlined above, if the organization of Agrosat entails rich bi-directional communication among the partners and a voice for the less resourceful members, then the involved partners are more likely to balance between market and ecological trade-offs and, ultimately, to better adapt and cope with systemic shocks (P4).

In the case of ACE in Malawi, a recent data collection and analysis also shows the relevance of promoting smallholder farmer entrepreneurship in value chain partnerships (Dentoni et al., 2020). Funded by private trading companies and public donor funding, ACE staff strived to provide farmers accurate and rich market information and knowledge to support their participation to a commodity storage scheme (P1). Despite the established communication routines and practices established to inform farmers about ACE's available resources and services (storage, credit, agricultural inputs, etc.) for many years the majority of farmers felt reluctant to participate to ACE (Dentoni and Krussmann, 2015). When participating, if outcomes were not as expected, many farmers felt poorly understood or even misguided by ACE staff (P2). These challenges to trigger mindset or behavioral changes led ACE partnership staff, in recent years, to reflect on how to adapt their coordination mechanisms. Instead of transferring information and knowledge to farmers (with the assumption that it would suffice to trigger their entrepreneurial behaviors), ACE is now seeking to decentralize their trainings through farmer field schools and community events (P3). This is meant to make communications and decision-making practices among farmers and other ACE partners more distributed and interactive (Moller et al., 2020). This has been their adaptation strategy to support the resilience of the Malawian and regional maize and legume systems (P4).

Finally, Zimbabwe Super Seeds' SESLEP represents an example of value chain partnership upstream in an agri-food value chain, i.e. in the provision and multiplication of drought-resistant seeds. The organization of SESLEP entails training by Zimbabwe Super Seeds and staff of an NGO with partial support of public donor funding. This complements contracts between farmers and their seed suppliers for seed multiplication. As part of SESLEP, partnering farmers co-access - to a certain extent - resources such as land, seeds and water-provisioning equipment (P1). Through meetings and other events, partnering farmers share – to some extent - decisions rights on production, input use, resources, activities with Zimbabwe Super Seeds (Genesis Analytics, 2018) (P2). The combination of contractual arrangements and training grounded on the development of business skills through mentorship and experimentation in the field serves the purpose of accelerating farmers' process of learning-by-doing (P3). In SESLEP, it would be important to assess to

what extent smallholder farmers are able to experiment and interact through this combination of trainings and contracts for seed multiplication. Therefore, on the basis of the conceptual framework (Fig. 1), it would be plausible to expect that partnership organization translates into smallholder farmers' entrepreneurial learning, thus supporting the resilience of the agri-food system surrounding them (P4).

6. Scientific, managerial and policy implications

This conceptual paper has proposed an integrative framework (Fig. 1), corroborated with empirical illustrations, on the linkages between the organization of value chain partnerships, smallholder farmer entrepreneurship and the resilience of agri-food systems. This contributes to the literature on ecosystem services (Reed et al., 2014; Benjamin et al., 2018; Laterra et al., 2019) – and, more specifically, to the current policy debate on agri-food systems resilience in the EU – by focusing on two underexplored and interconnected drivers of smallholders' ability to balance between socio-economic and ecological trade-offs (Costanza, 2000). These are:

- First, the *organization of value chain partnerships* between agri-food companies and smallholder farmers. Relative to the existing literature, we propose that how partnerships are organized – specifically, to what extent resources are pooled, who takes decisions over them, and how (formally or informally) these decisions are implemented – shapes the balancing of socio-economic and ecological trade-offs (Costanza, 2000) and, ultimately, for the resilience of agri-food systems (Milestad et al., 2010; de Kraker, 2017; Ungar, 2018).
- Second, smallholder farmer entrepreneurship as mindsets and behaviors that involve redeploying resources innovatively in and around farms (Dias et al., 2019). Relative to the existing literature (Milestad and Darnhofer, 2003); Darnhofer et al., 2010) we add that smallholders' entrepreneurial mindsets and behaviors contribute to explain their capacity of balancing socio-economic and ecological trade-offs (Costanza, 2000).

While it is beyond the scope of conceptual papers like this to empirically demonstrate the advanced propositions, we encourage future interdisciplinary research, across natural and social sciences, to empirically test and refine them.

Advancing this line of research at the nexus of value chain partnerships, entrepreneurship and agri-food system resilience is important for policy-making worldwide, but particularly in the EU given current development of the new Common Agricultural Policy (CAP). Developing policy and value chain incentives that stimulate smallholder farmer entrepreneurship as a balancing between socio-economic and ecological trade-offs needs to be at the core of both the recent EU 'Farm to Fork' and 'Biodiversity' strategies. Aligning to the conceptual framework that we propose, for example, support income from the EU might better stimulate smallholder farmer entrepreneurship if pooled in existing value chain partnerships involving them – as advanced in our first proposition (P1) - rather than distributing it to farmers individually. Furthermore, as the new EU CAP will strengthen the support of agricultural knowledge innovation systems for supporting smallholder farmer investments in market adaptation, incentives should be dedicated to either to value chain partners (e.g., farmers' suppliers and buyers) or local policy implementers (e.g., municipalities or regional agencies) that play a catalyst roles to convey the expertise of civil society organizations, extension agents, and research organizations (including universities) towards smallholder farmers' entrepreneurial learning. To be supported by the new CAP, these organizations should demonstrate expertise in catalyzing, both formally and informally (in line with P3), resources necessary for smallholder farmers to innovate and balance ecological and socio-economic trade-offs.

Along policy-makers, future refining and testing of our conceptual framework have implications also for managers with leading positions in value chain partnerships (e.g., agri-food company managers, such as procurement managers or farmers' training managers). Our conceptual framework suggests that agri-food managers should (re)design value chain partnerships not only in terms of supply chain efficiency and (short-term) market competitiveness, but also and mostly as learning environments – even as living labs – for farmers and other partners to experiment and learn how to redeploy resources innovatively and to explore new ways of balancing ecological and socio-economic trade-offs (in line with P4). As unintuitive as it might seem, managers leading agri-food value chain partnerships should voluntarily give away some of their power to allow other partners, and smallholder farmers in particular, to actively participate on decisions over the use of pooled resources in partnerships (in line with P2). To support the (re)distribution of decision-making rights in value chain partnerships, public and non-profit actors can put pressure on agribusiness companies (Ingenbleek and Dentoni, 2016) for example through monitoring and advocacy or, alternatively, through funding dedicated to the effective support of smallholders' entrepreneurial learning. In the context of the EU, for example, these managerial changes in value chain partnerships would support the effectively implementation of the new CAP not only in terms of boosting rural innovation, but also in terms of redistributing power in the food chain, in the process of supporting agri-food systems resilience.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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