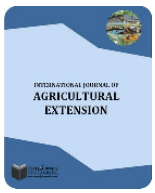

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THE ROLE OF COOPERATION FOR SUSTAINABILITY INNOVATIONS IN THE AGRICULTURE AND FOOD SECTOR

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A B S T R A C T

The necessary transitions in the agriculture and food sector require 'second order' innovations, which often are the result of collaborative networks between heterogeneous partners. The paper is based on the analysis of cooperation in two different German case studies: One case deals with the development of a sustained value chain for ethical poultry production while the other case aims at the combination of different niche innovations for cultural landscape conservation. The empirical analysis is based on the categories 'goals of the innovation and motives of cooperation', 'actors and their resources', 'distribution of costs and benefits', 'cooperation structure and management'. It comprises guided interviews with central actors of the co-operative networks and participative observation as part of a transdisciplinary research process. The comparison reveals similar and different challenges for establishing the two types of innovation, which can partly be explained by the different character of the niche-regime interactions in the two cases. Both face the challenge that partnerships have to be built up, which allow compensation of the added societal values. The establishment of ethical poultry production is confronted with competitive disadvantages of niche products on the market due to challenging the paradigm of specialization and cost efficiency on different levels of the value chain (divergent or oppositional niche-regime interaction). The case of cultural landscape preservation, which has characteristics of an emergent niche-regime interaction, is confronted with different perspectives on the aspired qualities of the landscape by the heterogeneous actors involved (agriculture, nature protection, tourism and administration). Both cases show a high degree of complexity, which affords professional cooperation management, which is able to adapt to changing circumstances. Drawing on the concept of "failures", originating from the innovation system and transition approach, helps to get a better understanding of potentials and limits of cooperation in sustainable innovation processes.

Keywords: Sustainability innovations, cooperation management, ethical poultry production, organic value chains, cultural landscape conservation, marginal wetlands, niche-regime interaction, system failures.

INTRODUCTION

Rural sociology, agricultural extension research and other socio-economic perspectives have identified the societal relevance of the multiple functions of agro-food and other land use systems beyond the single paradigm of productivity and efficiency (e.g. Van der Ploeg *et al*., 2000; Goodman, 2004; Knickel *et al.,* 2004, 2009; Brunori *et al.,* 2013; Ingram, 2015). The increasing recognition of grand global sustainability challenges has given sustainability or eco-innovations, alternative agro-food networks and the like a sense of urgency (Leach *et al.,* 2012; Knickel *et al*., 2017). However, the productivity narrative continues to be used in agendas of bioeconomy and sustainable intensification (Levidow, 2015). Despite addressing global challenges such as biodiversity loss, N and P cycles or ethical animal husbandry, agro-food or eco-innovations often still remain in a niche (Knickel *et al.,* 2017; Brunori *et al*., 2013). These so called system or second order innovations (Knickel *et al.,* 2009) exceed the complexity of classical agricultural innovations (as e.g. introducing new plant variety breeds or new

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technologies) (Tidd & Bessant, 2013). The development of this type of complex innovations has to be navigated differently within networks, exceeding boundaries of single organizations by integrating a broader environment (Geels, 2002). Within a niche, which we understand as a room to navigate and organize innovative activities, cooperation management can support the diverse actors in organizing their contributions to and benefits of experimenting and social learning. In agro-food-systems local, regional or value chain specific (sub-) constellations of diverse actors could benefit from cooperation, allowing to complement the usually limited resources of small and medium enterprises and other actors by overcoming organizational boundaries in an adaptive way. Yet, cooperation in such settings can also pose challenges, as e.g. conflicts regarding the distribution of tasks (Klerkx & Aarts, 2013). In our contribution, we describe situations within such complex innovation processes and environments from a cooperation management perspective. So far the issue of cooperation is rarely addressed by extension services, which often focus on technical issues, missing opportunities for innovation (Sutherland *et al.,* 2017). However, extension formats fostering cooperation among farmers have proven to be a catalyst for farm development, adoption and change of practices, facilitating exchange of tacit and codified knowledge, e.g. in farmer groups (Prager & Creaney, 2017; Papa *et al.,* 2018).

The paper conceptualizes cooperation under the specific conditions of innovation processes for sustainable agro-food systems and provides empirical insights into two case studies from Germany. It is taking the perspective of actors that fulfil coordinating functions in innovation processes. This may be extension workers, but can also be central actors in value chains, administration, network managers or others. Farmers' roles in such innovation process settings can range from knowledge providers to co-designers, e.g. as demonstration farms (Lacombe *et al.,* 2018; Papa *et al.,* 2018). The aim of our research is to identify the preconditions and possibilities of these actors for improved cooperation management, navigating the development of sustainable agro-food innovations between niche and regime.

The paper is based on research done in the transdisciplinary research project "ginkoo" that aims at a better understanding of regional innovation processes in the agriculture and food sector and the development of supporting instruments and tools. We assume that cooperation is a central mechanism for the development of sustainability innovations since it a) fosters that perspectives from heterogeneous actors are considered to create holistic sustainability qualities, and b) may compensate competitive disadvantages that often characterize sustainability innovations by stabilizing the market position of the involved actors respectively the funding of sustainability qualities (Nölting & Schäfer, 2016). We want to gain insights regarding the potentials and limits of cooperation via the analysis of two contrasting case studies: One case deals with the development of a sustained value chain for ethical organic poultry production including farmers, processors, an organic marketing association, a wholesale trader and organic food stores. The other case aims at the combination of different niche innovations for the conservation of a cultural landscape with a high degree of biodiversity and attractiveness for tourism. The central focus of this case is value creation for further extensive cultivation of marginal wetlands.

The comparison of cooperation in these different case studies allows discussing the potentials but also limits of cooperation management for developing and establishing different sustainability innovations in the agriculture and food sector.

The paper deals with the following research questions:

- Which similarities and differences can be detected regarding the challenges of cooperation in two contrasting cases of sustainability innovation processes in the agro-food sector?
- What are the potentials and limits of cooperation management for the establishment of sustainability innovations? Can limits be explained with the differing compatibility of innovative niches with the dominant regime and connected innovation system failures, which can – and cannot – be addressed via cooperation?

Theoretical background: During the last decades, many excellent ideas for sustainable agriculture and food production have emerged which often cannot be established successfully within the dominant structure of food markets, regulations, subsidies and consumption patterns (Knickel *et al.,* 2017). Alternative forms of sustainable production and niche innovations do not diffuse automatically to replace outdated elements of the incumbent agro-food regime (Grin *et al.,* 2010; Maye, 2013; Ingram *et al.,* 2015; Levidow, 2015). The environment entails barriers, conceptualized by Weber

& Rohracher (2012) as market failures, structural system failures and transformational system failures.

To deal with these barriers, practitioners as well as researchers advocate cooperation, and analyses of best practice cases demonstrate its potential (Marsden & Smith, 2005; Schermer *et al.*, 2011; Fichter & Clausen, 2013; Anderson *et al.*, 2014; Dyg & Mikkelsen, 2016). Authors with different disciplinary background stress different advantages of cooperation for innovation development. Economic literature points out that cooperation allows single enterprises to concentrate on core competences and pool resources resulting in acceleration of innovation cycles, improvement of the market position and increase of economic benefits (Swoboda, 2003). Authors from industrial and network sociology emphasize that social relationships of reciprocity and trust are crucial elements of cooperation (Sydow, 2010) and that power structures within networks shape cooperation (Weyer, 2011). Literature on innovation in the agro-food sector places learning at the core of innovation processes and understands innovation as changed patterns of interaction between people, tools and natural resources (Brunori *et al.,* 2013). Weber & Rohracher (2012) raise attention to the "interaction" or "network failure", which can be addressed by cooperation between diverse actors. As central advantages of cooperation, they mention access to external knowledge and complementary resources and support of interactive learning processes. Besides cooperation management between the actors involved, they consider coordination between research, technology, innovation policy and other relevant policy fields as necessary for successful innovation processes (ibid).

Literature from different disciplinary strands highlights the following categories to analyze the quality of the cooperation: the goals of the innovation and motives for cooperation, selection of actors and distribution of costs and benefits between collaborating partners as well as the role of operational management within a cooperation (Nölting & Schäfer, 2016). Along the temporal dimension, four phases of the cooperative process are differentiated: initiation, development, realization and transformation. We understand cooperation as voluntary collaboration of independent partners who work together for a specific purpose that they can achieve better jointly than individually. Further, we specify cooperation for sustainability innovations as horizontal and/or vertical multi-actor collaboration between actors such as enterprises, members of civil society, public actors or researchers, with the common goal of contributing towards a sustainable agriculture and food sector. A minimum level of organizational and management structures is necessary for successful, stable cooperation, which needs to be based on trust, comprises a reciprocal exchange of resources (e.g. material and financial resources, knowledge, experience), and is characterized by learning and experimenting with new practices (Nölting & Schäfer, 2016). Ingram *et al.* (2015) point out that different types of cooperation for more sustainable agro-food systems (also called Learning and Innovation Networks for Sustainable Agriculture (LINSA)) differ in their compatibility with the assumptions, practices and rules of the dominant agricultural regime and resulting niche-regime interactions. They differentiate between compatible, complementary, emergent, divergent or oppositional modes of interaction. By focusing on niche-regime interactions they overcome the dichotomous understanding of radical, path-breaking innovations taking place only in niches and incremental, path-dependent innovations only taking place within the regime.

Considering the character of the interaction of the innovative niche with the existing agro-food regime (Ingram, 2015) and the possibilities of cooperation management to address system failures to improve sustainability (Weber & Rohracher, 2012) might be valuable starting points to interpret potentials and limits of setting up successful partnerships for sustainability innovations in agro-food-systems.

METHODOLOGY

The empirical basis of our contribution is embedded in the transdisciplinary action research approach of the "ginkoo" project (Coughlan f& Coughlan, 2011) which was developed in a co-design process (König *et al.,* 2015). The research project follows a constructivist grounded theory approach, starting from the innovation management practices of actors and developing tools to support these practices in order to develop model solutions for sustainable land management. In two case studies, actors are accompanied in their ongoing innovation processes, supporting the development of new ideas and putting them into practice. The data for our contribution are derived from the transdisciplinary process as well as from specific data collection aimed at

deepening the empirical insights regarding cooperation aspects in innovation processes. The transdisciplinary approach involved a joint situation analysis of the case studies with workshops and interviews that were carried out by at least two team members using a jointly developed interview guide (König *et al.,* 2017). Moreover, data from participating observation from transdisciplinary working groups was included. Overall, the timespan of our empirical work presented here covers a period of three out of five project years, namely 2015 until 2017.

The data used for the analysis of the innovation process and cooperation between the partners are based on the following empirical analyses during the joint situation analysis: In the case of ethical poultry production nine interviews with actors along the value added chain were carried out. In the case of creating value for the cultivation of marginalized wetlands, eight interviews were carried out with representatives from relevant regional stakeholder groups such as farmers, nature conservationists, tourist experts, and a political representative. The semi-structured interviews contained questions regarding the development and the aim of the innovation, the choice of cooperating actors and the structure of the actor constellation, challenges in the innovation process as well as supportive or hindering framework conditions for successful establishment of the innovation. In addition to the interviews, in both cases several workshops with actors in the case studies, transdisciplinary team meetings, bilateral tool tests (e.g. for analysis of the cooperation, for a cooperation agreement) as well as bi- and multilateral exchange to develop the innovation further took place, which allowed participant observation. All workshops involved participants either along the value chain in the ethical poultry case study or from different sectors such as nature conservation, agriculture and tourism in the wetland case. In both cases, actors had not worked on the topics together in a participatory process with each other prior to the project. After each case study workshop, the transdisciplinary team reflected and jointly decided on the implications of workshop results for further planning of the action research process. Within the transdisciplinary research project, the coordinators of the innovation projects in the case studies regularly reported about challenges and difficulties of the innovation process and cooperation between the partners. Individual and overall feedback rounds were documented. Empirical data (interview transcripts, protocols from workshops and transdisciplinary team meetings, documentation of bi- and multilateral exchange and team reflexion) was analysed using the categories from cooperation and network literature as sensitizing concepts. In a second analytical step, the results were compared and similarities as well as differences were discussed in the light of niche-regime interactions (Ingram *et al*., 2015) and so called transformational system failures (Weber & Rohracher, 2012).

RESULTS

In the following sections, cooperation in the two case studies is analysed on the basis of central categories from cooperation and network literature as well as the description of different phases (Nölting & Schäfer, 2016).

Identification of the cooperation phase

Ethical organic poultry production: The project of a dual-purpose breed was initiated as an innovation in organic poultry production in 2011. The 'normal' form of chicken husbandry, including the killing of male chicklets in egg production, was increasingly taken up critically by the media, damaging especially the image of organic animal husbandry, which is supposed to serve animal welfare. In the year 2017 750,000 eggs, 4,700 laying hens and 4,600 broilers per year were produced on five farms, a rather small quantity even in the context of organic farming. Despite its initiation some years ago, the cooperation is still in the development phase since the innovation is not established on the market yet and cooperation structure and management still have to be optimized (see section 4.2).

Value creation for cultivation of marginal wetland: The second case study is located in a biosphere reserve in the Southeast of Berlin. It is taking up the challenge that wetlands, which are typical for a specific cultural landscape, can no longer be cultivated profitably, resulting in natural reforestation and loss of open peatland biodiversity. Further on, this cultural landscape is very important for regional identity and of high relevance for the touristic sector. During the last years, there have been numerous attempts to ensure further cultivation of these areas (1,500 to 2,000 ha) via diverse funding measures or attempts of value creation. However, up to now no long-term solution could be established which integrates the different interests of landowners, farmers as well as actors from nature conservation and

tourism. The cooperation for developing the regional innovation therefore is still in its initiation phase despite first ideas dating back more than 20 years.

Analysis of the cooperation structure and management: Data illustrated in the Table 1 gives an overview about the central characteristics of cooperation in the two case studies, which will be described in more detail in the following sections for in depth probing.

Table 1. Analysis of cooperation in two case studies of sustainability innovations in the agro-food sector.

Categories for cooperation analysis	Value added chain innovation: ethical organic poultry production	Regional system innovation: Value creation for cultivation of marginal wetland
Goals	Establishing ethical organic poultry production with a dual purpose breed; small stocks of chicken in (mostly) mobile stables; cooperation with mixed farms; regional processing and marketing	Ensure value creation for cultivation of marginal wetlands and conservation of cultural landscape with high importance for biodiversity, regional identity and tourism by combining innovative technical, organizational and financial elements
Actors	Value added chain: farmers, slaughterhouse, organic marketing and farmers' association, wholesale trader, organic stores and supermarkets	Land owners, farmers, actors from tourism, nature conservation and administration
Costs and Benefits	Little data on 'real costs'; cost coverage for the farmers (but not sufficient profits), financial deficits but image gain for marketing association and wholesale trader	Costs for extensive cultivation of sensitive areas and cultural landscape conservation are not covered due to changing funding environment Mix of financial instruments is aimed for; image gains for actors from tourism are possible. Exchange between actors results in learning processes and regional social capital
Structure of the cooperation	Organic marketing association as coordinator; few formal agreements and institutionalized structures, classical value chain structures limit the room to maneuver for the initiative	Temporary cooperation between part of the actors; no overarching institutionalized, generally accepted cooperation structure on the topic of maintenance of wet peatland meadows, but different coordinating actors for other related topics, as e.g. marketing of regional products, tourism
Cooperation management	Unclear distribution of responsibilities and tasks for push and pull activities; lack of resources for management and monitoring	No integrative cooperation management; lack of personnel and financial resources

Goals of the innovation and motivation for cooperation: The value added chain innovation pursues the goal of establishing high quality products (eggs and meat from a dual-purpose breed) which contain additional societal benefits as ecological and ethical production. The underlying expert discourses argue that dual purpose breeds address crucial ethical and sustainability challenges and allow for a long needed fundamental system change of poultry production (Reuter, 2014). The product innovation is linked to changes in breeding and rearing practices, but also consumption habits. Farmers still have to gain experiences with breeding and rearing dual-purpose chicken (instead of hybrid species) and consumers are confronted with different quality of the meat (longer preparation time, different texture and taste) and no all-year-round supply. The actors along the value added chain cooperate because they want to establish this quality product on the market and distinguish themselves as pioneers in this field. Commitment of the

organic marketing organization and the wholesale trader to take care of product marketing was the precondition for the farmers to build up poultry production as a new field of income. Since public attention has been high for the negative aspects of conventional chicken production (killing of male chicklets and other sustainability challenges of animal production), there are good chances for image gains. Yet, the initial workshop with value chain actors revealed the expectations of the involved actors that their solution to ethical and sustainability challenges should also be economically viable.

The vision for a regional system innovation pursues the goal of enabling further extensive cultivation of the endangered wetlands by value creation. To achieve this goal, the combination of several innovative technological, organisational and financial elements is aimed at. One of the options is a better value creation for the farmers by using the harvested grass as a resource for producing heat. However, so far, the technical solution to process the harvested material is still in its testing phase, calling first for technology and knowledge management before cooperative solutions, e.g. between farmers and hotels can be established around the technology. Another complementary option is the establishment of financial instruments as e.g. sponsorships by touristic actors, which can be used to finance farmers' efforts for cultivating those sensitive areas. The goal of the cooperation is to overcome the limits of 'small solutions' by working on an integrated strategy which includes all actors who benefit from and rely on the qualities of the cultural landscape.

In both cases, the goal(s) of the respective innovation were not clear enough yet. Besides the workshops with the different actors of the value chain, revision of the website and formulation of a cooperation agreement had the side effect of specifying and agreeing on common goals in the case of ethical poultry production. In the case of the regional system innovation, the process of clarifying and defining common regional goals is still ongoing. So far, actors from agriculture, nature protection and tourism partly have very different visions about which type of cultural landscape should be preserved and which kind of land use should be possible. A common vision for a 'desirable cultural landscape' was not formulated explicitly enough so that also the aims of the cooperation for the development of the single approaches were somewhat unclear in the beginning. However, even if there is a lacking awareness for mutual interdependency between the actor groups, the loss of cultural landscape is widely acknowledged and perceived as a major issue by all parties.

The two cases differ regarding their aim of 'establishing' the innovation: while the value added chain innovation mainly follows a market-oriented approach, the regional innovation searches for additional possibilities of creating value since the market does not acknowledge the created common goods adequately. In the case of ethical poultry production, success can be measured via sales figures and benefits for the partners along the value added chain. In the case of the regional system innovation, it is more difficult to measure success with a single indicator since the formulation of aims and definition of products is more difficult due to the diversity of the cultural landscape. The size of endangered wetland areas, which can be brought back to cultivation via a successful value creation model, is only one possible criterion.

Actors and their resources: Cooperation of actors along the value added chain is necessary for the establishment of the value added chain innovation (eggs and meat from ethical organic poultry production). The project was initiated by an organic marketing association and a regional wholesale trader as the core partners of the cooperation. Farmers were contacted via the organic marketing association. In the year 2016 altogether seven rather small mixed farms were partners of the project. However, in 2017 two farms left the cooperation because one was not content with the realized profits and the other farmer retired. Slaughtering of the poultry is carried out by two regional contractors, who are not directly integrated as cooperation partners, but act as service providers. Since the organic wholesale trader delivers to organic specialized stores only (and not to conventional supermarkets), trading is restricted to this market segment. Cooperation analysis in this case made clear that the organic stores, which are addressing the consumers are not adequately integrated in the cooperation and more efforts are needed for communication with the consumers. Since sales, especially of the poultry meat, remained unsatisfactory without further efforts, a workshop with retailers was organized and an organic supermarket chain was won as new cooperation partner. However, this goes along with further partners and new requirements e.g. regarding

quality and packaging, since this supermarket chain is dealing with all the meat they sell via another single processor. The high commitment of the initial actors for ethical poultry production is a very positive aspect. However, the constellation remains very fragile because sales numbers for meat continue to be lower than expected. Cooperation remains in a rather adaptive mode, testing different options for processing the meat and cooperating with further partners, compromising on central issues as efficient communication and division of tasks, as well as assuring quality management along the value added chain. Handling the innovative products parallel to established logistic and communication in both the organic marketing association's and the wholesale trader's routines requires continuous high coordination and communication efforts. If these efforts do not result in rising profits, there is the danger of growing discontent of the involved partners.

Since the goal of preserving a sensitive cultural landscape is linked to certain areas in a specific region, cooperating actors are restricted to this region ('place based') and choice is limited. In the studied case, this partly leads to the necessity for targeting cooperation between partners who had negative experiences with each other on previous occasions and entrenched positions as well as mistrust. This is especially true for actors from agriculture and nature protection who traditionally view each other rather as opponents than allies. Even though there are great reservations towards each other, the awareness for the problem of an endangered cultural landscape is acknowledged by all stakeholder groups. However, coming to agreements to assure cultivation of sensitive wetlands is difficult, because the land is owned by a multitude of land owners who partially do not live in the region. Cultivation of those small plots is sometimes carried out by agricultural service providers who expect adequate payment. Other plots are still cultivated by farmers who will retire in the near future. This multiple owner and user structure goes along with a loss of identity and responsibility, hindering commitment for a collaborative strategy for the maintenance of the cultural landscape. Regarding actors from tourism, there is only a gradually growing sense of interdependence and shared responsibility for conservation of the cultural landscape and its attractiveness for tourists, partly fuelled by the workshops of the ginkoo project. This group is also very heterogeneous including bigger hotels and small guesthouses, as well as restaurants, canoe and bike rentals, regional food stores, cultural institutions and tourism offices. So far, part of the administration of the biosphere reserve and a regional civic trust have been trying to initiate cooperation between the different partners and innovative ideas. However, these organizations partly are not viewed as acting as sector-overarching 'neutral' moderators.

The comparison shows that it is easier to start a cooperation between partners with similar values and goals in the case of the value chain innovation. However, to establish the innovation at the market, inclusion of further partners might be necessary who do not necessarily share the idealistic goals of the pioneering partners to the same extent. In the case of cultural landscape conservation an innovative cooperation model is more dependent on the existing regional actors. Certain institutions (as e.g. tourism associations) have to be included to establish the innovation on a broader scale. Therefore, a common vision and understanding of which kind of cultural landscape is supposed to be preserved and the ecological and economic implications are necessary. To be able to develop this vision, some kind of an overarching communication forum and 'neutral' moderation is necessary which to some extent could be provided temporarily by the research team.

The experiences of the accompanying participatory observation also showed that development of an innovation is not a linear process: the entry of new partners is accompanied by irritation, which makes iterative processes of adjusting innovation goals necessary at the operational level, forcing the pioneering actors to reconsider their original innovation goals and discover so far unknown implementation barriers.

Distribution of Costs and Benefits: As already mentioned, commitment of the core partners for ethical poultry production is high. Efforts are made to cover the costs of the farmers while the organic marketing association and the regional wholesale trader so far are bearing the deficits. These mainly result from insufficient meat marketing that remains a challenge for all alternative chicken initiatives in Germany. Full cost calculation and pricing for the farmers is difficult, since the structure of the involved farms differs, and there are still learning costs involved for establishing a different herd management with a new breed. Pricing at the point of sale is not based on surveys or tests but on estimates 'what consumers are willing to pay' and comparisons

with similar organic products and practices of standard price differences. So far, one of the farmers has left the network because he was not content with the achieved profits. Since chicken production was meant as a new source of income for mixed farms, this is a demotivating experience, which may also influence other interested farmers. The organic marketing association, the wholesale trader and the organic stores are benefitting from image gains connected to the innovative approach. The project has won prices and is given a lot of attention by the media especially since criticism towards conventional ways of raising poultry has been growing. Even if the organic supermarket chain is still selling small quantities (of the meat), it has taken up the issue already several times in its weekly leaflet for customers. So far, costs for cooperation management are covered by the transdisciplinary research project and are not part of the pricing for eggs and meat.

Regarding the cultivation of marginal wetlands, the costs are partly covered by farmers whose efforts are not acknowledged adequately. A growing percentage of those sensitive areas is no longer cultivated since costs are not covered. So far, only a very small part of the areas is cultivated on the basis of innovative cooperation or financial models as e.g. sponsoring or via 'wetland stocks' which are sold to touristic actors or tourists. The incoming money is used to pay farmers, unemployed locals or agricultural service providers for cultivation of the endangered areas. Those actors who have the highest benefit of the cultural landscape – the actors from tourism and the tourists – are almost not contributing financially to its conservation yet. There is also no governmental compensation for the preservation of biodiversity on these areas on national or European level. The resulting unintended consequences – loss of biodiversity and of identification with a historically grown landscape – have to be borne by the general public (especially by future generations). At the same time, the tourist sector is communicating the aesthetical and recreational benefits of the landscape without linking it to how and by whom it is created and preserved. The comparison makes clear that compensation of costs for the achieved or aimed for sustainability qualities is a crucial issue, which is not solved yet satisfactorily in the two cases. Compensation of those costs makes it necessary to cooperate with new actors (as the consumers or touristic actors) which have to be sensitized for the sustainability problem and be convinced of the innovation. Governmental compensation or rules, which internalize external costs would be another possibility to confront this challenge, which is, however, not in sight for the two case studies.

Structure and management of the cooperation: In the case of ethical poultry production, cooperation was very informal before the start of the transdisciplinary research project, relying on implicit assumptions that this innovation can be incorporated into existing value chain procedures just as any other and would be accepted by informed consumers. On the one side, these informal structures are a key resource of mutual trust between the partners. On the other side, operationalization and division of tasks and responsibilities along the value chain actors were not clear, repeatedly had to be discussed or were discovered as source of misunderstandings. Our analyses made clear that none of the partners really felt responsible for intensive communication with the managers of the organic stores and consumers - an essential task considering the special qualities of the products and the higher price. Based on recommendation from the research partners, a cooperation agreement between the two core partners was signed, specifying rights and duties but also elaborating on the innovation goals. An agreement with the farmers, which specifies delivery dates, quantities (eggs and meat) and a documentation of all necessary handling processes along the value chain is in preparation. Cooperation management is located at the organic marketing association as the connecting institution between the farmers on the one side and trade on the other. However, so far the management has a situational character, mostly operating in response to occurring difficulties. Also due to restricted resources, a lack of strategic development can be observed. Being confronted with pressing issues in daily routines in a highly competitive and price sensitive food system, further advancement of the innovation often is of secondary priority. During the transdisciplinary process, knowledge gaps and the complex character of this innovation could be specified and communication among value chain actors was supported. The tension between the small size of the project and the need for gaining experience through cooperation bears the challenge to safeguard the newly acquired knowledge, especially in case of fluctuation of employees (König *et al.,* 2017).

As mentioned above, there is no generally accepted

cooperation management in the case of value creation for marginalized wetlands yet. Professionals from the biosphere reserve, who are also active in the regional civic trust, have been trying to initiate cooperation between different partners. Due to embeddedness of the biosphere reserve in specific administrative structures, their mission and daily routines, the effort to overcome these logics and to implement a strong and pro-active project management and monitoring culture remains a challenge. Projects as the 'wetland stocks' or the establishment of an oven for thermal utilization of the mowed grass are valuable elements of an integrative strategy of value creation for marginalized wetlands. So far, however, cooperation mostly has a radial structure with the biosphere reserve as linking institution in the middle and little contact between the other actors. A generally accepted institutionalized structure for the exchange and co-ordinated action between actors from agriculture, nature protection, regional development and tourism is still missing. This goes along with a lack of a joint vision about the qualities of the cultural landscape that are worth of being preserved.

In both cases, cooperation management is characterized by a lack of resources resulting mostly in situative operational activities instead of strategic development. Both innovations require parallel activities on different levels, which makes cooperation management a challenging task, which affords comprehensive competences and adequate resources. The transdisciplinary project was a chance to increase capacities for cooperation management and to take strategic steps. However, so far both innovative constellations are still fragile due to the long-term nature of such complex innovations in the setting of the agro-food system and at the intersection with other sectors. Therefore, their establishment remains insecure despite increased efforts for cooperation during the transdisciplinary project.

After the analysis of the two case studies from a cooperation management perspective and their comparison, we will discuss the results in the light of niche-regime interactions (Ingram *et al.,* 2015) and from a sustainability innovation systems failure perspective (Weber & Rohracher, 2012)

DISCUSSION

Analysis of the two different cases reveals some similarities and differences in regard of establishing the sustainability innovations. Both cases struggle with the continuous challenge of setting up and maintaining partnerships, which allow adequate acknowledgement – and financial compensation – for the generation of sustainability qualities. While in the case of ethical poultry production products have been introduced to the market, testing cooperation with different partners, the wetland case is in an earlier stage of the innovation process where coordinating actors are looking for partners to develop and test different approaches for an integrative solution. In both cases, potential to improve cooperation management could be detected as clarifying the innovation goals, specifying responsibilities and distribution of tasks, getting a clearer picture of costs and benefits for the different partners (including non-financial benefits) and introducing a more strategic instead of a situational cooperation management.

The encountered difficulties confirm challenges mentioned in innovation literature as shifting criteria linked to the inclusion of new actors (Van den Veen *et al.,* 1999) and the iterative character of establishing (sustainability) innovations. Cooperation management in the two studied innovation processes has to deal with the very limited resources contrasting with the "size" of the sustainability challenges the actors want to solve with their approaches. What is more, due to the need for experimentation with different possible solutions, clear or constant cooperation arrangements are not easy to achieve. Rather, the emerging solutions require a reflexive and adaptive cooperation management, which reacts to the fragile and rather amoeboid character of the constellations (Moschitz *et al.,* 2015). However, even if the initiatives succeed in optimising cooperation management, it remains unclear if the innovations can be stabilised without explicit windows of opportunity and supportive governance structures.

In the following sections, the concepts of differing niche-regime interactions and innovation "failures" which have to be addressed from an innovation system perspective are referred to for a better understanding of the potentials and limits of cooperation in (sustainable) innovation processes. Table 2 summarizes the insights won from referring to the two concepts.

The empirical insights in the two case studies revealed complex issues of cooperation. The aims, actors, structures and procedures involve different modes of interaction between niche and regime, partly at the same time. The innovation of establishing ethical poultry production via a dual-purpose breed in a regional

organic value chain can be characterized as oppositional interaction mode (Ingram *et al.,* 2015). Assumptions, practices and rules in the cooperating network differ from the mainstream agricultural regime and break with dominant patterns. Introduction of a dual-purpose breed questions the dominant paradigm and long-term innovation path of specialisation and increase of efficiency and re-integrates the production of eggs and meat, which have been optimized separately during the last decades. Re-integration aims at overcoming the negative ecological and ethical effects of industrial poultry production but goes along with less output and significantly higher prices. The dual-purpose breed approach does not only try to implement an alternative path for conventional, but also for mainstream organic chicken and egg production in that it is set up regionally, involving small mixed farms and limited herd size far below organic farmer associations' standards.

Table 2. Reflection of potentials and limits of cooperation in innovation processes for sustainable agro-food systems referring to niche-regime-interactions and innovation systems failures.

	Value added chain innovation: ethical organic poultry production	Regional system innovation: Value creation for cultivation of marginal wetland
Type of niche-regime interaction and characteristic (Ingram *et al.*, 2015)	Oppositional: contrasting paradigms, goals, values, practices, rules & guiding principles (animal welfare instead of cost efficiency) Divergent: Limited political support or recognition from regime; using certification or new brands for marketing; old actors in new roles and new actors	Emergent: innovations at the intersection of agriculture with other sectors (in this case energy production from biomass, nature protection and tourism); some political support & recognition from regime; traditional actors belonging to different spheres + new actors including facilitators
Regime-tensions the innovations can link to (Ingram et al., 2015)	Discourse about animal welfare and ethical animal husbandry	Discourse about multifunctional agriculture and the role of wetlands for climate protection
"Failures" the innovations are confronted with (Weber & Rohracher, 2012)	Market failure: external costs of intensive poultry production are not covered; Directionality failure: lack of shared societal vision for transformation of the animal production sector Demand articulation failure: deficit in anticipating and learning about users' needs	Market failure: external costs of preserving cultural landscape and biodiversity are not covered. Directionality failure: lack of shared societal vision regarding the multifunctionality of agriculture Strong and weak network failure: lack of infusion of new ideas due to too inward-looking behavior and dependence on dominant partners; lack of weak ties to third actors
Potentials of cooperation to deal with the failures	Compensation for production of societal benefit is covered by network partners with similar values and goals (actors along the value chain accept lower profit margins, consumers pay higher prices). Experimental approaches to support joint learning processes between consumers and producers	Compensation for production of societal benefit is covered by network partners with similar values and goals (experiments with integrating touristic actors in financing cultivation of wetlands). Agreement on vision and goals through mutual learning between heterogeneous actors in collaborative processes on the regional level Establishment of weak ties to new actor groups (as e.g. partners from tourism) and

		loosening of strong ties between dominant partners
Limits of the cooperation to deal with the failures/ additional necessary (policy) measures	Compensation of external costs is only possible in a small niche, addressing consumers with "oppositional" values Societal discourse and regulative measures for ethical animal husbandry are necessary to confront directionality failure and overcome market failure.	Subsidies, which acknowledge the benefits for climate and biodiversity protection are necessary to overcome market failure. Societal discourse on future perspectives of agriculture is necessary to confront directionality failure.

However, being embedded in the regional organic value chain, it can also be characterized as divergent interaction mode (Ingram *et al.,* 2015) regarding its implementation which takes advantage of the existing organic value chain (infra)structures and procedures and attempts to market the products via a new brand. The actors themselves call it a "niche in a niche".

Interaction in the case of creating value for the cultivation of marginalised wetlands can be categorized as emergent, describing innovations at the intersection of agriculture with other sectors. Ingram *et al.* (2015) refer to energy and health in their cases, but nature preservation and tourism could also be sectors, which are relevant for this type of interaction. The authors describe these interactions as "intermediary regimes". with altered rules, languages and institutionalised settings, which often are rather vulnerable since they depend on policy instruments as subsidies (ibid.: 67). This case encompasses cooperation between actors from different sectors who, most of the time, are linked to the dominant regime and part of different institutional logics and principles. In contrast to the poultry case, only the integrative innovation has the character of a niche. The involved actors are no typical niche-actors, because – while pioneering for integrative sustainability solutions – they also fulfil functions in their respective sectoral regimes. The innovation network tries to link to the regime by using existing funding schemes in agriculture but are also affected by regime dynamics as the abolishment of subsidies for this special type of land management which results in loss of income.

Ingram *et al.* (2015: 65) point out that niche-innovations have better chances to offer solutions, if they can link to tensions in the incumbent conventional regime. In the case of poultry production, criticism about mainstream practices of chicken husbandry is intensifying and policy measures as a ban of chicklet killing are discussed. It can also be observed that central actors from the dominant regime, as e.g. big discounters, are getting involved with the topic of animal welfare, e.g. by introducing specific labels. This might lead to more openness of organic mainstream actors to test innovative products and practices, potentially leading to the tendency that animal welfare is becoming a matter of competitive advantage for retailers. The other case can link to the ongoing debate about multifunctional agriculture and its role for landscape and biodiversity conservation, which is also captured with the term ecosystem services. Also, the discourse about the role of wetlands with regard to climate change might result in more favourable policies.

From an innovation system perspective the two cases are confronted with similar and different market, structural and transformation system failures (Weber & Rohracher, 2012) which can only partly be overcome by mechanisms of cooperation.

Both innovation processes face the challenge that market prices do not acknowledge the ecological and ethical benefit generated by sustainability innovations due to externalisation of costs (market failure, Weber & Rohracher, 2012). The establishment of collaborative networks with partners with similar values and goals can be a valuable strategy for a compensation of these costs. However, in a competitive environment, this kind of solution, which depends on voluntary engagement e.g. of consumers and actors from tourism, will probably not be able to leave the niche as long as no additional supportive measures are taken.

Both innovation processes additionally face a "directionality failure" (ibid), with no shared societal visions about the necessary sustainability transformations in the agriculture and food sector in general and, more specifically, regarding future animal husbandry and the interaction between agriculture and nature as well as climate protection. Mutual learning processes in collaborative networks, as the two analysed cases, foster a common understanding of each other's

perspectives and leeway to act on a local or regional level. In the case of ethical poultry production, tensions between the holistic approach of the regional initiative and the demands of bigger marketing channels regarding homogeneous product quality, continuous product availability and being able to serve consumers' needs for convenience are a constant field for negotiations. In the case of wetland cultivation, raising awareness of the touristic sector for its interdependency and co-responsibility for preserving the cultural landscape and a further shift of self-image of farmers from being a 'producer' to being (also) a 'landscape-carer' and – maybe – 'energy producer' are necessary. Regular meetings and discussions within the transdisciplinary research project fostered discussions between the different actors and mutual understanding. However, these local or regional processes cannot replace a more comprehensive societal discourse. As mentioned above, in both cases there are societal debates the innovation processes can link to, which will eventually result in supportive measures on a national or international level. In the case of ethical poultry production, there are certain signs of a "demand articulation failure" since the demand of a certain group of consumers for products of ethical animal husbandry is hardly satisfied on the market. Initiatives of alternative agro-food networks are able to experiment with new options of producer-consumer cooperation as "chicken sponsorships" or "chicken funding", which integrate the consumer in a more active prosumer role in the design and financing of value chains. Under current market conditions, it would, however, probably only be a rather small group of consumers with values, which are "oppositional" to the dominant regime, which are attracted by this kind of marketing options.

In the case of cultivation of wetlands, "strong and weak network failures" (Weber & Rohracher, 2012) could be detected. Development strategies in this region are dominated by a rather small group of dominant actors, which bears the risk to lock-in into established trajectories and a lack of infusion of new ideas. Relationships between actors from agriculture and nature protection are partly characterized by pre-conceptions. Weak ties to further actors as e.g. tourism were not sufficiently established when the transdisciplinary research project started. Since the transdisciplinary research team was able to take a role as a neutral moderator, weak ties between a bigger group of actors could be established and unintended effects of strong ties between dominant actors for the development of the innovations could be made explicit.

CONCLUSION

Concluding, our analysis of two case studies of sustainable agro-food innovations shows that professional and adaptive cooperation management plays an important role for the development and establishment of sustainable niche innovations. The right choice of collaborating partners, clarifying innovation and cooperation goals as well as a fair division of costs and benefits are crucial points for successful partnerships, which are challenged both by the nature of fragile constellations and limited choice of partners as a result of pre-existing regime dynamics. The transdisciplinary project was able to sensitize the core partners of the two cases for current deficits of cooperation management and support them in initiating appropriate measures. Taking into account the specific characteristics of the respective niche-regime interaction supports reflection about the choice of appropriate adaptive management measures. However, certain market, structural and transformational system failures can only be overcome by additional policy and support measures.

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