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Co-development  
of transition pathways  
towards agroecological  
farming and food systems

–

A transdisciplinary  
case study in  
Northern Patagonia, Argentina



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German Institute for Tropical and Subtropical  
Agriculture  
DITSL Witzenhausen  
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# **Co-development of transition pathways towards agroecological farming and food systems – A transdisciplinary case study in Northern Patagonia, Argentina**

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## Summary

Prevailing intensive agro-industrial farming is the main driver of anthropogenic environmental change and negatively impacts global human development. Immediate action is required to leverage transition to sustainability in global farming and food systems. Principles to conceptualize and co-develop transitions pathways towards sustainability in farming and food systems have been globally consolidated under the umbrella of agroecology. Argentina provides a distinct example of land-use and food-system change during recent decades from diversified small- and medium-size farming to large-scale monoculture and export-oriented agro-industrial systems. Currently, agroecology is starting to gain momentum in Argentina in farming practice, consumer demand, social movements, policy, research, and development. However, situated methodological approaches to build collaboration between relevant stakeholders to co-develop transition pathways still need to emerge and be tested in research and development practice. Participatory action research (PAR) and social innovation (SI) approaches offer possibilities to gain better understanding of incipient transition processes and to co-develop and test socially legitimated pathways at the farm and local food-system level in a transdisciplinary process. Such approaches could facilitate new types of collaboration between local food actors, involving changes in social practice towards co-production, testing and integration of knowledge and pathway strategies into local farming and food practice.

The overall purpose of this thesis was to contribute to building pathways for transdisciplinary co-development towards agroecological farming and local food system practice. In a case study in Northern Patagonia, Argentina, the transdisciplinary research explored which innovative social arrangements are needed to ecologise farming and local food systems. It sought to address three related research problems. Firstly, current methods to conduct participatory research with farmer groups in support of *farm-level transitions* usually lack due consideration to farmers' active participation and control over the research process and contents, and to inclusion of farmers' experiential knowing as an important part of pathway co-creation. Secondly, insights into how multi-stakeholder SI initiatives evolve in support of *local food-system transitions* are needed to understand how relationships are built and actors' roles change, and how SI can be facilitated. Thirdly, assessment of pathway co-development by local food actors during the recent unprecedented global pandemic that widely impacted agri-food chain functioning is needed to understand how changing conditions framed the room for manoeuvre of actors to develop local marketing pathways and what transformative

potentials unfold in relation to the principles of agroecology. To address these research gaps, in three complementary sub-projects, three research objectives were addressed: i) to conceptualize and pilot a co-inquiry approach for enhanced PAR with farmers; ii) to analyse SI processes, relationship-building and role changes in multi-stakeholder transition initiatives; and iii) to study how changing conditions trigger local food actors to (re-)frame their objectives and activities regarding local marketing, and to assess the relevance of agroecological principles as a basis for responding to the changing conditions and unfolding longer-term transitions.

Objective i): By conceptualizing and empirically testing a co-inquiry approach with a group of horticultural farmers in transition to agroecology, the process documentation and content analysis of data collected during the group activities revealed that co-inquiry extended the roles of farmers as co-researchers. The participating farmers indicated that co-inquiry encouraged horizontal learning based on systems thinking, through a joint explorative assessment of their farming purposes, context, and experience, and through joint choice of methodology, experimentation, and reflection.

Objective ii): By conducting action research in co-developing a Participatory Guarantee System, the process documentation and qualitative analysis of group activities revealed that SI evolved when narratives of change about social needs and pathways for change in relationships and roles were shared in different local stakeholder environments. Building new multi-stakeholder working relationships was facilitated by strategies of trust-building, co-development of agreed rules, horizontal decision-making structures, and innovative work methods, such as use of participatory group methods

to facilitate active co-learning and decision-making, and 'in-situ' demonstrations and dialogue on farms and farmer markets. Change in role understanding and performance was found crucial, as stakeholder groups needed to expand their activity system towards new tasks and responsibilities. Performance of such new roles was restricted when individual benefits were uncertain and delayed, highlighting the need to articulate and jointly elaborate on role expectations at the outset of SI initiatives.

Objective iii): Qualitative content analysis of semi-structured interviews with members of identified self-organized producer groups (SOPGs) that set up local producer shops and markets during the first months of the pandemic revealed that alternative practices were adopted both to satisfy basic needs and to use new opportunities, in response to changing conditions, such as mobility restrictions, income losses, and increased demand for local food. Objectives pursued and activities undertaken by the SOPGs revealed reactive short-term mitigation strategies and proactive pursuit of longer-term

transformative objectives. The analysis of relations between practices and agroecological principles showed that the principles became an important basis for responding to changing conditions and unfolding longer-term transitions. This highlights the relevance of agroecology for co-developing pathways and mitigating possible future crises.

Findings from the three sub-projects contributed to an understanding of how farmers and other local food actors become involved and collaborate in multi-stakeholder processes that are geared towards enhancing agroecological farming and food practice, and how such new pathways can be co-developed and analysed. Thus, the research devised new conceptual and methodological knowledge to facilitate co-development of transition pathways. The thesis presents detailed strategies, methods and exemplary activities that help build collaboration to support transition in practice at the level of both the farm and the local food system. Integration of the results obtained from the three complementary sub-projects highlighted that pathway co-development starts off when different stakeholder groups share their narratives of sustainability problems, co-develop pathway scenarios, or respond to changing conditions by taking the initiative to develop new pathways through learning-by-doing. The stakeholder groups realized the advantages of building collaboration to increase their room for manoeuvre and the necessity to align their very different individual goals in the definition of viable common goals for collaboration. Limitations to practising pathway co-development related to the need to understand new roles and to the individuals' commitment to expand the routine activity system when taking on new tasks. Major constraints related to perceived uncertainties – particularly by the farmers, food processors and consumers – regarding tangible short-term benefits when engaging in exploratory processes, while learning in collaboration was perceived by all participating groups as the lasting pathway towards change.

The reported transdisciplinary research process provides a pioneer experience in the Argentinean context of agroecological transition research, illustrating how the investigation of science-based research problems can be purposefully integrated with transdisciplinary co-development of solutions that are perceived as relevant by local food actors to work towards agroecology.

## Zusammenfassung

Intensive agrarindustrielle Landwirtschaft führt zu anthropogenen Umweltveränderungen und wirkt sich negativ auf die globale menschliche Entwicklung aus. Maßnahmen sind erforderlich, um Übergänge (*transitions*) zu nachhaltigen Landwirtschafts- und Ernährungssystemen zu befördern. Prinzipien für die Konzeption und Entwicklung von Übergangspfaden (*transition pathways*) wurden unter dem Begriff der Agrarökologie konsolidiert. Argentinien ist ein deutliches Beispiel für den Wandel von Landnutzungssystemen hin zu großflächigen Monokulturen und exportorientierten agroindustriellen Systemen. Gleichzeitig gewinnt die Agrarökologie in Argentinien auf verschiedenen Ebenen an Dynamik, beispielsweise in der landwirtschaftlichen Praxis, der Verbrauchernachfrage, den sozialen Bewegungen, der Politik, sowie in Forschung und Entwicklung. Dennoch sind methodische Ansätze für die Zusammenarbeit zwischen den relevanten Akteursgruppen zur gemeinsamen Entwicklung von Übergangspfaden in der Forschungspraxis noch wenig erprobt. Ansätze der partizipativen Aktionsforschung (PAF) und der sozialen Innovation (SI) bieten die Möglichkeit, beginnende Übergangsprozesse besser zu verstehen und in einem transdisziplinären Prozess gemeinsam sozial legitimierte Wege auf der Ebene landwirtschaftlicher Betriebe und lokaler Ernährungssysteme zu entwickeln und zu testen. Diese Ansätze befördern die Schaffung neuer Multi-Stakeholder Kollaborationen und Entwicklung sozialer Praktiken in Richtung Ko-Produktion, Erprobung, und Integration von Wissen und Strategien in die Praxis.

Das übergeordnete Ziel dieser Dissertation ist es, zur transdisziplinären Entwicklung von Übergangspfaden beizutragen. Unter Verwendung eines transdisziplinären Forschungsansatzes in einer Fallstudie in Nordpatagonien, Argentinien, dreht sich die Forschung um die Frage, welche innovativen sozialen Prozesse für die Ökologisierung landwirtschaftlicher Betriebe und lokaler Ernährungssysteme notwendig sind, und geht auf drei damit verbundene Forschungsprobleme ein. Erstens findet in Methoden zur Durchführung partizipativer Forschung mit Gruppen landwirtschaftlicher Erzeuger zur Unterstützung betrieblicher Umstellungsprozesse die aktive Beteiligung und Kontrolle der Erzeuger über den Forschungsprozess und Inhalte sowie die Einbeziehung ihres Erfahrungswissens als wichtige Quelle für die Mitgestaltung von Pfaden nicht ausreichend Berücksichtigung. Zweitens werden Einblicke in Entstehungsprozesse lokaler sozialer Innovationsinitiativen benötigt, um zu verstehen, wie sich der Aufbau von Beziehungen und Rollenveränderungen entwickeln und wie SI befördert werden kann. Drittens ist eine Untersuchung der gemeinsamen Entwicklung

von Übergangspfaden durch lokale Akteursgruppen während der COVID-19 Pandemie, die das globale Funktionieren von Agrar- und Ernährungssystemen stark beeinträchtigte, erforderlich, um zu verstehen, wie die sich ändernden Handlungsbedingungen den Handlungsspielraum der Akteure bei der Entwicklung lokaler Vermarktungsstrategien einschränkten und welche transformativen Potenziale diese Strategien in Bezug auf die Prinzipien der Agrarökologie entfalten. Um diese Wissenslücken zu adressieren, wurden in drei sich ergänzenden Teilprojekten die folgenden Forschungsziele verfolgt: i) Konzeptualisierung und Erprobung eines *co-inquiry* Ansatzes zur Verbesserung der PAF mit Landwirten; ii) Analyse sozialer Innovationsprozesse und dabei entstehender Beziehungen und veränderter Rollenverständnisse in Multi-Stakeholder Initiativen; und iii) Untersuchung der sich verändernden Bedingungen und der Art und Weise, wie diese die lokalen Akteure dazu veranlassen, ihre Ziele und Aktivitäten in Bezug auf die lokale Vermarktung (neu) zu formulieren und die Relevanz agrarökologischer Prinzipien als Mittel zur Reaktion auf die sich verändernden Bedingungen und zur Entfaltung längerfristiger Übergangsprozesse zu bewerten.

Forschungsziel i): Anhand der Konzeption und empirischen Erprobung eines *co-inquiry* Ansatzes mit einer Gruppe von Gemüseerzeugern hat die Prozessdokumentation und die Inhaltsanalyse des während der Gruppenaktivitäten erhobenen Materials gezeigt, dass der Ansatz die Rolle der Landwirte als Ko-Forscher erweitert. Die teilnehmenden Landwirte reflektierten, dass *co-inquiry* durch eine gemeinsame explorative Bewertung ihrer Ziele, ihres Kontexts und ihrer Erfahrungen sowie durch die gemeinsame Wahl der Methodik, Versuchsdurchführung und Reflexion horizontales Lernen und Systemdenken fördert.

Forschungsziel ii): Bei der Aktionsforschung im Rahmen der gemeinsamen Entwicklung eines partizipativen Garantiesystems haben die Prozessdokumentation und die qualitative Analyse der Gruppenaktivitäten gezeigt, dass SI entsteht, wenn Narrative über soziale Bedürfnisse und Wege zur Veränderung von Beziehungen und Rollen in verschiedenen lokalen Stakeholder-Umgebungen ausgetauscht werden. Der Aufbau neuer Multi-Stakeholder-Beziehungen wurde durch Strategien der Vertrauensbildung, der gemeinsamen Entwicklung von Regeln, horizontaler Entscheidungsstrukturen und innovativer Arbeitsmethoden erleichtert, beispielsweise durch den Einsatz partizipativer Gruppenarbeitsmethoden zur Förderung des aktiven gemeinsamen Lernens und der Entscheidungsfindung, sowie durch Vorführungen und Austausch auf Betrieben und Bauernmärkten. Eine Veränderung des Rollenverständnisses und der Rollenausübung wurde als entscheidend angesehen, da die Interessensgruppen ihr Tätigkeitssystem auf

neue Aufgaben und Verantwortlichkeiten ausweiten mussten. Die Ausübung dieser neuen Rollen wurde eingeschränkt, wenn der individuelle Nutzen ungewiss war und sich verzögerte, was die Notwendigkeit unterstreicht, die Rollenerwartungen zu Beginn von SI Initiativen gemeinsam zu erarbeiten.

Forschungsziel iii): Die qualitative Inhaltsanalyse von Interviews mit Mitgliedern selbstorganisierter Erzeugergemeinschaften (SOEGs), die in den ersten Monaten der Pandemie lokale Erzeugerläden und -märkte einrichteten, ergab, dass als Reaktion auf veränderte Bedingungen wie Mobilitätseinschränkungen, Einkommensverluste und die gestiegene Nachfrage nach lokalen Lebensmitteln alternative Praktiken sowohl zur Befriedigung grundlegender Bedürfnisse als auch zur Nutzung neuer Möglichkeiten eingeführt wurden. Die von den SOEGs verfolgten Ziele und durchgeführten Aktivitäten zeigten reaktive kurzfristige Mitigationsstrategien und proaktive längerfristige transformative Ziele. Die Analyse von Zusammenhängen zwischen den Praktiken und den Prinzipien der Agrarökologie zeigte, dass die Prinzipien zu einem wichtigen Mittel wurden, um auf die sich verändernden Bedingungen zu reagieren und längerfristige Übergangsprozesse zu vollziehen, was die Relevanz der Agrarökologie bei der gemeinsamen Entwicklung von Pfaden und ihr Potenzial zur Abschwächung möglicher künftiger Krisen unterstreicht.

Die Ergebnisse der drei Teilprojekte tragen zum Verständnis bei, wie Erzeuger und andere lokale Akteursgruppen in Multi-Stakeholder-Prozesse zur Entwicklung agrarökologischer Praxis eingebunden werden und zusammenarbeiten können und wie solche neuen Pfade gemeinsam entwickelt und analysiert werden können. Die Dissertation stellt neues konzeptionelles und methodisches Wissen bereit, um die gemeinsame Entwicklung von Übergangspfaden zu befördern und es werden detaillierte Strategien, Methoden und beispielhafte Aktivitäten vorgestellt, die den Aufbau von Kollaborationen in der Praxis unterstützen. Die Integration der Ergebnisse aus den drei komplementären Teilprojekten zeigt, dass die gemeinsame Pfadentwicklung beginnt, wenn verschiedene Interessensgruppen ihre Narrative von Nachhaltigkeitsproblemen austauschen, gemeinsam Pfadszenarien entwickeln oder auf veränderte Bedingungen reagieren. Sie erkennen die Vorteile des Aufbaus von Kollaborationen, um ihren Handlungsspielraum zu vergrößern, und müssen ihre sehr unterschiedlichen individuellen Ziele bei der Definition tragfähiger gemeinsamer Kooperationsziele aufeinander abstimmen. Grenzen für die praktische Umsetzung wurden identifiziert, die sich auf das erforderliche Verständnis der neuen Rollen und die Bereitschaft der Einzelnen beziehen, das System der Routinetätigkeiten zu erweitern, wenn neue Aufgaben

übernommen werden müssen. Die wichtigsten Grenzen beziehen sich auf die wahrgenommene Unsicherheit insbesondere von Landwirten, Verarbeitern und Verbrauchern in Bezug auf greifbaren kurzfristigen Nutzen, wenn sie sich an Sondierungsprozessen beteiligen, während das Lernen in der Zusammenarbeit als dauerhafter Weg zur Veränderung angesehen wurde.

Der hier beschriebene transdisziplinäre Forschungsprozess stellt eine Pioniererfahrung im argentinischen Kontext der agrarökologischen Transformationsforschung dar und zeigt, wie die Untersuchung wissenschaftlich fundierter Problemstellungen zielgerichtet mit der transdisziplinären Entwicklung von Lösungen verknüpft werden kann, die von den lokalen Akteursgruppen als relevant für die Umsetzung der Agrarökologie angesehen werden.

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## List of abbreviations

PAR	Participatory Action Research
PGS	Participatory Guarantee System
R&D	Research and Development
SI	Social Innovation
SOPGs	Self Organised Producer Groups
SP	Sub Project
TDR	Transdisciplinary Research

# CHAPTER 1

## Introduction

---

### 1.1 Research theme and problem statement

Prevalent intensive agro-industrial farming, characterized by uniformization and depletion of agricultural landscapes through monocultures, excessive use of fossil energy and application of synthetic fertilizers and pesticides, and increasing monopolisation of global agribusiness structures, is a main driver of anthropogenic environmental change and subject of controversial discourses about negative impacts on global human development (Ambikapathi et al., 2022; IAASTD, 2009; IPES-Food, 2016). In its continuous quest for increasing productivity and profitability for a relatively limited number of commodities at ever larger scale, intensive agro-industrial farming and food systems reportedly contribute to biodiversity loss, environmental pollution, soil degradation and climate change, and affects social welfare, through health hazards for rural communities, under- and malnutrition, or by threatening smallholder farming systems and rural livelihood development (Dobermann & Nelson, 2015; IAASTD, 2009; IPES-Food, 2016). The Global Panel on Agriculture and Food Systems recently highlighted these multidimensional negative effects, in light of the COVID-19 pandemic, which revealed fragilities and unsustainability of current globalized food systems, the panel calls for immediate action to leverage sustainability transitions of global farming and food systems (Global Panel on Agriculture and Food Systems, 2020). Principles and pathways to conceptualize and co-develop transitions towards sustainability in agriculture and food systems have been globally consolidated under the umbrella of agroecology by multiple relevant stakeholders, representing farmer movements, policy makers, and science (HLPE, 2019; Nyéléni, 2015; Wezel et al., 2020).

Argentina provides a distinct empirical example of rapid land-use change during the last decades from diversified small and medium size farming, to large scale monoculture and export-oriented agro-industrial systems, including vast conversion of natural forest and grassland biomes (Brown, 2006; Grau & Aide, 2008; Nogueira & Urcola, 2013; Satorre, 2005). Resulting negative environmental and socio-cultural change processes and impacts in the country have been widely addressed by scientific research (e.g., Albaladejo, 2020; Bidaseca & Gras, 2009; Pengue & Rodriguez, 2018; Sarandón & Flores, 2014; Tapella, 2004; van Zwanenberg et al., 2018). Concurrently, agroecology is gaining momentum on different levels in

Argentina, such as farming practice, consumer demand, social movements, research and development (Baldini & Mendizábal, 2019; Domínguez, 2019; Hernandez et al., 2014; Javier & Marasas, 2017; Parodi, 2018; Patrouilleau et al., 2017; Perez & Gracia, 2021). In particular, the introduction of agroecology at different scales is observable by increasing numbers of farms under agroecological management (although scattered), establishment of policy regulations for family farming and organic standards, and recent introduction of research, extension and academic education programs, and national policy entities and networks (Domínguez, 2019). However, given the tensions between industrial and export-oriented agri-food regimes and agroecological niche innovation processes, methodological approaches to build collaboration between relevant stakeholders for the co-development of transition pathways towards agroecological farming and food systems are still poorly addressed (Albaladejo, 2020; Easdale et al., 2017; Juárez & Zavala, 2017; van Zwanenberg et al., 2018).

In order to gain a better understanding of initiated transition processes, and to co-develop and test socially legitimated pathways for agroecological transitions through improved facilitated collaboration between the multiple food system actors at different scales, transdisciplinary approaches are proposed for sustainability research in general (Lang et al., 2012), and more particular for agroecology research (Méndez et al., 2015). These approaches respond to the ongoing paradigm change in agricultural research and development (R&D) that innovation cannot be introduced as “one size fits all measures” but must be local food system- and farm-specific (Röling & Wagemakers, 2000). To achieve the democratised co-development and implementation of such multi-dimensional innovations along agri-food chains, it is necessary to tailor transition pathways in a participatory learning process with local stakeholders, involving changes of social practice (Duru et al., 2015; Folke et al., 2005; Lacombe et al., 2018; Pimbert, 2017).

To establish and facilitate such transdisciplinary learning processes in the support of *agroecological farm level transitions*, participatory action research (PAR) approaches are under development, guided by the question of how farmers may benefit from collaborating with researchers in the process of improving or transforming their farm management (e.g., Méndez et al., 2015; Pimbert, 2017; Rosset & Altieri, 2017). However, a drawback to employed methods is that the level of control over the knowledge co-creation process of farmers and other involved societal stakeholders is often weak, as the collaboration is initiated and steered by the researchers and their objectives,

and societal stakeholders have still limited influence on the how and what of the knowledge co-creation process (Brandt et al., 2013; Lacombe et al., 2018; Vilsmaier et al., 2015; Zscheischler & Rogga, 2015). Particular issues that need further consideration in the development of PAR methods for agroecology research with farmers are the integration of farmers' experience (experiential knowing) as an important source for knowledge co-creation (Baars, 2011), and the so far often limited roles and low level of control farmers have in the collaboration, especially in defining scope and methods for joint research (Di Iacovo et al., 2016; Hazard et al., 2018; Ingram et al., 2020; Lacombe et al., 2018). Thus, advancing transdisciplinarity through PAR methods involves reconfigurations of roles and co-development of new social practices in multi-stakeholder collaboration (Lamine, 2018; Popa et al., 2015).

Reconfigurations in relationships and stakeholder roles to co-develop new social practices is also considered a key driver for *local agroecological food-system transitions* (Anderson et al., 2021; Backhaus et al., 2017; Jaeger-Erben et al., 2015; Rosset & Torres, 2016; Wezel et al., 2016). Here, the concept of social innovation is only recently gaining attention in agroecological transition research (Chiffolleau & Loconto, 2018). Social innovation facilitates solutions that satisfy social needs, lead to better relationships between actors, and improve capabilities of actors in sustainable use of resources (see Caulier-Grice et al., 2012; Moulaert, 2013). Established social innovation initiatives working at different food system levels, from local to global, and their potentials and constraints to support agroecological transitions, have been studied from retrospective outside perspectives (Coelho de Souza et al., 2021; Juárez et al., 2018; Mert-Cakal & Miele, 2020; Rossi, 2020). However, the studies fall short in providing understanding of *how* social reconfigurations and role changes of involved groups (e.g., farmers and consumers) occur, as retrospective innovation analysis provides understanding of innovation outcomes (Pettigrew, 1997). Insight views on social innovation in the making, based on action research approaches (Estensoro, 2015), are required to understand the *how* of multi-stakeholder relationship-building and involved changes of role understanding and enactment of participating stakeholder groups (Akrich et al., 2002; Chiffolleau & Loconto, 2018; Kluvankova et al., 2021). Such process-oriented insights are relevant to understand how local transition initiatives can be facilitated, and to better inform policy support for social innovation initiatives, so that they succeed in their agroecological pathway developments.

Another perspective to understand local food actors' collaborative strategies and activities in the co-develop of transition pathways is the study of changing conditions in farming and food regimes that frame the room for manoeuvre of local food actors to work towards agroecology in innovation niches (Darnhofer, 2015; Elzen et al., 2017; van der Ploeg et al., 2004). Reported effects of the measures taken by national governments to control the COVID-19 pandemic on farming and food systems provide a distinct global example for changing conditions that widely impacted agri-food chain functioning (Rivera-Ferre et al., 2021; Savary et al., 2020; Stephens et al., 2020; van der Ploeg, 2020; Workie et al., 2020). First survey-based studies conducted at the very beginning of lockdowns indicated that local food actors responded to the consequences and impacts by developing immediate decentralized collective strategies, and by implementing alternative practices under the umbrella of agroecology (Nemes et al., 2021; Tiftonell et al., 2021; Zollet et al., 2021). However, given the unprecedented character of the pandemic and consequences, the particular changing conditions under which such strategies have been implemented and what potentials local food actors' responses uncover within local food systems' sustainability transitions in time and in relation to the principles of agroecology (Wezel et al., 2020) require further assessment (Nemes et al., 2021).

## **1.2 Research purpose and objectives**

The overall purpose of this thesis is to contribute to building pathways for transdisciplinary co-development towards agroecological farming and local food system practice. By taking a social-ecological perspective on agricultural and food systems, the research revolves around the question of which innovative social arrangements are necessary to ecologise farming and local food systems. Based on a case study in Northern Patagonia, Argentina, the overall objective of the research is to co-develop, conduct, and evaluate local actor-driven approaches and processes for enhanced multi-stakeholder collaboration in the support of agroecological transition processes at farm and local food system level. The investigation was conducted based on three specific research objectives:

- i. conceptualize and pilot a co-inquiry approach for enhanced participatory action research with farmers;
- ii. analyse social innovation processes, relationship-building, and role changes in multi-stakeholder transition initiatives;

- iii. study how changing conditions trigger local food actors to (re-) frame their objectives and activities regarding local marketing, and to assess the relevance of agroecological principles as a basis for responding to the changing conditions and unfolding longer-term transitions.

## 1.3 Literature review

### 1.3.1 Social ecology in agriculture and food systems

Agricultural and food systems integrate dynamic and complex interactions between the environment and human society, and are therefore conceptualized as complex social ecological systems (Berkes & Folke, 1994; Stokols et al., 2013). Social-ecological sustainability research in agriculture and food systems takes this relational perspective to recognize and understand interdependencies and feedbacks. This understanding considers both the role of ecosystem services and the social practices that influence systems functions and change processes, approached through concepts of resilience, adaptive capacity and transition management (Berkes & Turner, 2006; Carpenter et al., 2012; Folke et al., 2005; Foxon et al., 2009; Hill, 2014; Keating et al., 2010). The co-development of change pathways, in times of uncertainty, exploration and fluctuation, requires participation of society in experimentation with alternative social-ecological practices and governance mechanisms (Carpenter et al., 2012; Stokols et al., 2013). Co-development can be facilitated through increased transdisciplinarity and social innovation (see Sections 1.3.5 and 1.3.6). Social-ecological change pathways towards sustainability in agriculture and food systems have been developing since humans first engaged in agricultural activities (ancient farming practices). They were intellectually and empirically advanced in the early 19th century (Howard, 1940; Steiner, 1924), and consolidated in the development of organic agricultural production systems and standards (Wachendorf et al., 2022). A broader avenue that shares principles of the organic farming system approach (health, ecology, fairness and care), without targeting global uniformization and narrowing-down of holistic claims through certification standards (Seufert et al., 2017), is the concept of *agroecology* (Niggli, 2015). The concept goes beyond certified organic production systems, exploring sustainability transition pathways from a social-ecological food system perspective (Francis et al., 2003; Gliessman, 2014; Hernandez et al., 2014). Rather than striving for the implementation of alternative agricultural

production systems that are designed based on the compliance with global organic standards, agroecology advocates for context-specific development of agricultural and food practices based on ecological processes to produce environmental services. Furthermore, agroecological development pathways emphasise specific socio-cultural and political conditions and change processes, based on food sovereignty (Pimbert, 2017).

### 1.3.2 The concept of agroecology

Agroecology, as introduced by the international farmer movement, was developed based on the food sovereignty framework (Nyéléni, 2007; Pimbert, 2017). The global farmer organization *La Via Campesina* defined food sovereignty as:

*... the right of peoples to define their own food and agriculture; to protect and regulate domestic agricultural production and trade in order to achieve sustainable development objectives; to determine the extent to which they want to be self-reliant; to restrict the dumping of products in their markets; and to provide local fisheries-based communities the priority in managing the use of and the rights to aquatic resources. Food Sovereignty does not negate trade, but rather it promotes the formulation of trade policies and practices that serve the rights of peoples to food and to safe, healthy and ecologically sustainable production (see Wittman et al., 2010).*

Based on this claim for autonomy and self-determination of producers and consumers, the *International Forum for Agroecology* formulated a declaration about their understanding of agroecology (Nyéléni, 2015), promoting the concept as a transformative means to navigate out of the global food system crisis:

*The industrial food system is a key driver of the multiple crises of climate, food, environmental, public health, and others. Free trade and corporate investment agreements, investor-state dispute settlement agreements, and false solutions such as carbon markets, and the growing financialization of land and food, etc., all further aggravate these crises. Agroecology within a food sovereignty framework offers us a collective path forward from these crises (Nyéléni, 2015).*

The declaration first formulated principles of agroecology from the farmer movement's perspective. The principles include site-specific, community-based, and autonomous development of agriculture and food practices in

territories based on knowledge co-creation, using a set of ecological farming practices, based on local cycling, fertility management, and reduction of external input use, encouraging local governance, gender equity, and youth advocacy for the right to food (Nyéléni, 2015).

From the scientific-educational stance, agroecology is proposed as a framework to '*guide research, education, and action in the multiple and interacting facets of an increasingly complex global agriculture and food system*' (Francis et al., 2003). Based on the conceptualization of Francis et al. (2003), Wezel et al. (2009) further differentiated agroecology into a:

- i. scientific discipline, i.e., ecology applied to farming; agroecosystem and sustainability research; ecology of food systems,
- ii. set of farming practices, i.e., those which contribute to implement an environmentally friendly, ecological agriculture, and
- iii. social movement, i.e., evolved as a global social response to the negative impacts of the Green Revolution and in the context of environmental protection initiatives.

The *United Nations Food and Agriculture Organization* (FAO) adopted the concept of agroecology for its work, developing ten principles (FAO, 2018). Based on these principles and the *Report of the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security* (HLPE, 2019), thirteen consolidated agroecological principles were defined, differentiating between scales of application, i.e., field, farm, agroecosystem, and food system (Table 1-1).

Differences in the conceptual use of the term agroecology arise from its historical and geographical evolution. While, for instance, in Germany the term has mostly been used as a scientific discipline, and agroecological farming is referred to as organic farming, in Latin America, agroecology is predominantly rooted in social movements and concrete alternative agricultural practices, promoted by the development of smallholder farming and food systems (Gliessman, 2014; Wezel et al., 2009). Sevilla Guzmán (2015) reflects the recent evolution of *agroecology* in Latin America and Argentina in the political domain as a critical social movement against the predominant extractive and expansive capitalist agro-industrial system, describing agroecology as the '*participatory construction of proposals for socio-cultural and political liberation*' (Sevilla Guzmán, 2015).

Table 1-1 Consolidated set agroecological principles, their scale of application and correspondence to FAO elements of agroecology. FI, field; FA, farm; agroecosystem; FS, food system<sup>1</sup>

Principle	Scale of application	Correspondence to FAO elements
<i>1. Recycling.</i> Preferentially use local renewable resources and close as far as possible resource cycles of nutrients and biomass.	FI, FA	Recycling
<i>2. Input reduction.</i> Reduce or eliminate dependency on purchased inputs and increase self-sufficiency.	FA, FS	Efficiency
<i>3. Soil health.</i> Secure and enhance soil health and functioning for improved plant growth, particularly by managing organic matter and enhancing soil biological activity.	FI	Reflected in diversity, synergies and resilience
<i>4. Animal health.</i> Ensure animal health and welfare.	FI, FA	Reflected in resilience
<i>5. Biodiversity.</i> Maintain and enhance diversity of species, functional diversity and genetic resources and thereby maintain overall agroecosystem biodiversity in time and space at field, farm and landscape scales.	FI, FA	Part of diversity
<i>6. Synergy.</i> Enhance positive ecological interaction, synergy, integration and complementarity amongst the elements of agroecosystems (animals, crops, trees, soil and water).	FI, FA	Synergies
<i>7. Economic diversification.</i> Diversify on-farm incomes by ensuring that small-scale farmers have greater financial independence and value addition opportunities while enabling them to respond to demand from consumers.	FA, FS	Parts of diversity as well as circular and solidarity economy
<i>8. Co-creation of knowledge.</i> Enhance co-creation and horizontal sharing of knowledge including local and scientific innovation, especially through farmer-to-farmer exchange.	FA, FS	Co-creation and sharing of knowledge
<i>9. Social values and diets.</i> Build food systems based on the culture, identity, tradition, social and gender equity of local communities that provide healthy, diversified, seasonally and culturally appropriate diets	FA, FS	Human and social values Culture and food traditions
<i>10. Fairness.</i> Support dignified and robust livelihoods for all actors engaged in food systems, especially small-scale food producers, based on fair trade, fair employment and fair treatment of intellectual property rights.	FA, FS	Part of human and social values
<i>11. Connectivity.</i> Ensure proximity and confidence between producers and consumers through promotion of fair and short distribution networks and by re-embedding food systems into local economies.	FA	Part of circular and solidarity economy
<i>12. Land and natural resource governance.</i> Strengthen institutional arrangements to improve, including the recognition and support of family farmers, smallholders and peasant food producers as sustainable managers of natural and genetic resources.	FA, FS	Responsible governance
<i>13. Participation.</i> Encourage social organisation and greater participation in decision-making by food producers and consumers to support decentralised governance and local adaptive management of agricultural and food systems.	FS	Part of human and social values

Text in italics show the titles of the respective principle

In this line of thought, agroecology is proposed as a vehicle for socio-cultural, economic and political transformation in food systems, as suggested in post-growth economics (e.g., Neder & Thomas, 2010; Paech, 2011). Here, proposed food system change considers global natural boundaries (Rockström et al., 2009), aims for global equity in the use of natural resources, and argues for the inevitable socio-cultural change of expansive capitalistic-consumer societies towards sufficiency (Paech, 2011).

<sup>1</sup> Reprinted from: Wezel, A., Herren, B. G., Kerr, R. B., Barrios, E., Gonçalves, A. L. R., & Sinclair, F. (2020). Agroecological principles and elements and their implications for transitioning to sustainable food systems. A review. *Agronomy for Sustainable Development*, 40(6), 40. With permission from Springer Nature BV.

### 1.3.3 Agroecological transitions

As outlined above, the concept of agroecology is proposed as a generic framework to guide the transition of agricultural and food systems towards sustainability. Within the broad field of transformation research, which includes the fields of sustainability research, transition research, social-ecological research, social innovation research, and resilience research (Wittmayer & Hölscher, 2017), the term *transition* is referred to as the non-linear process of *going across* from one state to another. Conceptually, it is used to analyse processes and patterns of change in order to identify hindering and supporting factors, and to further address the epistemological shift in research from *'analysing and understanding problems towards identifying pathways and solutions for desirable environmental and societal change'* (Hölscher et al., 2018). Sustainability transitions involve fundamental changes in human-environment interactions, i.e., social-ecological interactions, and reach out to changes at the social, institutional, economic and technical level (Grin et al., 2010).

Connecting this theoretical field with sustainability change processes in agricultural and food systems, Hazard et al. (2022) provided a general working definition of *agroecological transitions* that is *'a change of the agricultural model in order to implement the principles of agroecology and therefore respond to the sector's crises'*. The authors frame that transition is based on: i) *the creation and mobilisation of knowledge from agroecology*; ii) *the involvement of actors in the construction of this knowledge to tailor it to different territories*; and iii) *the territorialisation of agriculture, involving in particular a reconnection of agricultural production with food localism* (Hazard et al., 2022).

A number of theoretic frameworks have been adapted and applied to study agroecological transitions at different scales and from different disciplinary angles (see El Bilali, 2020 for a systematic review). Within innovation system thinking (Belz, 2004; Chaminade et al., 2018; Edquist, 2001; Hall, 2007), the *multi-level perspective of socio-technical change (MLP)* provides a theoretical transition framework (Geels, 2004). Currently, this perspective is most prominently used in farming and food transition research (Belz, 2004; El Bilali, 2019; Elzen et al., 2012; Ingram, 2015; Karanikolas et al., 2015; Sutherland et al., 2014; Tittonell, 2019). The MLP approaches socio-technical innovation by introducing three interconnected levels (see Figure 1-1). At the centre (meso-level) is the *regime*, which refers to the predominant and established system of practice (e.g., dominant farming or food system practice), composed of the

actors that operate the system in networks (e.g., supply chains), formal and informal rules that organize and sustain the regime, and material elements and technologies that are used. The superior macro level is the *landscape*, which refers to the global innovation context, i.e., exogenous factors, such as: global trends and events, political ideologies, macroeconomics, social values, pandemics, or more particular: common agricultural policy reforms, demographic decline, health crises, food safety concerns, increased environmental awareness and activism, consumption patterns, climate change, and agriculture as a producer of energy (see Karanikolas et al., 2015).

The third level, subordinated to the regime, is the *innovation niche*. This level describes spaces where innovative practices are developed and tested through learning and experimentation at small scales, protected from the rules that govern the regime (El Bilali, 2019; Tuttonell, 2019).

Key issues related to the analysis of each level and interactions between the three levels are feedback processes, emergence, lock-in effects and path-dependency (Feola, 2015). Feedbacks and linkages between levels are referred to as changes caused by tensions within one level that lead to changes in the other level, e.g., when rules that govern the regime are changed through new environmental policies for the agricultural sector, agricultural practices within the regime may need replacement, and environmentally friendly practices developed in an innovation niche are adopted by regime actors. Such feedbacks are also referred to as windows of opportunity for niche innovations to enter and thereby to gradually change the regime rules and functioning through new forms of governance (Marsden, 2013). In turn, actors involved in niche innovation are partly influenced in their innovation behaviour by the dynamics (emerging pressures, problems) at the regime and landscape levels ( Geels & Schot, 2010).

Alternative pathways co-developed and tested in niches are considered innovations that contribute to wider system transitions in relation to regime and landscape when they are successful in responding to fragilities and/or demands at these other system levels. Based on this understandings, *pathways concern a 'demarcated trajectory that leads from situation A to situation B through a particular territory'* (Wigboldus et al., 2021). Thus, the territorial co-development of pathways in innovation niches is the incubator for agroecological alternatives to contribute to wider system transitions, when new practices, technologies, knowledge, institutions, social organization, guiding principles and values are aligned by the multiple relevant actors from regional to global levels (Sutherland, 2014, pp. 1–12).

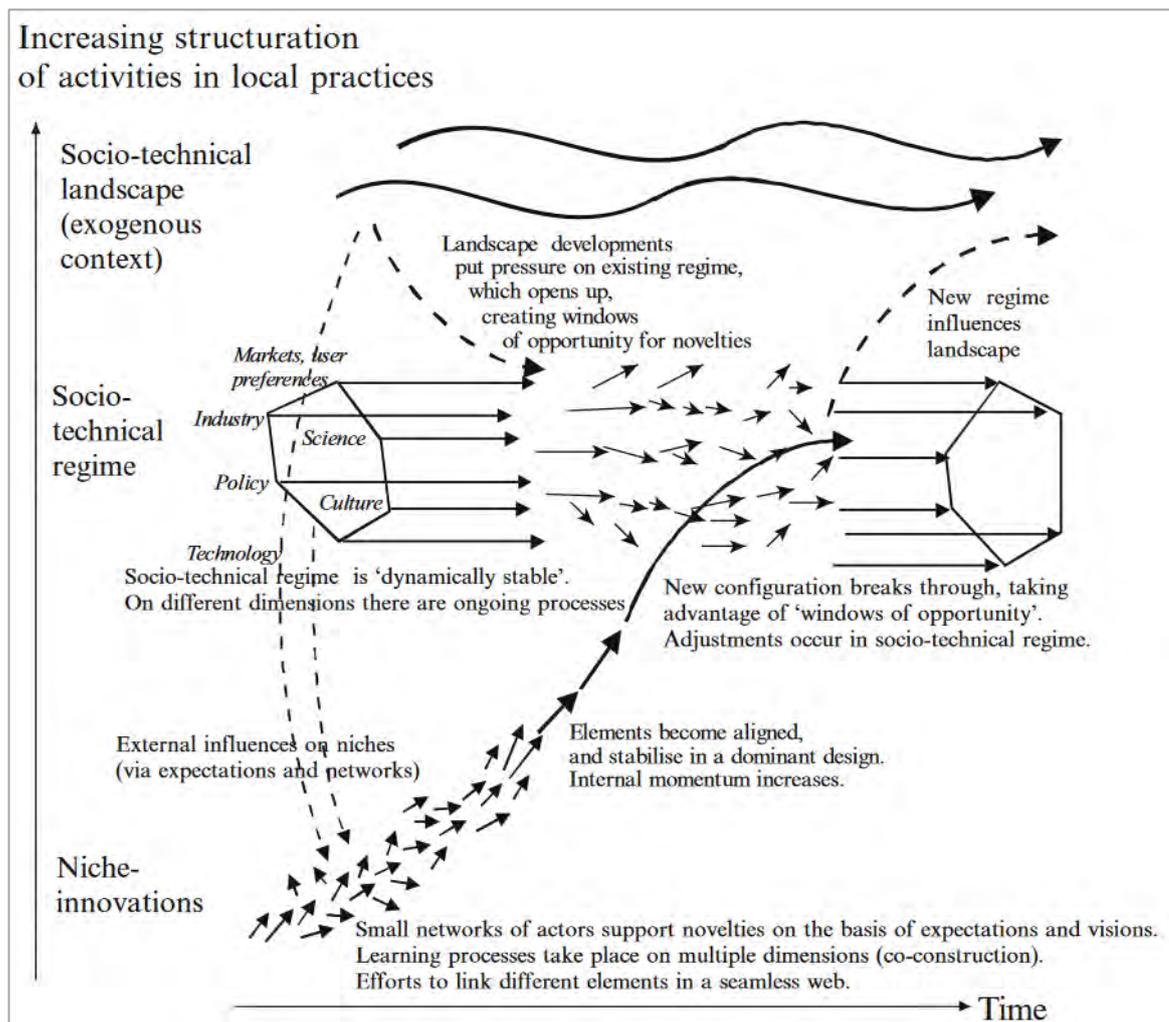


Figure 1-1 Transitions from a dynamic multi-level-perspective on socio-technical innovation <sup>2</sup>

Ingram (2015) empirically showed that the MLP applied to changes in agricultural systems, which are considered complex adaptive systems (see Section 1.3.1), requires a less hierarchical and more differentiated multi-levelled analytical lens, focussing on adaptive capacity of the regime, and actor and network learning through linkages within niches and between regime and niches (see also Elzen et al., 2012; Huttunen & Oosterveer, 2017; van der Ploeg et al., 2004). Such actor-, social practice- and learning-oriented approaches help understand change caused by perturbations, and resilience building, here referred to as the 'regime's *capability to absorb disturbance and reorganise while undergoing change*' (Berkes & Turner, 2006). Darnhofer (2015) further emphasizes the crucial role of social change in transitions and

<sup>2</sup> Reprinted from: Geels, F. W., & Schot, J. (2007). Typology of sociotechnical transition pathways. *Research Policy*, 36(3), 399–417. With permission from Elsevier.

the importance to enhance learning capacities of the multitude of actors involved (see also Section 1.3.5). Social change and agroecological transitions are long-term processes that cannot be planned and managed in a linear model of deliberate interventions, as they involve *'a multitude of societal agents and are thus fraught with scientific uncertainty, social ambiguity and unpredictability'* (Darnhofer, 2015, p. 25). Recent research on agroecological transition scenarios in Europe found that critical factors for agroecological transitions to have sustainability implications are: i) *mature social capital and improved farmer knowledge of the benefits of agroecological practices*, ii) *strengthened collaborative actions and collective institutions to increase negotiating power within the value-chain*, and iii) *changes in consumer behaviour and diets* (Schwarz et al., 2022). These factors further illustrate the critical role of social rearrangements needed in the development of agroecological transition pathways.

### **1.3.3.1 Farm transitions**

The analysis of transition processes at the farm level requires micro-level perspectives to understand and enhance change processes from conventional to agroecological farm management. The classical view of farm innovation was based on the assumption that farmers pursue a unique, predefined production goal (output maximization), responding to uniformised technological innovations to reduce variations in the production system and thereby to increase predictability and productivity (Milestad et al., 2012; Röling & Wagemakers, 2000). This approach to innovation is still prevalent in today's farming regime (agro-industrial farming systems). In contrast, systems-oriented innovation approaches start from the premise that farming systems are subject to socio-economic, political and environmental dynamics, requiring adaptive capacity and resilience as strategies to constantly respond to changing conditions (Milestad et al., 2012). Furthermore, when farming systems are modelled as purposeful human activity systems, individual farmers become the subjects of analysis to understand innovation, emphasizing how farmers manage their farming system within their restricted room for manoeuvre, and based on their individual goals, motives and values (Checkland, 1981; Kaufmann & Hülsebusch, 2015; Kernecker et al., 2021).

Whereas the conversion process from conventional to certified organic farming has a clear target system, with defined criteria and a positive list of practices and inputs that can be used, agroecology is less explicit in the definition of the target system, or at least, no clear excluding standards are available (Niggli, 2015). From a chronological timeline perspective,

agroecological farm transitions follow a change sequence of increasing *input-use efficiency* (e.g., reduction of synthetic input use), *substitutions* (e.g., replacement of mineral fertilizer with organic manure produced on farm), and *redesign* (redesign of the whole production system, based on agroecological principles).<sup>3</sup> This levelled structure is proposed to monitor and evaluate transition at farm level, and to distinguish changes related to single farming practices and to structural changes in the whole (farm) agroecosystem (Gliessman, 2014).

However, this perspective is questioned by the fact that both transitions to agroecological farming and conversion to certified organic farming involve highly complex and risk laden radical change processes, facilitated or hindered by individual farm and farmer specific factors, as well as structural, social, and wider economic aspects, for instance related to liquidity, land tenure situation, family generational aspects, ideological (re)-orientation, social embeddedness, and available marketing structures (Möller, 2022, p. 258 ff). Thus, farm transition trajectories can hardly be conceptualized in a chronological and linear model of change, but they need context-specific assessment, based on individual motivations and drivers at the interface between personal, farm-specific and external factors, and considering agronomic, human, economic and political potentials and challenges (Huttunen & Oosterveer, 2017; Padel, 2008; Padel et al., 2019). More precisely, individual farm transitions are highly interdependent and interlinked with the specific local landscape, including production systems and resources produced on neighbouring farms (e.g., for exchange of locally produced farm inputs or machinery), input markets for alternative farm inputs (e.g., organic seeds) and marketing channels (e.g., marketing structures, consumer preferences and demand), as well as political legislation frameworks. Particularly, subsidies are considered important mechanisms that influence decision-making of farmers to start integrating agroecological practices into their farm management, as well as taxes in case of large scale export-oriented farms (Tittonell et al., 2020).

Sutherland et al. (2012) conceptualized a “triggering change” cycle based on empirical findings from British farmers’ decision making when converting to organic farming practices. The conceptual argument is that farmers usually manage their farms based on minor adaptive changes to maintain and

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<sup>3</sup> These levels of conversion are conceptually expanded to food-system transitions (see Section 1.3.3.2)

improve the system, and that initiating a sustainability transition process (major change of the production system) at the individual farm level is most often related to a major trigger event. Triggers can be, e.g., generational change at the farm, social learning, and inspiration from exchange with other farmers and initiatives, policy change, or environmental hazard. Such events have the potential to break the path dependency of a specific farming style, production process, or single practice. In continuation, an interactive process of active status quo assessment, implementation of alternatives and evaluation of outcomes leads to further active assessment or consolidation of new practices (Sutherland et al., 2012). Formal facilitation and support of such (individual) farm level trajectories towards agroecological farming involves status quo assessment, scenario planning based on sustainability factors, and experimentation, testing, monitoring and evaluation of new practices (c.f., Möller, 2022; Gliessman, 2014).

### **1.3.3.2 Local food-system transitions**

Food systems are conceptualized as open and complex systems, defined as *'the sum of the various elements, activities and actors who, through their interrelationships, make possible the production, transformation production, distribution and consumption of food'* (Santivañez et al., 2017). Based on the work of Ericksen (2008), the conceptualization of food systems involves: i) *interactions between and within bio-geographical and human environments, which determine a set of activities*, ii) *the activities themselves*,; and iii) *outcomes of the activities (contributions to food security, environmental security, and social welfare)*.

The main characterising attribute of local food systems is *geographical proximity* (e.g., between production, processing, consumption and recycling), followed by relational proximity (e.g., between local actors involved in the food system activities), and proximity in values that actors attribute to food (e.g., place of origin, traceability, freshness, quality) (Eriksen, 2013). The concept of proximity is also proposed by Gliessman (2014) to expand his four levels of conversion from the farm level (see Section 1.3.3.1) to local food systems (level 4), and finally to the global transformation of food systems (level 5). At level 4, proximity refers to creating *a better and more direct connection between producers and consumers* (Gliessman, 2014).

This general proximity-based definition is often used to argue for the high contribution of local food systems to sustainability, despite lacking empirical evidence for this argument (Enthoven & Van den Broeck, 2021). In

agroecology transition research, the concept of proximity is therefore complemented with the other principles of agroecology that apply to the local food system level (see Table 1-1, page 8), to refer to *agroecology-based local agri-food systems* (González De Molina & Lopez-Garcia, 2021) or *agroecology territories* (Wezel et al., 2016). Both concepts emphasise the governance and institutional perspective at the local level, i.e., the important role of local food system actors (producers, consumers, processors, local policy makers, etc.) in steering transition initiatives to develop agroecological niche innovations (e.g., alternative food networks) and to gradually enter them into the farming and food regime (see Figure 1-1) (Anderson et al., 2021; Wezel et al., 2016; Lamine et al., 2012).

### 1.3.4 Facilitating agroecological transitions

*Facilitation* in general terms means the ‘*process or fact of making something possible or easier*’.<sup>4</sup> Transitions are radical change processes (see Section 1.3.3) involving innovation (singular = process) and innovations (plural = outcomes) (Conroy, 2008). Thus, *facilitation* has a central meaning in agroecological transitions, as it refers to *how* innovation can be operated, i.e., through the development and implementation of new social, organisational, institutional, economic, and technological solutions (Edquist, 2001; Lundvall, 1992). Facilitation of (agroecological) innovation occurs in *innovation systems*, which are conceptualized as interactive multi-actor processes that involve the ‘*interaction of individuals and organizations possessing different types of knowledge within a particular social, political, economic, and institutional context*’ (Hall, 2007). The interactive learning process between people is the main characteristic of innovation systems (Lundvall, 1992). Consequently, new multi-stakeholder collaboration for (social) learning and coordinated action at the local food system level is a key facilitating driver for agroecological innovation to develop (c.f., Duru et al., 2015; Lacombe et al., 2018; Lamine et al., 2012; van der Ploeg et al., 2004; Wezel et al., 2016).

Actor-orientation is grounded in the conceptualisation of social-ecological farming and food systems as human activity systems, where human actors shape and maintain the systems, based on their decisions and their underlying frame of relevance (Kaufmann & Hülsebusch, 2015). This systems perspective is needed, when R&D aims at triggering change towards agroecology, where

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<sup>4</sup> <https://www.oxfordlearnersdictionaries.com/definition/english/facilitation>.  
Accessed: 19.02.2023

interdependencies and interactions between ecological, social, and economic factors are inherent.

Approaches towards multi-stakeholder collaboration in R&D that use human activity and innovation system perspectives, focus on forming demand-driven partnerships between actors, linking farmers, advisors, researchers, businesses, and other actors in multi-stakeholder groups (Biggs, 2007; Lescourret et al., 2015). Multi-stakeholder processes have successfully led to coordinating activities targeting transition support in agroecology, biodiversity management, landscape planning or agroecosystem restoration (see examples in Sutherland et al., 2014; Méndez et al., 2015). Knowledge integration and co-creation between stakeholders generates new insights and ideas, and simultaneously considers their respective constraints. This collaboration can yield focused knowledge, which is more readily taken up due to the co-ownership generated. Farmers, processors, consumers and other food actors involved in the knowledge creation process and in testing of innovations are ultimately in a position to change their actions based on new understanding, gained through experience (Kaufmann et al., 2013; Kolb, 1984; Mezirow, 2000).

*Social innovation* (SI) is the conceptual approach to describe, analyse, and engage in the process of building new multi-stakeholder collaboration for the facilitation of transitions through new and/or reconfigured social relations, organisations, and institutions. Academia proposes *transdisciplinary research* (TDR) to build and work in new multi-stakeholder collaboration in the support of agroecological transitions. Both approaches are introduced in the following two sections.

### **1.3.5 Social innovation**

Agroecological transitions require social change processes and (social) learning, and therefore demand innovation in social relations to build new multi-stakeholder collaboration. The concept of *social innovation* refers to such processes that '*involve a change in social relations, involving new ways of doing, organising, framing and/or knowing*' (Haxeltine et al., 2017). New forms of multi-stakeholder organisation and interactions are developed in social innovation processes to establish new social practices in response to social needs. The new social practices produce solutions (products, services, models, markets, processes, etc.) that: i) satisfy social needs (content/product dimension), ii) lead to better relationships between actors (process dimension), and iii) improve capabilities of actors in sustainable use of

resources (empowerment dimension) (Caulier-Grice et al., 2012; Moulaert, 2013). Within a specific innovation context, the social innovation process involves social relationship-building (e.g., between producers and consumers) around material objects (e.g., farms and food), considering norms, values and beliefs of participating individuals and groups (e.g., regarding sustainability of food production and consumption), and their use of symbols and ideas (e.g., establishing a group-based certification system for agroecological production using product labelling). These elements are used to co-identify social needs and to co-create innovative solutions that better meet social expectations (Figure 1-2).

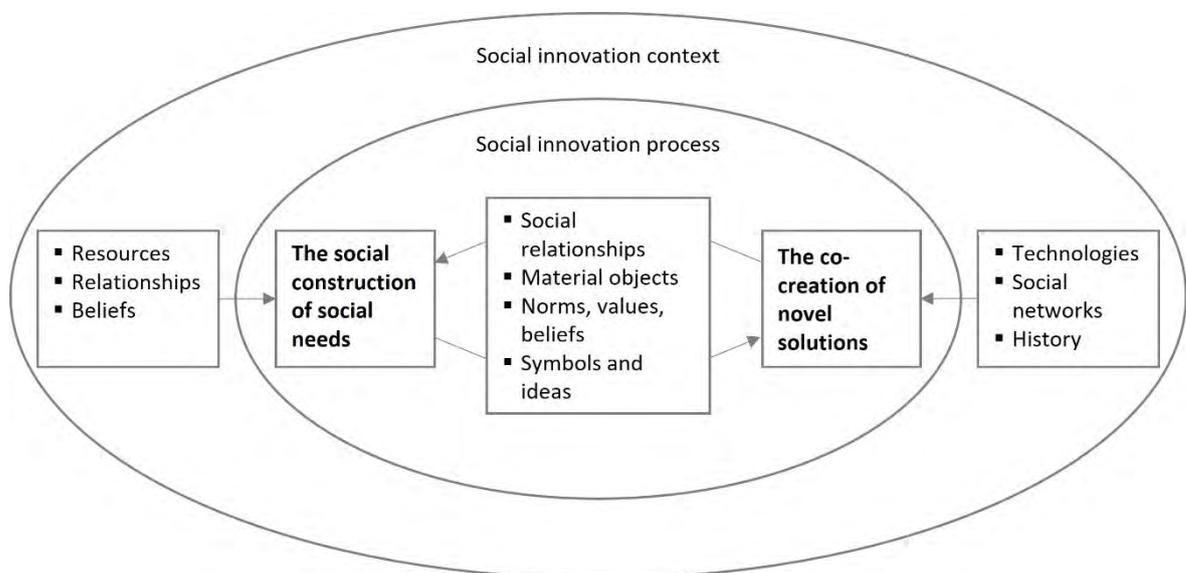


Figure 1-2 Social innovation framework (adapted from Dodgson et al. (2013))

Based on Richez-Battesti (2012), Chiffolleau & Loconto (2018) identified three fields where social innovation in agriculture and food systems evolves:

- i. *Public policy development* that better respond to social needs through public-private partnerships, citizen involvement in community actions, and participatory budgeting (e.g., food councils, local innovation support funds);
- ii. *Social enterprises and social entrepreneurs*, developing economic activities including social objectives (e.g., through fair trade labelling, local producer support mechanisms);
- iii. *Local citizen-driven bottom-up initiatives* established to cover social needs that are not addressed by public policies (e.g., community supported agriculture, food coops, community gardens, eco-villages).

In these fields, innovative spaces (niches) are established, where initiatives co-develop and pilot new social practices and products. The critical characterising element of tested solutions to become social innovations with transformative potential is the scaling of new social practices and products, thus their ability to be adopted in the wider societal context, and thereby to contribute to social change processes. The potential of social innovation to contribute to (agroecological) transitions, develops through empowerment of social innovation actors and new change narratives. However, disempowerment and weakening of transformative potentials can also be an important issue. When social innovation initiatives provide common goods and voluntary commitment in weak democratic welfare state conditions, their efforts are misused as arguments to justify further weakening of welfare state functions, such as budget cuts and outsourcing of public services (Avelino et al., 2019; Pel et al., 2020; Wittmayer et al., 2015).

### 1.3.6 Transdisciplinary research

Current social-ecological problems related to agriculture and food, such as globalisation, climate change, biodiversity loss, demographic change, food security, resource depletion, and environmental pollution are characterised by complex cause-effect relationships at different temporal, geographical and social scales. Such 'wicked problems' demonstrate that *'social action and ecological effects are so closely linked that the previously seemingly so secure boundary lines between society and nature are becoming increasingly blurred'* (Jahn, 2008). Consequently, the scientific challenge in sustainability research to tackle real world problems and to develop solutions is not only to overcome disciplinary boundaries, but also to develop systems approaches that consider complex human-environment interactions. Here, TDR can yield improved understanding of complex interactions between social and ecological systems and related problems, as it integrates knowledge of different stakeholders each having their own focal point, interests, and experience (Lang et al., 2012). TDR emphasises the involvement of relevant societal actors in dealing with these problems and co-development of solutions, based on informed societal problem framing, decision-making, and co-production of workable solutions (Jahn, 2008; Scholz & Steiner, 2015). Only then can *'the capacity of society to act [...] be sustainably increased and the available knowledge base deepened and broadened'* (Jahn, 2008).

TDR addresses these needs, by integrating diverse knowledge systems (academic, practitioner, and other societal actors) in the research process. Key

objectives are to gain a better understanding of real world problems, to increase innovation capacity of the multiple relevant actors within and between the different knowledge systems, and to co-produce and integrate applicable solutions into academic and societal practice (Hirsch Hadorn et al., 2006; Jahn et al., 2012; Lang et al., 2012; Stokols, 2006). These objectives are operationalised in a general ideal-typical TDR process (Figure 1-3).

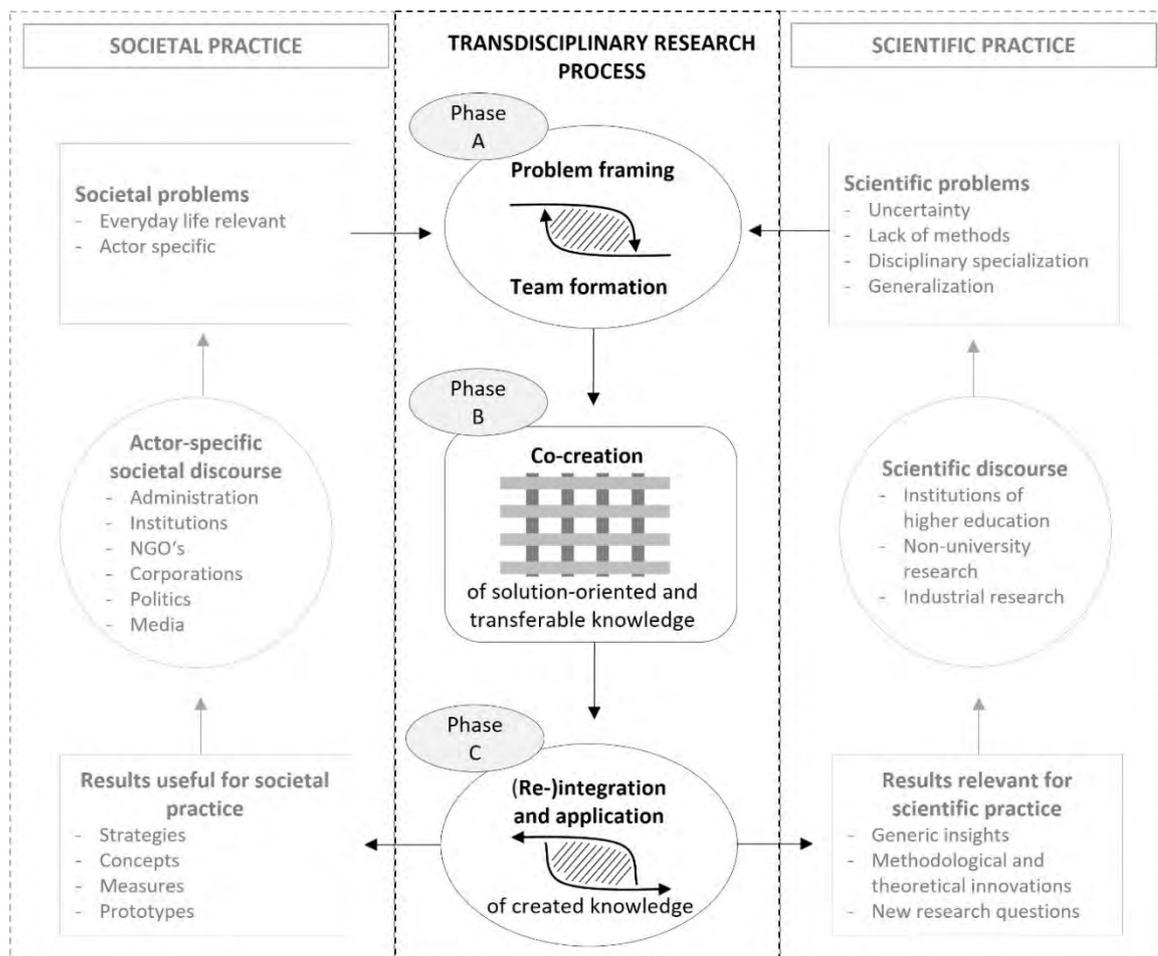


Figure 1-3 Conceptual model of an ideal-typical transdisciplinary research process (adapted from Lang et al., 2012; Bergmann et al. 2005; Jahn 2008; Keil 2009; Bunders et al. 2010)

Actor-orientation and participatory approaches to conduct the collaborative research and learning process are integral components of TDR (Stokols, 2006). The epistemological grounding of Participatory Action Research (PAR) matches the foundations of TDR, as it aims to involve peoples' perspectives on a specific issue at stake and to empower them to actively change a situation through mutual learning (Fals-Borda & Rahman, 1991; Freire, 1982; Reason & Bradbury, 2005).

In the development of methods for agroecological research, the adoption of transdisciplinary and (participatory) action research is gaining attention (Aeberhard & Rist, 2009; Caporali, 2010; Fernández González et al., 2021; Guzmán & Rist, 2018; V. Méndez et al., 2017; Méndez et al., 2015; Delgado & Delgado, 2016). Several examples of TDR have led to: i) co-development of improved agricultural practices, ii) establishment of participatory and reflexive on-farm monitoring systems, which allow learning about the agroecosystem, and iii) development of supportive tools for farmers to improve their farming systems through farmer-led and on-farm experimentation (e.g., Dalley et al., 2014; Penny & Moeskops, 2012). As these examples illustrate, in order to account for the context-specificity of agroecology, TDR projects in agroecology transitions are best placed in local contexts (Lamine, 2018), for local societal actors to gain awareness of their potential roles in agroecological transitions through direct involvement (Pinto-Correia et al., 2015).

However, the interdisciplinary integration within TDR, the type and level of involvement of societal actors in the different research phases (see Figure 1-3), and methodological approaches to conduct the research process are still weakly developed in the field of agroecology research (Fernández González et al., 2021; Freyer et al., 2019). A recent meta-analysis by Fernández González and colleagues (2021) showed that: i) involvement of non-academic actors in agroecology research, particularly in field studies and experiments, is still low; ii) in more than 60% of the assessed research projects, non-academic stakeholders were only consulted and did not take any active role in dialogical or experimental activities; and iii) empirical studies that claim for transdisciplinarity as their methodological background, actually lack theoretical grounding. In addition, another meta-analysis of case studies in agroecology showed that only few studies employed (participatory) action research methods at all (23 out of 347), the remaining used 'extractive research methods' (Sachet et al., 2021).

Within higher education, there are initiatives and approaches under development to incorporate transdisciplinary thinking and TDR approaches into academic curricula of agroecology scholars (e.g., David & Bell, 2018; Francis et al., 2015; Francis et al., 2011). Moreover, there is a pool of different methodological approaches that can be used to conduct TDR with societal actors, originating from the fields of participatory extension and farming system research (see, for instance, Chambers, 1994; Elzen et al., 2012; Gibbon, 2012; Hoffmann et al., 2007; Holt-Giménez, 2006; Scoones, 2009; Uphoff,

2002), as well as from other transdisciplinary sustainability research fields (e.g., Restrepo et al., 2014, 2018; Roux et al., 2017; Vilsmaier et al., 2015).

As detailed in Section 1.2, the overall objective of this dissertation is to co-develop, conduct, and evaluate local actor-driven approaches and processes for enhanced multi-stakeholder collaboration in the support of agroecological transition processes at farm and local food system level. A transdisciplinary case study approach was used to address the specific research problems presented in Section 1.1.

## **1.4 Research approach**

### **1.4.1 Case study research**

Given the exploratory and transdisciplinary research approach of this dissertation, a case study design was selected to operationalise the specific research objectives (see Section 1.2). In transdisciplinary sustainability research, case studies are suggested to conduct research that targets both co-production of knowledge and mutual learning between scientists and societal actors (Scholz et al., 2006). In-depth insights into contemporary phenomena can be captured by case study research, looking into questions of *how* and *why* of (social) circumstances (Yin, 2018). In particular, case studies are proposed to research into ‘wicked problems’ related to social-ecological transition processes, i.e., where the starting situation is known, but the target outcome and the process to get there (transition pathways) are unknown (Scholz et al., 1995).

To conduct the transdisciplinary research process (see Figure 1-3, page 19), one single case study region was selected to establish collaborative research with local food system actors within their respective local activity systems (farming, processing, marketing, consumption, extension, research, education, etc.). Selection parameters for the single case were based on the niche concept proposed in agroecology transition research (c.f., Section 1.3.3), i.e., i) the presence of ecological farmers with longstanding farming experience; ii) recently established farms and processing units with interest and ambitions to transit towards agroecology; iii) conventional farms; iv) local consumers with interest in sustainable consumption; iv) organisations created to support local agricultural development and agroecology; and v) clear geographic boundary conditions. Within the selected single case, during the first research stage, three sub-units (sub projects) were co-developed with

local food system actors, responding to embedded case study design (Yin, 2018).

### 1.4.2 Case study location

Argentina is the number ten of the world's agricultural exporters, produces on 108 million hectares agricultural land 93,5 million tons of grains<sup>5</sup>, and counts 53 million cattle<sup>6</sup>. During the last decades, land use changes and intensification of agricultural production within the main agricultural production region *Pampa Humeda* led to an expansion of the 'agricultural boarder' towards the surrounding rangeland-dominated regions, putting pressure on natural biomes and socio-economic and cultural development (Piquer-Rodríguez et al., 2018).

The case study location is situated in the south-western region of Northern Patagonia, denominated *Comarca Andina del Paralelo 42* (see map in Figure 4-1, page 122). The natural geographic expansion where collaborative research activities were conducted, included the localities El Bolsón in the north, Lago Puelo and El Hoyo in the centre and Epuyen in the south. Historically, the region is characterized by small to medium agricultural production and livestock systems (partly transhumant systems) with varying intensities, and in socio-cultural terms by a high heterogeneity of inhabitants dedicated to agricultural activities (Bondel, 2009). Detailed descriptions of the case study location with focus on the specific subjects studied in the selected sub-units (sub-projects) are provided in Chapter 2, Chapter 3 and Chapter 4.

Since the early 19<sup>th</sup> century, when migrants from Chile settled in the region and since the early 20<sup>th</sup> century, when the railway was constructed to connect the region with the urban capital of Buenos Aires, population growth developed rapidly in the region, pushed by increased in-migration and tourism. The bio-physical conditions which only provide small areas of arable land suitable for agricultural production in the pre-cordilleran valleys, a weak infrastructure connecting trade with other regions and the concurrent need for small-scale and subsistence-based agriculture have historically determined

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<sup>5</sup> FAOSTAT production data for 2022.

Retrieved from: <https://www.fao.org/giews/countrybrief/country.jsp?code=ARG&lang>  
(access date: 20.03.2023)

<sup>6</sup> Argentinean government statistical data.

Retrieved from: [https://occat.cancilleria.gob.ar/userfiles/investing\\_in\\_argentina-\\_beef\\_livestock\\_-\\_may\\_2020.pdf](https://occat.cancilleria.gob.ar/userfiles/investing_in_argentina-_beef_livestock_-_may_2020.pdf) (access date: 20.03.2023)

the high necessity of (mostly migrated) farmers to rely on adaptive trial and error experimentation to develop agricultural activities (e.g., grain production). In the early settlement stage, agricultural production was developed with low-external inputs, and during the process of increasing trade, external inputs were more available and used. However, the naturally difficult production conditions for cropping (climate) led to low competitive performance of local production compared to cheaper imported agricultural products from other regions (Eriksen, 1970).

Today, however, diversified agricultural production is sustained in the region. Apart from agriculture, important economic factors include tourism, urbanisation and population growth, putting pressure on agricultural development, and leading to conflicting discourses about environmental impacts and land tenure issues (Bondel, 2009; Cardozo, 2014; Cobelo, 2017).

### **1.4.3 The transdisciplinary research process**

The overall research process was grounded in the theoretical concept proposed for conducting TDR in the sustainability sciences (see Section 1.3.6). In a first step, a literature-based desk-study was conducted to elaborate the theoretical and empirical background, to define the general scope and purpose of the research, and to finally select the case study region for the empirical implementation of the TDR process. Between September 2018 and June 2022, field research was conducted, including intensive collaborative research activities with local stakeholders.

#### **1.4.3.1 Stakeholder identification and situation analysis**

In a second step, a stakeholder identification was conducted, using strategies and methods proposed for stakeholder analysis in TDR projects in food and farming systems (Lelea et al., 2014), and for participatory situation analysis (Thomas & Wehinger, 2009). Activities conducted and methods used are presented in Table 1-2 (see also Appendix 1 and Appendix 3).

Corresponding to *problem framing and team formation* (see phase A in TDR processes in Figure 1-3, page 19), the objective was to understand the empirical situation in the case study region regarding the research scope, and to identify specific problems, demands and interest as perceived by the relevant societal stakeholders in the study region (farmers, processors, consumers, representatives of state and non-governmental organisations, such as farmer organisations, education, research and extension organisms) through knowledge integration, i.e., the integration of theoretical scientific

knowledge gained from literature-based desk research, and experience-based site-specific knowledge from the local societal actors.

Table 1-2 Activities and methods used for situation analysis and stakeholder identification

Interviews with key stakeholders (open informal and semi-structured)	Farmers (n=22); Extension officers (n=3); Researchers (n=7); Policy makers (n=3)
Farm visits including transect walks	(n=15)
Workshops (tools: focus group discussions; stakeholder mapping; problem analysis and solution scenarios)	Local institutional representatives (n=1); Farmers (n=1)
Participation in local multi-stakeholder agroecology platform meetings (n= 4)	

Furthermore, the process and related exchanges with local actors served the purpose of identifying stakeholders interested in collaborating in the TDR process, and to build relationships to jointly work on co-developed subjects of interest.<sup>7</sup> The stakeholder identification and situation analysis resulted in the formation of two collaborations with interested local stakeholders, denominated as sub-project I (SP I) and sub-project (SP II) for the embedded case study design (Table 1-3).

A third sub-project (SP III) was initiated in March 2020, in response to the sudden crisis situation caused by the COVID-19 pandemic. The exploratory and actor-oriented TDR approach selected for this dissertation requires (and permits) the openness of the researcher to real-world processes in the case study region that are relevant to the local stakeholders on the one hand, and to the research scope on the other hand. The observations made in the case study region during the early lock-down indicated substantial interruptions and impacts on local agricultural production and marketing, as well as immediate responses taken by farmers, producers, and consumers to cope with changing conditions. To study these observations about impacts and responses, a farmer survey was conducted in June 2020 (see Frank & Amoroso 2023). The results showed that producers (farmers and processors) developed adaptation responses to sustain local production and marketing and indicated potentials of farmers and consumers to implement locally adapted (agroecological) and self-organized strategies in response to changing

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<sup>7</sup> The identification and analysis process and outcomes are further detailed in Frank et al. (2020)

conditions caused by a specific crisis situation (Frank & Amoroso 2023). This analysis and the review of emerging literature from other contexts (e.g., Tiftonell et al., 2021) provided first indications that effects of a profound systemic crisis could promote local agroecological transition processes. In line with the overall research purpose and objective of this dissertation, the subject was then included into the research process (see Table 1-3).

Table 1-3 Overview of specific research purpose, objectives and data collection and analysis methods

Objective	SP specific objectives	Collection methods	Analysis methods
<b>SP I – Article 1:</b> Co-inquiry in agroecology research with farmers: transdisciplinary co-creation of contextualised and actionable knowledge			
<b>Research problem:</b> Conceptual and operational challenges in achieving collaborative action and learning in participatory approaches for agroecology transition research with farmers.			
Conceptualise and pilot a co-inquiry approach for enhanced participatory action research with farmers	<b>1)</b> Conceptualise co-inquiry for agroecology research at farm level; <b>2)</b> Explore how the approach considers farmers’ experience in the knowledge co-creation process to achieve contextualised research questions and actionable results; <b>3)</b> Reflect on potentials and constraints of extended roles attributed to farmers and their increased control over inquiry process and contents	Literature review to build conceptual framework of co-inquiry for agroecology research; piloting a co-inquiry process with co-researchers (organic horticultural farmers) during 10 group sessions (use of visual tools; audio recording) and extensive experimentation on-farm with group of co-researchers (activity and participant observation, field notes and memos)	Iterative consultation of records and transcripts during co-inquiry process; chronological systematization of the process; process assessment based on participants’ perceptions through qualitative content analysis of transcripts (2 reflection sessions after 4 and 8 months of collaboration, memos and field notes, and visual materials)

Continued next page.

Objective	SP specific objectives	Collection methods	Analysis methods
<b>SP II - Article 2:</b> Social innovation for agroecological transitions: studying relationship and role building in transdisciplinary initiatives for local food system development			
<b>Research problem:</b> Understanding of how social innovation as one key driver of local agroecological transitions occurs through relationship-building and role changes and how it can be facilitated.			
Analyse social innovation processes, relationship-building, and role changes in multi-stakeholder transition initiatives	<b>1)</b> document a PGS development process and involved reconfigurations of relationships, and analyse narratives of change to reveal ambitions of the initiative to change relationships; <b>2)</b> identify implementation strategies and activities conducted by the initiative to assess how ambitions for changing relationships and roles were operationalized in practice; <b>3)</b> identify changes in role understandings and enactment of roles, and to assess implications of role changes for improved agroecological transition support	Multi-stakeholder meetings (n=7) and workshops (n=5) (17:30 hours of records); participatory group work tools implemented during the above activities (stakeholder mapping, rich picture, brainstorming); memos, field notes and participant observation for chronological documentation, and to document observations from activities without audio-recording (facilitation group/board meetings (during 2018/19 on a weekly basis, during 2020/21 monthly); farm visits (n=10), assemblies (n=2)	Qualitative content analysis of transcribed audio records in ATLAS.ti. Category development for systematic documentation, process analysis, and derivation of narratives of change guided by analytical questions proposed by Haxeltine et al. (2017); role perceptions deduced from the collected material, differentiating between participating stakeholder groups, including participant observation regarding actual enactment and challenges for enactment

Continued next page.

Objective	SP specific objectives	Collection methods	Analysis methods
<b>SP III</b> - Article 3: Changing conditions for local food actors to operate towards agroecology during the COVID-19 pandemic			
<b>Research problem:</b> Changing conditions under which local food actors implemented agroecological practices in response to the COVID-19 pandemic, and what potentials practices unfold for agroecological transitions.			
Study how changing conditions trigger local food actors to (re-)frame their objectives and activities regarding local marketing, and to assess the relevance of agroecological principles as a basis for responding to the changing conditions and unfolding longer-term transitions	<b>1)</b> Reveal marketing conditions that changed during the COVID-19 pandemic for local food actors to operate; <b>2)</b> Identify objectives of, and activities conducted by, local producer groups to establish producer shops and markets; <b>3)</b> Understand how the objectives and activities carried out reflect agroecological principles	Case study with Self Organized Producer groups (SOPGs) (operators of producer shops and markets); mapping of producer shops and markets (n = 14), and selection for case study based on specific criteria (n=9); SOPG visits for first interactions to learn about functioning, motivation of participants and their objectives; semi-structured interviews (n=5 group; n=8 individual) with SPOGs members (average duration of 70 mins)	Qualitative content analysis of transcribed audio records in ATLAS.ti, using a hybrid approach (inductive / deductive); first analytical categories were derived from the research objectives (deductive). Then, sub-categories were developed based on the transcripts (inductive). Analysis of linkages of objectives and activities of SOPGs with agroecological principles by using principles consolidated by (Wezel et al., 2020)

#### 1.4.4 Data collection and analysis

Building on the general theoretical and empirical framework of the dissertation (see Section 1.1), for each SP, a detailed literature review was conducted, using bibliographic print and electronic data bank sources. A qualitative research approach was selected for data collection and analysis, as suggested for exploratory case studies (Yin, 2018), and for processual analysis of innovation processes (Pettigrew, 1997).

Table 1-4 Overview of field research activities

Activity		Project term (quarterly)															
		18	19				20*				21				22		
		4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	
Stakeholder identification and situation analysis	Farm visits																
	Interviews																
	Institutional and farmer workshops																
	Participation in multistakeholder innovation platform																
Sub-project	I	Co-inquiry group sessions															
		Co-inquiry on-farm experimentation															
		Co-inquiry participatory evaluation															
	II	Incentive phase PGS (literature review, meetings)															
		Consolidation of PGS facilitation group															
		Co-development of standards and certification schemes															
		Pilot phase PGS															
		Participatory reflection activities															
		III	Farmer survey														
			Mapping of farmer markets														
SOPGs visits and interviews																	

\*Due to the COVID-19 pandemic and strict lockdowns in Argentina, fieldwork in SP II was interrupted between March 2020 and March 2021 (see Chapter 4 for details)

Data was collected in the framework of field research activities conducted in the three SPs, as outlined in Table 1-4, and as further detailed in the respective result section of each SP (see Chapter 2, Chapter 3, Chapter 4, and exemplary data collection tools and interview guide in Appendix 3).

Data collection and analysis methods used in the three SPs are summarized in Table 1-3 (page 25 ff).

Semi-structured qualitative interviewing (Kvale, 2012) and narrative interviewing (Jovchelovitch & Bauer, 2000) techniques were used, combined with the conduction and facilitation of the large number of group activities (SP I, II & III), and on-farm experimentation activities (SP I). SP I and II required a detailed systematisation of the implemented participatory research processes, which was conducted by chronological documentation of activities, participant observation (Musante & DeWalt, 2010), and supported by field notes and memo writing. Moreover, facilitation of group sessions within the collaborative process was supported by different visual and group work tools, such as brainstorming, problem- and solution trees, rich picture, ranking, and stakeholder mapping (see Brouwer et al., 2016; Thomas & Wehinger, 2009).

Content analysis of collected (text) materials was used in all SPs. Qualitative content analysis is a flexible but structured method for qualitative interpretative analysis of (text) material. It is the systematic analysis of documented communication, based on certain rules and led by theory (Mayring & Fenzl, 2014). The structured analytical-interpretative process is guided by the development of concepts and categories (codes) that are applied to the text in order to sort the material with regard to content (coding), and to increase information density by reducing text volume (see code system and supplementary information in Appendix 4). In this dissertation, the content analysis was guided by methodological principles developed by Mayring and Fenzl (2014) and Strauss and Corbin (1997). Specific category and code approaches developed for the analysis of data collected in the three SPs are detailed in the respective result section (see Chapter 2, Chapter 3 and Chapter 4).

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## Chapter 1

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## Chapter 1

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## CHAPTER 2

### Co-inquiry in agroecology research with farmers: transdisciplinary co-creation of contextualized and actionable knowledge<sup>8</sup>

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#### Abstract

The transformative claim of agroecology research draws on transdisciplinarity and participatory action research to operationalize horizontal learning and experimentation for knowledge co-creation and change of action. Drawbacks to recent research strategies in this field are lack of activity-orientation, and limited roles and low level of control attributed to farmers, particularly in defining scope and methods for collaboration and joint experimentation. In response, in this article we conceptualize a co-inquiry approach for agroecology research adopted from participatory action research and explore its operationalization and outcomes with a group of organic horticultural farmers in Argentina. We assess how co-inquiry considers farmers' experience in the knowledge co-creation process to achieve contextualized research questions and actionable results and reflect on potentials and constraints of extended roles attributed to farmers and their increased control over inquiry process and contents. We found that co-inquiry facilitates extended roles of farmers as co-researchers and thereby encourages horizontal learning based on systems thinking, through a joint explorative assessment of the systems operators' purposes, context, and experience, and by joint methodological choice, experimentation, and reflection.

**Keywords:** co-operative inquiry; transdisciplinary research; participatory action research; transition; knowledge co-production; organic horticulture, Rio Negro Argentina.

#### 2.1 Introduction

Agroecology research uses transdisciplinary approaches for transformation of farming and food systems (Gliessman, 2014; HLPE, 2019) and aims to capitalize on various knowledge systems that support and expand experimentation and horizontal learning between farmers, researchers and

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other food system actors (Méndez et al., 2015). Participatory action research (PAR) is increasingly proposed to operationalize such collaborative actions between the diverse actors in agroecology research (e.g., Pimbert, 2017; Rosset and Altieri, 2017; Méndez et al., 2015). PAR aims at the involvement of peoples' perspective on a specific issue at stake and their empowerment to actively change a situation (Fals-Borda & Rahman, 1991; Freire, 1982). Following the claim of the global social movement for agroecology (Nyéléni, 2015), *transdisciplinary co-inquiry* (Pimbert, 2017, p. 263) is proposed as a means for democratizing research in the way that '*farmers and other citizens can directly define the upstream strategic priorities*' (Pimbert, 2017, p. 263). This democratic and emancipatory perspective is deeply rooted in co-inquiry theory, where '*people have the right to participate in research and [in defining] the meaning of outcomes concerning issues of their proper experience, and to express their values in the design of the inquiry*' (Bray et al., 2000, p. 5). Hence, co-inquiry may potentially support democratic and emancipatory processes in agroecology research. Further, co-inquiry conducted at farm level with groups of farmers can help to design and test farm level transition processes, and if embedded in local communities of practice (Morgan, 2011), it may contribute to transition processes at local food system level, thereby responding to the multiple scales of agroecological innovation systems (Tittonell, 2019).

In recent decades, within transdisciplinary research, a number of different methodological approaches that enhance the collaboration between scientists and societal stakeholders, such as transdisciplinary research for systemic change (Roux et al., 2017), collaborative learning (Restrepo et al., 2018) and case-based mutual learning sessions (Vilsmaier et al., 2015) have been proposed and tested. These methods have achieved increased mutual learning between scientists and societal stakeholders and established knowledge co-production. However, a drawback to these methods, observed by various authors (Brandt et al., 2013; Vilsmaier et al., 2015; Zscheischler & Rogga, 2015), is that in these collaborations roles and level of control over the knowledge co-creation process of societal stakeholders are often still weak as the collaborations are initiated and steered by the researchers.<sup>9</sup> Accordingly, for instance, farmers have still limited influence in the how and what of the knowledge co-creation process.

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<sup>9</sup> In this study, we use the term *role* to relate to a set of expected behaviours by a social group or individuals towards a social position (Peuckert, 1992) including *tasks* and *responsibilities* in collaborative actions.

In order to enhance democratic knowledge production processes and the empowerment of societal stakeholders in transdisciplinary research, PAR is '*concerned with developing practical knowing in the pursuit of worthwhile human purposes*' (Reason & Bradbury, 2008, p. 4). Therefore, PAR proposes different methodological strategies to reach farmers' active involvement in changing their situation at the farm and local level. It is guided by the question of how farmers may benefit from collaborating with researchers (and other relevant local actors) in the process of improving or transforming their farm management. PAR, hence, puts the interest of the farmers and their knowledge creating processes at the centre. It builds on farmer experimentation that is a regular element of farmers' activity system and source of learning for change of farm management (Hansson, 2019; Leitgeb et al., 2014).<sup>10</sup>

Two research strategies that aim for increasing benefits of farmers in collaborating with researchers can be differentiated within the domain of participatory approaches for agroecology research with farmers: i) to involve farmers in group-based (multi-actor) dialogical research activities such as in co-innovation or activity-centred design approaches (e.g., Ingram et al., 2020; Lacombe et al., 2018; Berthet et al., 2016), and ii) to support farmers' experimentation processes (e.g., Catalogna et al., 2018; Navarrete et al., 2018).

Supporting farmers in their own experimentation processes includes joint reflection on the farm and experimental situations, explicating farmers' motives and ideas, discussing risks and jointly developing appropriate modalities for experimentation, and data recording and evaluation (Catalogna et al., 2018; Hagmann et al., 1997). Some approaches capitalize on farmers' innovation potential to encourage further (informal) farmer-led experimentation and diffusion of farmers' own innovations (Waters-Bayer et al., 2015). Others encompass involving farmers in joint experimentation processes with researchers to exploit each other's innovation potential (Navarrete et al., 2018). As the experimentation process is embedded in the farmers' activity system, it considers and suits the particular farm context, its outcome is actionable knowledge, and farmers train their ability to

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<sup>10</sup> In this article we use the term *experimentation* in a broad sense, including experiments on a scientific basis, and informal experimentation without using scientific criteria, for instance when farmers reflectively observe their actions and draw conclusions for changing their practices. See Hansson (2019) for a comprehensive analysis of farmer experimentation from the philosophy of science perspective.

experiment with their own ideas for improvement and management of complex systems (Navarrete et al., 2018; Leitgeb et al., 2014). Beyond individual farm-specific experimentation, these strategies emphasise that local transition processes could be enhanced when methods and results of individual farmer experimentation are systematized and fed into local peer-to-peer learning and action networks (see also Di Iacovo et al., 2016).

Apart from their potentials, both strategies also show conceptual and operational challenges in achieving collaborative action and learning. Challenges in supporting farmers' experiments include integration of formal experimentation methods into the farmers' work routine. Problems arise from time limitations faced by farmers during data collection, monitoring, and dissemination of outcomes (Hagmann et al., 1997). Additionally, there is the problem that often scientific methods for experimentation are not relevant for farmers (Di Iacovo et al., 2016). Furthermore, when researchers engage in experimentation with farmers, farmers may lose control over the experimentation process. In order to increase farmers' ownership of the experimentation process and outcomes, farmers' active role and involvement throughout the entire experimentation process and joint decision making need further methodological consideration (Navarrete et al., 2018; Leitgeb et al., 2014). The obvious shortcoming of dialogical strategies is that they lack activity-orientation. When transformative research aims at changing farmers actions through newly gained knowledge and possibly a change of farmers' relevance system (Kaufmann et al., 2013), farmer need to test and contextualize ideas gained in a dialogical process through experimental and activity-oriented practices.

Particular issues that need further consideration in the development of methodological approaches are the so far often limited roles and low level of control farmers have in the collaboration, especially in defining scope and methods for joint research (Ingram et al., 2020; Lacombe et al., 2018). Another issue is the recognition of farmers' experience (experiential knowing) as important source for knowledge co-creation (Baars, 2011), and the creation of peer-to-peer learning environments as important place for incentive-building for farmers to transition towards agroecology (Padel et al., 2019; Cristofari et al., 2018). To address these issues we propose the adoption of a co-inquiry approach (Heron & Reason, 2008; Heron, 1996) to operationalize an integrated strategy of dialogical group work (thinking) and joint experimentation (doing), to enhance farmers' role and control over the knowledge co-creation process, to build on farmers experience in co-creation,

and to ultimately increase benefit of farmers from the collaboration with scientists and peers.

We explored the approach within the context of agroecology research by piloting a co-inquiry process in a case study in Northern Patagonia, Argentina. The aims of this article are to: a) conceptualize co-inquiry for agroecology research at farm level; b) explore how the approach considers farmers' experience in the knowledge co-creation process to achieve contextualized research questions and actionable results; and c) reflect on potentials and constraints of extended roles attributed to farmers and their increased control over inquiry process and contents.

We first briefly introduce theoretical groundings of the co-inquiry approach, describing its origin, characteristics and overlaps with the general principles of agroecology research. Then we give insights into our case study by describing the operationalization of the co-inquiry approach. After that, we analyse potentials and constraints as perceived by the participants, particularly regarding farmers' roles and control over scope definition and methodological choice, and on how farmers' experience was considered in the knowledge co-creation process. Finally, we discuss how our results respond to the identified methodological gaps, concluding with some reflections about the potential of co-inquiry in agroecology research with farmers (and potentially with other relevant stakeholders) to enhance dialogue and experimentation for learning and change of action in both farming and research practice.

### ***Co-inquiry***

*Co-inquiry* evolved as a form of participatory action research (PAR) within the social sciences (Heron, 1996; Heron & Reason, 2008). In *co-inquiry*, also referred to as *co-operative inquiry* (Heron, 1996) *collaborative inquiry* (Bray et al., 2000) or *systemic co-inquiry* (Ison & Straw, 2020), participants work together as *co-researchers* and *co-subjects* to explore jointly identified issues of common interest, using jointly identified methods. The principal aims of co-inquiry are '*to construct meaningful, practical knowledge from participants' experience*' (Bray et al., 2000, p. 89), '*to deepen understanding of one's experience, gain from the experience of fellow inquirers and together develop a new understanding of the shared phenomena under inquiry*' (Kakabadse et al., 2007), and finally to change behaviour and action in practice (Heron, 1996, pp. 92 and 101).

The approach addresses co-learning within iterating phases of action-inquiry and group reflection. The different inquiry stages (see Figure 2-1) are grounded in the various ways of knowing, which are experiential, presentational, propositional and practical.<sup>11</sup> Heron and Reason (2008) argue that co-learning and change of action are facilitated when knowing is grounded in personal experience, the experience is shared in a community of practice, understood through joint intellectual assessment, and then improvements are tested through implementation in the individual's practice. The inquiry can be more informative (create descriptive/explanatory understanding about an issue or practice) or transformative (facilitate change of practice). Often both forms are intertwined, typical for transformation research, where conceptual and actionable knowledge is co-created to understand and to support societal change processes (Wittmayer & Hölscher, 2017, p. 14f). The group-based inquiry allows the co-inquirers to share experience, identify and express relevant parameters, give them meaning, relate them to each other and possibly rearrange or manipulate them in order to understand and change a situation through change of action as a function of newly acquired knowledge and skills (Heron, 1996, pp. 92 and 101). Here, parallels of co-inquiry and pragmatist thinking towards social learning and knowledge creation, rooted in practical experience and iterative questioning of assumptions, become clear. Conceived as social learning, co-inquiry encourages reflexive processes by participants on background values, assumptions and understandings that guide the research process. Hence it addresses the important role of reflexivity in sustainability research (Popa et al., 2015). Furthermore, co-researchers are able to co-create and test knowledge in a process of transforming tacit into explicit knowledge, and reincorporating it into their practice (c.f., Nonaka & Takeuchi, 1995). The approach relates to Kolb's experiential learning cycle of i) concrete experiences (feeling that something is important), ii) reflective observation (watching what is happening), iii) abstract conceptualization (thinking about consequences), and iv) active experimentation (acting on those thoughts) (Kolb, 1984).

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<sup>11</sup> According to Heron and Reason (2008) *experiential knowing* refers to the immediate encounter with a person, thing or place, hence the direct experience through perception and feeling. *Presentational knowing* refers to the process of expressing and sharing experience with others. *Propositional knowing* is based on intellectual knowledge that is shared with others in form of beliefs or ideas. *Practical knowing* is the know-how for implementation, leading to new skills or competences.

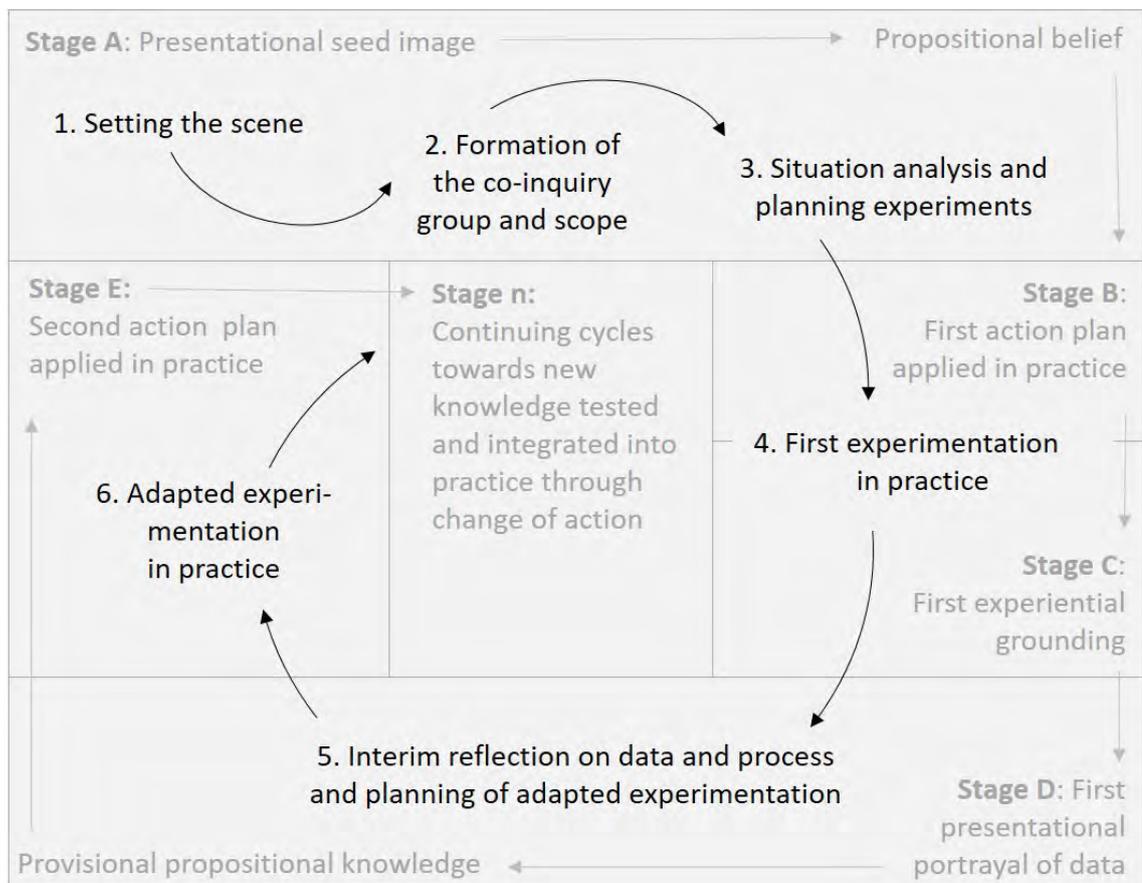


Figure 2-1 Conceptual representation of the co-inquiry process (grey: co-inquiry stages adapted from Heron (1996); black: operational steps implemented in the case study (see results))

Co-inquiry enables shared ownership of all participants through joint decision making in defining scope, contents, and inquiry procedures. Differences in power can be levelled when initial purposes and methods of the facilitating co-researcher are questioned by the group. Then group takes over by iteratively shaping participatory collaboration, role definitions, inquiry contents and outcomes (Heron, 1996, p. 153). Through increased ownership, the co-researchers give meaning to the inquiry process and contents, enabling change of their (professional) practice (Baldwin, 2002).

Learning through concrete experience is core to transdisciplinarity (TD), defined as *'a reflexive, integrative, method-driven scientific principle aiming at the solution or transition of societal problems and concurrently of related scientific problems by differentiating and integrating knowledge from various scientific and societal bodies of knowledge'* (Lang et al., 2012). TD research

typically consists of three phases: problem formulation and team building, knowledge co-creation, and reintegration of newly gained knowledge into academic and real world practice (Lang et al., 2012). The core element in the co-creation phase is to step into action within the activity system of farmers (Kaufmann et al., 2013), by for instance, conducting joint activities for situation analysis, experimentation and reflection. It can thereby address the need for bridging the gap between action and knowledge processes in agroecology research (Girard et al., 2015). Building on the comparison of key agroecology principles and PAR by Méndez et al. (2015, pp. 4–9), the potential suitability of co-inquiry, as a form of PAR, to operationalize agroecology research is shown in Table 2-1.

Table 2-1 Overlaps between principles of agroecology research and co-inquiry

<b>Agroecology research principles</b> (Méndez et al., 2015, pp. 4–9)	<b>Co-inquiry principles</b> (Heron & Reason, 2008)
Transdisciplinary actor-orientation	Group-based actor approach
Empowerment of food actors	Joint definition of research scope, methods, and procedures
Horizontal learning and knowledge exchange	Social learning process based on individual experience
Agroecological systems are site-specific, complex, and constrained by uncertainty, therefore contextualization is key	Inquiry into a particular situation of co-researchers; contextualization of inquiry contents and methods
Systems approach	Encourages systems thinking and reflectivity
Transformative change	Aims for change of action through acquisition of new knowledge and skills.
Redefinition of the researchers' role	All co-researchers become co- subjects

## 2.2 Materials and methods

### ***Study location***

The pilot co-inquiry was carried out with horticultural farmers in the Andean valley region *Comarca Andina del Paralelo 42*, Province of Rio Negro, Argentina. Surrounded by mountainous Andean forest landscapes, in the productive valleys and terraces diversified small and medium scale agricultural production takes place (fruits, vegetables, hop, cereals, and extensive animal production). The region is characterized by cold temperate mountain climate (precipitation average 750 mm/a, average annual temp. 9,8

°C) and by very rich soil conditions for agricultural production in the valleys (Madariaga, 2009). In socio-economic terms, tourism, the public sector, agricultural production and a diversity of handcrafts are the main sources of income for the local population, which has been rapidly growing in the last decades due to high migration fluxes from the countries' urban centres and from abroad (Cobelo, 2017; Bondel, 2009). The study region was chosen in the frame of a transdisciplinary research project dealing with *exploring transition pathways towards agroecological farming in Argentina*. In particular, as this region is considered a niche where farmers experienced in organic and agroecological management and new agroecological farming projects, as well as institutions that focus on agroecology, are present. One such facility is the recently established research institute for agroecology and the undergraduate study program on agroecology (unique in the country) at the National University of Rio Negro. These circumstances were expected to facilitate the implementation of the transdisciplinary approach.

### ***Co-inquiry partners***

The pilot co-inquiry was initiated by the first author (referred to hereinafter as the *facilitating co-researcher*) and conducted with a group of horticultural farmers (n=6; referred to hereinafter as the *co-researchers*). The co-researchers manage a collectively organized organic market gardening farm (approach c.f., Morel & Léger, 2016) with one hectare intensive organic vegetable production for self-consumption and local marketing. Over 30 types of vegetables are grown in greenhouses (1200 m<sup>2</sup>) and outdoor, relying on small scale mechanization for soil preparation and seeding, and other manual cropping practices. On average, the six core group members work two-third to full time on the farm. Seasonally, particularly during the growing season, farm work is also supported by volunteers. All co-researchers have an urban-rural migration background, started agroecological horticulture farming few years ago, and have a higher educational background in the field of agroecology and agricultural economics. For more contextual details about the case study see also Frank et al. (2020).

### ***Data collection and analysis***

Material for analysis in this research was collected as part of the co-inquiry activities between March 2019 and March 2020. In this period, a total of 10 group sessions were carried out (audio recorded). Settings, session contents, and participatory tools used are outlined in the first result section. In the experimentation stage, the facilitating co-researcher regularly worked on the farm to set up field trials, collected data with the co-researchers, and

participated in the farm routine work, guided by methods of participant observation (Musante & DeWalt, 2010). Recorded audio and visual material from group sessions and field notes were complemented with regular memo writing by the facilitating co-researcher.

All audio-recorded material from group activities was transcribed by a professional typist, using basic transcription mode to completely transcribe the literal content in the original Spanish language.<sup>12</sup> Transcripts were introduced into a qualitative data analysis software (ATLAS.ti). Records and transcripts were iteratively consulted by the facilitating co-researcher throughout the inquiry process for reflection and meaning making to readily respond to emerging group dynamics and inquiry topics. The operational description of the co-inquiry process is based on a chronological systematization of the process and the analysis of transcripts from group sessions. The assessment of the co-inquiry process, based on the participants' perceptions shared in two reflection sessions after four and eight months of collaboration, was guided by qualitative content analysis (Mayring & Fenzl, 2014). Codes (such as potentials and constraints of the inquiry process, motivation for participation, reflection on roles and farmers involvement in methodological choice) were applied to transcripts in order to sort the material with regard to content, and to increase information density by reducing text volume. Direct quotes from co-researchers presented in the results are coded by the respective session date (SD), and by differentiating gender of co-researchers (male/female). The presented analysis was carried out by the facilitating co-researcher, with permission and feedback of the draft article by the co-researchers.

## 2.3 Results

### ***The co-inquiry – operationalizing joint experimentation and learning***

The different conceptual stages of a co-inquiry process (grey) (Heron, 1996) constitute the frame for the operational steps (black) of the PAR conducted by the co-inquiry team (see Figure 2-1 in the introduction). In the following we describe methods used and exemplary outcomes of the different operational steps conducted in our co-inquiry process.

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<sup>12</sup> The facilitating co-researcher is fluent in the Spanish language, hence no translator was needed for conducting the co-inquiry process and for analysing the data.

### ***Stage A: Presentational seed image***

In co-inquiry, the objective of stage A '*presentational seed image*' (see Figure 2-1) is to present experience and existing knowledge on the issue within the co-inquiry group, and thereby sharing perspectives on (problematic) situations, knowledge gaps, and ideas. Thereafter, assumptions on how improvements could be achieved, or knowledge gaps closed, are revealed ('*propositional beliefs*'). Additionally, methods and procedures used to explore the assumptions through action inquiry are jointly defined.

***Setting the scene (step 1):*** Following the transdisciplinary research approach used in the overall research project, and prior to the formation of the co-inquiry group, the facilitating co-researcher conducted an extensive stakeholder analysis (Lelea et al., 2014) in the case study region (see Frank et al., 2020 for results). This analysis was the operational starting point to approach the facilitating co-researcher's general objective to conduct an exploratory and actor-oriented TDR process for co-developing transition pathways towards agroecological farming in the frame of a doctoral study. It allowed us to learn about the local food system, its problematic situations regarding agroecological transition processes and its social context. In a subsequent meeting with interested farmers the facilitating co-researcher presented the general idea of conducting a co-inquiry and the identified demands and problematic situations were shared and consolidated with the participating farmers. General problems consolidated with farmers included: i) lack of (documented) practice-relevant and contextualized knowledge on agroecological vegetable farm management in the region; and ii) missing interactions between farmers and with R&D institutions to co-create and test lacking knowledge, and to enhance farmer-to-farmer learning and collective action in the support of local agroecological farm transitions. The group of farmers attending the meeting discussed ways to encompass these general problems in a collaborative process. Two participating farmers, representing the collectively managed organic market gardening farm (see Materials and Methods), proposed to ask for interest within their group to participate in a co-inquiry process, and to offer their farm as monitor farm.<sup>13</sup>

***Formation of the co-inquiry group and scope (step 2):*** The two farmers invited the facilitating co-researcher to a farm visit for a tour and for some intensive

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<sup>13</sup> Within a community of practice of peer farmers (Morgan, 2011), individual farmers (monitor farm) become actively involved in experimentation, monitoring, evaluation and demonstration of farming practices, to trigger joint learning and action among peer farmers and other relevant stakeholders (e.g. Dalley et al., 2014)

discussions. General demands for the inquiry identified in Stage 1 were related to particular problems and interests of the farmers. This led to the development of a pre-proposal for the co-inquiry that matched general local and farm-specific demands, such as: i) documentation of agroecological management practices of the organic market gardening farm; ii) reflecting on the farm situation and developing/testing possible strategies for improved agroecological practice iii); co-developing strategies for farmer-to-farmer exchange and mutual learning, based on results of i) and ii). In the first group session, the two farmers presented the pre-proposal to other interested farm members (n=4). The facilitating co-researcher explained the general functional principles of co-inquiry, such as group work of co-researchers, joint decision making about contents and methods, and iteration of reflection and action-oriented experimentation. All six participants agreed to participate in the co-inquiry as co-researchers on a regular basis. A broad organizational structure for the group process was agreed on, such as frequency and place of meetings, and communication structures. For content documentation of the group sessions, video recorded recalls at the beginning of each session were proposed by the facilitating co-researcher. The collaboration with the group was formalized by a memorandum of understanding.

***Situation analysis and planning of experiments (step 3)***: Building on the general issues formulated in the pre-proposal the first group activity was to collectively identify those areas of farm activity the co-researchers considered important and characteristic for their farm, when thinking of documenting their farm management for internal reflection on (problematic) situations, knowledge gaps and ideas for improvement (see Figure 2-2 for exemplary initial problem statements). In the following sessions, the identified areas were analysed to share problem statements, to discuss assumptions, and to develop proposals for experimentation. During this dialogical analysis, the guiding question '*what are our purposes of doing agroecological farming?*' came up.<sup>14</sup> Based on different purposes stated, co-researchers described and analysed their farm activity system and the farm context, thereby deepening understanding of '*what are we doing to reach our purposes and what are constraining or supporting context conditions to reach our purposes?*' These questions helped the group developing a cognitive picture of purposes, activity system and context to better define situated and relevant issues and

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<sup>14</sup> We use the term *purpose* to refer to intentions, aims and reasons for doing something or for allowing something to happen  
(<https://dictionary.cambridge.org/de/worterbuch/englisch/purpose>)

methods for experimentation. Moreover, they helped highlighting conflicting individual stances and opinions.

Exemplarily, the dialogical process is illustrated by the inquiry area *farm economy and farm data recording* (Figure 2-2). One key purpose stated by the co-researchers was to reach decent year-round income and working conditions for the farmers. The joint assessment of the activity system concerning this purpose revealed missing accountability structures and economic assessment tools (and effective use by the farmers) for the improvement of farm management, the definition of market prices, and improvement of overall high workload and hard manual work. The crop diversity, related labour-intensive cropping tasks and constraining production conditions imply challenges for cost-benefit analysis, indicating why the co-inquiry group opted for experimenting in the field of the farm economy.

Context conditions that constrain the farmers to better achieve these purposes are, for instance, the lack of investment capital, a short planning horizon due to short-term land tenure contracts, and the overall lack of local knowledge about agroecological practices and labour efficient implementation. Additionally, supporting context conditions, such as increasing local market demand for their produce, and support by the local university and governmental extension service, were highlighted. The contextualization of the farm activity system and purposes helped to delimit the 'room for manoeuvre' of farmers and to identify possible pathways for experimentation, i.e., development of data and management tools to calculate and assess production costs and revenues, defining prices to meet increasing local demand, and assessment of labour demand for different cropping tasks for improved management. To operationalize the proposed actions, parameters, time frame, data collection methods and procedures were jointly developed.

### ***Stages B and C: First action plan applied in practice and experiential grounding***

In stage B, the 'first action plan is applied in practice' to explore and test initial ideas and assumptions in practice, building on practical knowing, the know-how needed for action. In this implementation phase, the co-researchers gain a '*first experiential grounding*' (stage C) of assumptions and use of agreed methods within their activity system.

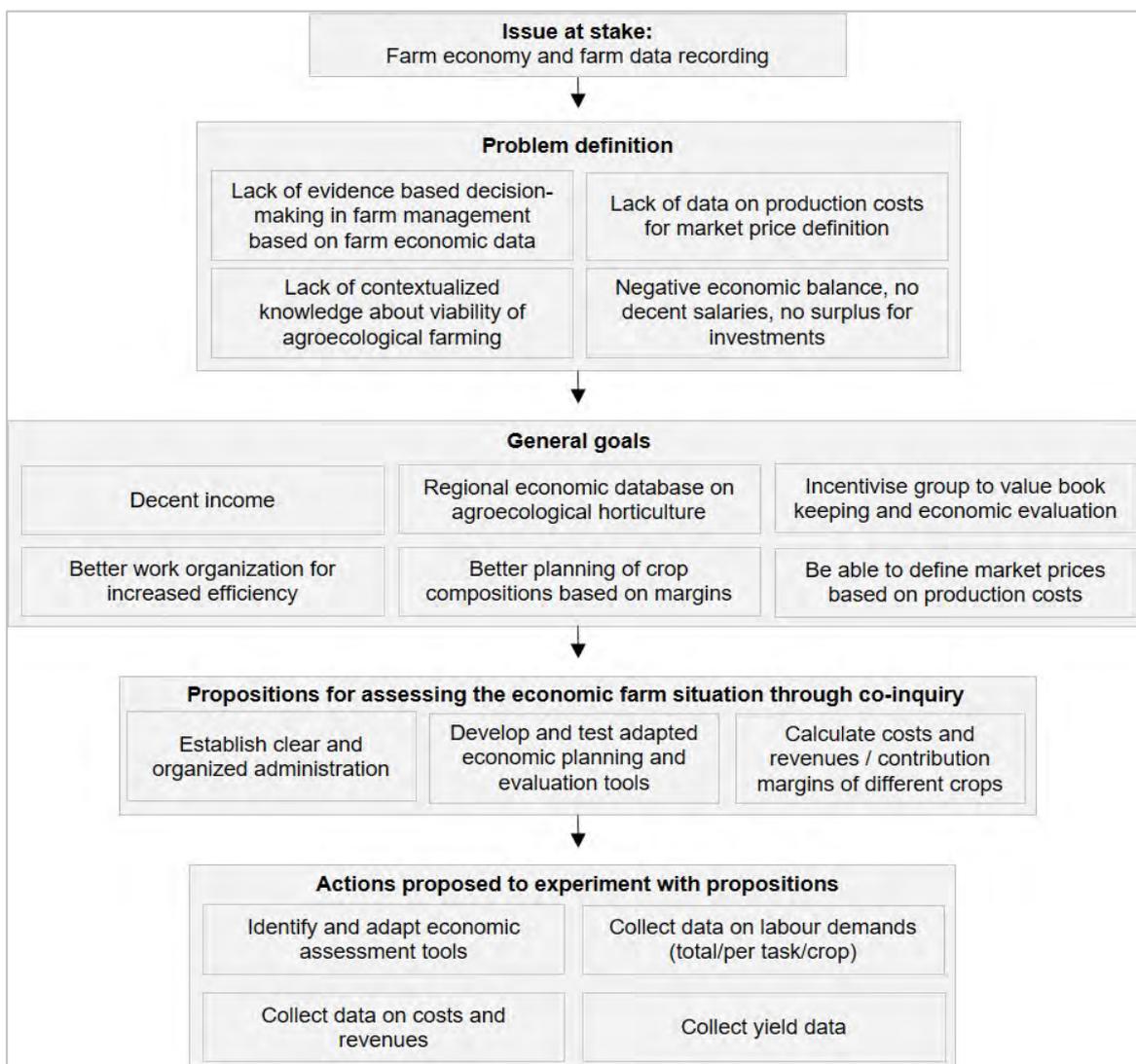


Figure 2-2 Situation analysis and proposals for the area farm economy and farm data recording

**First experimentation in practice (step 4):** The co-inquiry group distributed the tasks for experimentation, considering particular roles and responsibilities and individual interests of different members within the farm activity system. To compensate for extra workload caused by inquiry tasks of some co-researchers, the group decided to provide a compensation from the research funds. Further, necessary small equipment was purchased from research funds, based on a joint evaluation made by the group. Co-researchers collected data and observed the inquiry issues within their routine farm work. The facilitating co-researcher regularly participated in the farm and inquiry activities and coordinated field trials and data collection. Further, desk work with one co-researcher for development and testing of economic assessment tools was conducted on a regular basis.

To illustrate the initial experimentation process, we further draw on the example of *farm economy and farm data recording* (Figure 2-2 and Table 2-2). In order to calculate production costs for performance analysis and marked price definition based on production costs, the group defined the parameters as yields, direct and indirect labour demand and other costs per crop. After a revision of partially existing farm data and methods recommended by literature, it was agreed to collect the requested data during one economic farm year (July 2019 – June 2020). A field trial was planned and carried out to estimate yields of different crops per square meter (kg per several randomly selected linear meters). Linear meters were marked after sowing/transplanting to account for the particular farm situation that consists of continuous and uncontrolled harvesting, and to ensure randomization of linear meters within plots. The cropping calendar used by the group was extended with field data on plot size and square meters used per crop. Recording of direct labour demands for the different cropping tasks was proposed by the facilitating co-researcher to be done by using an open-source record-keeping app (BeetClock) designed for market gardening farms. For this purpose, a small group defined all directly crop-related tasks carried out on the farm and fed the information into the app interface. Moreover, a local marked price survey was conducted by one co-researcher monthly during the growing season for a comparative assessment of local marked prices.

***Stages D and E: First presentational portrayal of data and second action plan applied***

The individual experience gained, and the data generated is shared and evaluated in the group to build a '*first presentational portrayal of data*' (stage D). Preliminary knowledge is discussed and adapted assumptions about the issue are revealed. These outcomes are used to develop an adapted action plan that is implemented in stage E '*second action plan applied in practice*'. Then the inquiry cycle can be iterated to gain deeper insights, experiment and further re-frame ideas and assumptions towards new knowledge tested and integrated into practice through change of action.

***Interim reflection on data and process and planning of adapted experimentation (step 5):*** The first reflection meeting on the initial experimentation phase was held after three months of experimentation. To recall and mutually inform all group members about the ongoing experimentation, the facilitating co-researcher provided a visual overview of the initial objectives, related activities carried out and presented the *status quo* of experimentation activities. Co-researchers complemented the report

from their perspective and gave report on activities conducted individually or in small groups. Then, a structured evaluation was carried out where every co-researcher was given a space (without interruptions by others) to share his/her experience with the co-inquiry process, evaluating initial assumptions, lessons learnt, and operational constraints faced during the first experimentation phase. Afterwards, the points mentioned were taken up by the group in a reflective open discussion, to re-frame original ideas and methods, and to adapt inquiry procedures. Based on the operational and motivational constraints experienced (detailed in the next section), ***adapted experimentation in practice (step 6)*** was planned and conducted. During subsequent experimentation activities, the group decided to continue the inquiry by conducting further cycles of reflection and action, revising initial ideas, organising adapted planning, formulating experimentation, analysing data and reintegrating gained knowledge into their farming practice, and into their peer-farmer-networks.

### ***Role of farmers in the co-inquiry process***

The above process description shows that farmers took as co-researchers a leading role and control in framing and contextualizing problems and objectives, and also involved themselves in developing inquiry methods and conducting experiments. Following the example *farm economy and farm data recording* (Figure 2-2), methods used for situation analysis and planning of experiments and involvement of co-researchers in methodological choice and experiments is shown in Table 2-2.

How farmers (co-researchers) shared and made use of each other's experience in the knowledge co-creation process was revealed in the dialogical sessions. The group-based activities, supported by visual tools, served at considering farmers' experience (e.g., organizational structure of the farm, farming purposes and objectives, related problems, and ideas for improvement) for knowledge co-creation. For instance, the co-researchers described their farm activity system in a farm organigram. Here, based on their practical experience, they identified relevant farm areas and potential improvements, illustrated by one co-researcher as follows:

*What we captured in this meeting was the topic of organization of our group, of the [farm] project, how we are working. (...) We did a drawing, showing the horizontal organizational structure, the assembly at the heart of our farm project. Then we visualised the areas that make up the [farm] project (...), how we are situated. We noticed that we are lacking a bit of discipline and organization. (...) Therefore, it was useful to*

*visualize the scheme of the [farm] project as a starting point to identify areas of priority for inquiry (SD210519-Male).*

Organizational shortcomings and knowledge gaps in the area of farm economy were then specified, as exemplarily shown by the following quotes:

*In the group [the group of farmers running the farm] the area of administration and accounting has not been valued yet, nobody took the responsibility of this aspect. The same happens with planning [of the growing season], it is like, it is a very necessary task and helps organizing a lot of things. However, within the group, these working hours are donated, they are not valued (...). What I see is the motivation, the stimulus of some group members, to understand the value of the intellect as a tool for specification and mapping (SD160819-Male).*

*We lack economic stability. First [at the beginning of the growing season] we have a lot of expenses, and thereafter, the revenues come in, we need to find ways to understand and balance the financial fluxes (SD210519-Female).*

Based on this analysis, the group then planned actions for experimentation (Figure 2-2). Co-development of calculation matrices, parameters, and recording procedures for economic assessment also considered the co-researchers experience and the particular farm activity system, such as in defining a particular structure of costs and revenues to collect data for assessment. In addition to the considered practical experience of farming, co-researchers' experience gains from the co-inquiry process also facilitated co-creating knowledge on process and contents, as shown in the following.

### ***The co-inquiry experience from the co-researchers' perspectives***

Positive and critical statements of the interim reflection sessions provided valuable insights into the group process in terms of the potentials and constraints of the approach for operationalizing joint experimentation and learning in agroecology research with farmers. Overall, co-inquiry activities were regarded useful by the co-researchers, as a means of analysing their farm situation in a group setting and to identify and test pathways to reach (or reformulate) purposes in the agroecological farm trajectory (Table 2-3).

Table 2-2 From problem statements to proposals for experimentation:  
Involvement of co-researchers in methodological choice

		<b>Methods</b>	<b>Involvement of co-researchers in methodological choice and experiments</b>
<b>Problem statements</b>	Economic viability is questioned. High perceived labour demand. Lack of data for planning and decision making (economic data, crop composition, labour demand, definition of market prices).	Open guided talking rounds  Visual mapping  Problem/solution trees	Group agreed that facilitating co-researcher prepares sessions and proposes methods for group work in his role as facilitator.  Co-researchers were strongly encouraged to and interested in leading emergent thematic choice for inquiry and to identify problems and arising assumptions. Here the facilitating co-researcher remained in the role of listener, moderating group work and documenting/summarising contents.
<b>Assumptions</b>	Improved accounting structures and adapted tools for economic assessment may help generating relevant data for planning and provide regional data on agroecological management for other farmers.	Video recorded recalls of session contents	
<b>Proposals and planning of experiments</b>	Develop and test adapted accounting and economic assessment tools	Identification of available accounting and assessment tools for comparable production systems and adaptation to the specific demands.	One co-researcher with knowledge and particular interest in economics actively engaged in the search, adaptation, and implementation of tools. Feedback was provided by the group regarding requirements of tools.
	Record data on costs and revenues for one economic farm year	Collection and sharing of available farm data and regular book-keeping, using identified tools.	One co-researcher developed a record and calculation sheet for expenditures and revenues, and introduced other group members in charge of purchase and selling in using it.

Continued next page.

	Estimate yields	Field trial to measure randomized serial meters in crops and calculation of average yields of selected crops per m <sup>2</sup>	The facilitating co-researcher proposed the method. Operational issues of how to set up the trial and collect data was discussed and gradually adapted in the group. Yields were recorded both by co-researchers and the facilitating co-researcher.
	Estimate labour demand	Collect data on total labour demand, and for different crop-specific tasks, using a mobile application (BeetClock)	The group reflected on the current way working hours were registered. The general use of mobile applications in the farm organization led to the proposal by the facilitating co-researcher to use a mobile app. Parameters for defining crop-specific tasks were developed by the co-researchers.
	Record of crops grown (m <sup>2</sup> /crop)	Cropping calendar (Collect field data on crops grown).	Based on existing cropping calendars, proposals for improved recording were developed in the group, and data jointly collected.

Co-researchers particularly valued co-creating a facilitated space for problematizing relevant issues, by thinking of how to improve farm management, and how to generate information through systematization and experimentation for peer-to-peer exchange.

While the stages of group formation, scope definition and planning (consisting of mainly dialogical group sessions) were overall rated positively, experienced constraints were related to the practical experimentation stages.

Here, perceived stagnation of the experiments, time restrictions in the high farming season to pursue data collection and incorporation of the inquiry tasks into the farm routine activities were explained by the co-researchers.

Table 2-3 Potentials of the co-inquiry perceived by co-researchers and content analysis

<b>Potentials of co-inquiry</b>	<b>Co-researchers' positive statements</b>
Provides an extra space outside the routine activities for evaluation of farming practice, rooted in the co-researchers' practical experience.	<p><i>The time we give ourselves to organize is valid, it has a deep impact from here to the whole season, and I feel that giving it value depends on us, it is time to get together, to evaluate. It is as important as sowing, as watering, and it seems to me that it was evidenced and in an extremely valuable scope (SD160819-Male).</i></p> <p><i>What was really good is that we had the possibility to kind of stand outside the project and be able to analyse it and I think that gave a lot of clarity on a lot of aspects (SD121119-Male).</i></p>
Encourages systems thinking for farm assessment and co-creation of knowledge.	<p><i>I liked the first part very much when we started the meetings, the intellectual part. The way of developing a broad view on the system. This motivated me (...). To be able to generate concepts and ways of organizing the parts of a [farm] project. I liked it very much as a tool (SD121119-Male).</i></p>
Increases relevance of inquiry contents for co-researchers as they actively define objectives, data collection methods and evaluate data.	<p><i>(...) Concerning the concrete tools, the group provided [accounting tools, data collection tools, weather station, weighing balance], maybe these are small things, but actually they are not, they are a real necessity to be able to work. I liked that we were able to concretize, and that we were able to collect data. If we can sustain this, we can recompile the data and they will serve a lot (SD121119-Male)</i></p>
Co-researchers analyse their activities based on data relevant to them.	<p><i>It helped me a lot to (...), to first have a practical experience of analysis, of data that are generated. It opened up a lot of thinking, about where to carry it outward, as this always was an objective of the [farm] project (...) to carry the internal organization [project] to the outside. Regarding the pricing, but also the possibility to go outwards with this... these are the costs, this is the price for local organic vegetables produced by a group of persons (...) (SD121119-Male).</i></p>
Facilitates social and transformative learning	<p><i>These [the inquiry process] are ways of working that not everyone [in the larger farming project] conceives, and when they see how it works, they start to value (...) as they see the potentials, that is what I observe in the group, how they open their eyes and realize that it is not only about dedicating physical force, but to put the mind first (SD160819-Male).</i></p> <p><i>Since we started meeting (...), planning, sharing, designing, getting to know each other, a lot of things happened, (...). I have no doubts that we advanced, shared, and generated new things. This already shows that sustaining a joint work towards some place is going to carry you, something you will live, some transforming experience is going to happen (SD121119-Male).</i></p>

For instance, a critical observation made by the facilitating co-researcher concerning initial enthusiasm and active participation of the co-researchers in situation analysis and planning of experiments, and later-on decreasing commitment in carrying out agreed actions, was explained by one co-researcher as follows:

*It is new [to do structured experimentation] for us, so it is challenging to organize ourselves, to take this role [of being a co-researcher and collecting data], to say 'well, this is part of the harvest, I have to record it.' These are those things that one can say, prepare, but once you are in the doing, you need to change a lot of mental configurations to make it (SD121119-Female).*

Further, personal resource limitations and priorities of farmers to become co-researchers revealed to be major constraints for co-inquiry. The active role of farmers means increased responsibility and action to be taken in the process of 'social construction' for transdisciplinarity research:

*I feel that a lot [of initiative] came from Markus [the facilitating co-researcher]. We should ask ourselves why. Do we consider important what is happening? Do we really have the tools, the will to concretize the things we are doing together? (...). Personally, it was difficult to engage because I was not able to assist all meetings, because I am not hundred percent in the project, dedicating my life to other things (...). I like all the things we are doing; I consider them very valuable, but (...) we need to be sincere. What we want to realize is sensible (...) the openness to social constructions. I think that one needs to dedicate a lot of energy. We need to ask ourselves as a group if we really want to focus on that (SD121119-Female).*

### ***The co-inquiry experience from the facilitating co-researcher's perspective***

Reflecting on the process from the facilitating co-researcher's perspective, the co-inquiry brought valuable professional learning opportunities. These learning opportunities included the need to question classical researcher-farmer role distribution and the need to consider positionality in PAR. As fundamental pre-condition for the co-inquiry, the group had to clarify new role assignments. This highlighted the need for all participants to assume roles different from those typically assigned to researchers/farmers in classical farm research (Table 2-2). Further, the initial, rather theory-driven expectations of the facilitating co-researcher to reach high levels of interest and commitment

needed revision throughout the process. This was necessary to respond to co-researchers' varying predisposition to assume new roles and to invest substantial resources for the co-inquiry in terms of group work and experimentation activities.

Overall, the facilitating co-researcher perceived that co-researchers were in the position to draw on their experience and were encouraged to actively participate in defining scope, methods, and active experimentation. Facilitating group sessions during the scope definition and situation analysis was challenging for the facilitating co-researcher. First, to respond to the open-space character proposed for this stage of co-inquiry, to provide space to the participants to share experience and to problematize situations based on systems thinking. Second, to translate with the group the revealing diversity, interrelatedness and complexity of problems and ideas into viable objectives for experimentation within the restricted frame of inquiry, such as time limitations for experiments. These limitations include, time dedication of group members, temporal limitations for long-term experiments, and limitations in integrating third party expertise necessary for tackling certain problems.

Sharing control and tasks helped to iteratively revise relevance of inquiry contents and process for the co-researchers. However, it also meant that data collection methods proposed by the facilitating co-researcher (e.g., for estimating yields) had to be adapted during the process to better fit data collection into the co-researchers' activity system. This adaptation helped to meet the co-researchers' objective to obtain more data (e.g., yield estimation for the high variety of vegetables cultivated) considering the particular restrictions of the inquiry situation, while the scientific accuracy of data decreased.

Although this highly participatory process fostered co-ownership, the facilitating co-researcher took the role of organizing and pushing the process as a facilitator. A high need for commitment and motivation of co-researchers was noted to sustain agreed targets and related tasks. As the group members shared control over contents and responsibilities for agreed tasks, the facilitating co-researcher was requested to respond with flexibility to changing group dynamics, and also to be open to familiarize and deepen knowledge in emerging topics (e.g., economic farm assessment). This requirement

contrasted with the classical conception of (doctoral) research in the field of agriculture, controlled by academic researchers to earn results in a given field, based on a predefined experimental design. Previous trainings in group facilitation and transdisciplinary research and extension allowed the initiating research to master the given tasks. In this regard, it was observed that the conducted group-based approach with farmers went beyond mere research orientation towards a hybridization of research and extension.

## 2.4 Discussion

In the following we discuss how our case study revealed the potential of co-inquiry to better address the above identified shortcomings of other approaches. On the one hand, the limited roles of farmers and their low levels of control in agroecological research and the limited consideration of farmers' experiential knowledge. And on the other hand, the need to accommodate system thinking and activity-orientation in the transdisciplinary process, and to create learning environments for agroecological farm transitions.

The operationalization of the principles for agroecology research using co-inquiry pointed to the importance of understanding transdisciplinary collaborations as processes of social construction of confident human relations. The group-based and participatory approach implemented in co-inquiry supported trusted relationship building between the co-researchers and the initiating researchers, representing practice and academia. The following statement from one co-researcher underlines the value of the approach for starting a transdisciplinary collaboration:

*To share with you [the co-inquiry group] was great, to start to create real links between academia and practice. I consider that this was achieved. And moreover, the link in terms of confident human relations (...), at the end for me this is most important, the most vital and lasting. This is also a great result (SD121119-Male).*

In (participatory) action research, recognizing power dynamics and collaboration at eye level are critical elements in relationship building (Levitan, 2019). We identified this to be a prerequisite for inclusive processes of contextualized knowledge co-creation, horizontal learning and implementation of actionable solutions both for academic research and (in our case) farming practice, as proposed for agroecology research (HLPE, 2019) as well as for transdisciplinary sustainability research in general (Wittmayer and Hölscher, 2017).

Although in the co-inquiry, the initiating researcher had as a matter of fact a pronounced role in setting the frame of the collaboration, the implemented stakeholder analysis (Lelea et al., 2014) paved the way for creating co-ownership between scientists and farmers. It enabled learning about local (social) context and research demands from multiple-stakeholder perspectives, as well as interest of farmers in the proposed collaboration (Thomas & Wehinger, 2009). After explaining the co-inquiry approach, farmers liked to take over the role of co-researchers and took the leading role in defining inquiry scope and in analysing a particular farm situation. Thereby, they were enabled to actively identify local and farm-specific problems and knowledge gaps regarding agroecological farming, and to develop relevant local and farm-specific research topics. Whereas other approaches for co-innovation in agroecology research are characterised by predefinition of research agendas, lack of participation of farmers in decision-making, and missing consideration of the farmers' activity system in the research (Lacombe et al., 2018), it became evident that co-inquiry attributes a more powerful role to farmers and thereby increases their control in decision-making on topics and methods. Hence, we found that by attributing farmers the role of co-researchers, co-inquiry represents an approach that facilitates the call for democratic definition of research agendas in agroecology research and development (Méndez et al., 2015; Pimbert, 2017).

The increased control by farmers over process and contents were not only achieved through relationship-building and collaborative activities, but also, within the restricted funding frame of the project, through joint decision-making regarding equipment purchase and remuneration of co-researchers for extra tasks. This aspect could be further strengthened in co-inquiry by availing action funds to the co-researchers, as proposed for empowering groups of practitioners in collaborative research (Richardson-Ngwenya et al., 2019).

Engagement of co-researchers in the experimentation stages was not as pronounced as expected and desired by the facilitating co-researcher. This can partly be explained by changing priorities in periods of peak farm workload when co-researchers were not able to allocate as many resources to the inquiry as previously agreed on. However, they still identified with the contents and participated in decision-making, while many tasks were overtaken by the facilitating co-researcher. This shows that co-researchers in co-inquiry can experience a high degree of autonomy both in determining the focus of the collaboration, but also in taking freedom to reduce their

engagement. Here, the required openness of academic researchers using TDR approaches to hand over control to the co-inquiry group (societal actors), and to dive into a dynamic research processes is underlined (c.f., Lang et al., 2012). We showed that when co-researchers (representing practice) take a stronger role and increased control through co-inquiry, co-ownership can be created despite varying levels of engagement in experimentation tasks.

Reflecting on the role of the facilitating co-researcher, we learned that for doing transformative research with societal actors it is indispensable to leave the professional comfort zone (Hazard et al., 2018) by entering a mutual learning process on a par with practitioners. In other words, both parties were required to conduct activities that belong to the respective other activity system. In the present case, co-researchers systematically analysed their farm activity system, engaged in methodological choice, and collected data on a scientific basis. In turn, the facilitating co-researcher participated in farm activities, listened to the farmers' needs and ideas, and shared insights with farmers about his own activity system. Thereby mutual understanding about both activity systems was created. Conceptually, this also means that an overlap area between activity systems of practitioners and academics was created in which joint experimentation and experiential learning was achieved. For instance, this was illustrated in the conducted field experiment for estimating yields: activities of both activity systems (harvesting practice, and trial set-up and data recording practice) needed to be integrated by the group to obtain results. Whereas it profits from activities of both activity systems, operationalizing the co-inquiry highlighted epistemological differences between farmer and academic experimentation (Hansson, 2019). Farmer experimentation makes use of their experience, hence profits from experiential knowledge creation. Farmers' objectives for experimentation are practice-related to solve concrete problems they face, or to test creativity-driven ideas as part of their routine activity system. Here experimentation is directly action-guiding. In contrast, scientific experiments in agriculture are often conducted solely by scientists to understand why and how something works in order to contribute to a wider body of knowledge. Clarifying this difference through co-inquiry can help to increase the relevance of experimentation for farmers in transdisciplinary collaborations (c.f., Di Iacovo et al., 2016), and to address farmers motivation for participation (Charatsari et al., 2017). Furthermore, the shared actions lead to an emergence effect, which is the understanding that individual collaboration partners cannot develop on their own (Schrage, 1991).

The results illustrate that through co-inquiry activity orientation and changes in both activity systems can be facilitated. This relates to negotiation and rearrangement of roles (tasks and responsibilities) as part of the collaboration process (Frank et al., 2018). Thereby, established routines that often hinder co-innovation processes can be revised (Ingram et al., 2020). However, whereas in the dialogical stages, the willingness and motivation of the co-researchers to conduct new activities, such as the situation analysis, was high, operational challenges in the experimentation stages impacted the co-researchers' motivation level. A principal challenge was experienced when data collection tasks were to be incorporated into the farming routine. While routine farming tasks are carried out automatically by farmers, any new task that is to be integrated requires active reorganization of established routines (e.g., change harvest routine by integrating recording of harvested plots; integrate recording of working hours and tasks; implement effective accounting system). The required cognitive change/effort (from automatic action to conscious action) was hindering the integration of these changes. Nevertheless, we found that iteration of reflection and action in co-inquiry facilitated these mental change processes to some extent: by assessing experience made with experimentation activities and by jointly adapting experimentation procedures (Heron & Reason, 2008) to better fit the farming routine and expectations of the co-researchers. We learned that the relevance of inquiry procedures and contents for farmers need to be revised continuously throughout the process.

On the other hand, experimentation and practical implementation, a main limitation of dialogical strategies, was found to be an important source of new knowledge production (Hazard et al., 2018), as activity orientation through on-farm testing and experiential assessment by farmers are essential for analysing potential effects of new practices (Padel et al. (2019). In order to support farmers in this active assessment, mutual understanding about the individual farmers' purposes of farming practice and why and how (or why not and how not) farmers move towards agroecological practices need to be emphasized (Huttunen & Oosterveer, 2017; Noe et al., 2015) to support their transition trajectory. This was facilitated in the co-inquiry when farmers shared their experiential knowing with the co-inquiry group in stage A, and then again when they shared experience gained during experimentation in stage D. Hence, we found that co-inquiry better accounts for the shortcoming of other approaches regarding integration of farmers' experiential knowledge, as highlighted by Baars (2011). Co-researchers valued the co-inquiry as a means to disrupt their farm routine for reflecting and analysing their farm

activities in a peer-group, and to experimentally implement and evaluate improvements based on experience and peer-to-peer exchange. Kilpatrick and Johns (2003) found that experience and the exchange of experience with other farmers is one of the most important source for learning for change. Further, the focus of co-inquiry on practical experience and social learning confirmed to be useful to collaboratively enter a process of concrete problem-solving, including the reframing of parameters and questioning assumptions and values, and thereby responding to the call for reflexivity in transdisciplinary research (Popa et al., 2015).

In order to make use of farmers' experience for knowledge co-creation, we realized the importance of explicitly addressing the farmers practices from an activity system perspective (Kaufmann & Hülsebusch, 2015). This was achieved by the employed participatory tools, encouraging farmers to explain their practices and related experience with problematic issues, success stories, experimental- or other learning situations (both regarding the inquiry contents and process). This led the inquiry group to systematically explore farmers' farming practices and to understand the reasoning behind their purposes and actions. Thereby, systems thinking was encouraged, and participants were provided with practical tools to critically assess their farming activities (Ison & Straw, 2020). This analysis also revealed the purposes of farmers' agroecological farming practice. The purposes then became the outset for defining relevant research problems and objectives. Interestingly, contradicting or conflicting purposes expressed in group discussions finally led to proposals for inquiry topics made by the group. This supports the argument that contradictions are an important source of learning in group processes (Mukute, 2009; Vänninen et al., 2015). For instance, differing attitudes of co-researchers concerning the organizational structure of farm work and the (economic) objectives of the farm project encouraged the proposition to inquire into issues of economic performance. While these differences also led to disengagement of some co-researchers in the experimentation stages, the usefulness of the obtained results was later recognized by sceptic group members, indicating that assumptions were revised based on obtained results.

The approach increased the co-researchers' competences in various ways. From making use of systems thinking for situation analysis to planning of field trials until collection and evaluation of data. Although achieved levels of system thinking by participants was not explicitly measured in our analysis, outcomes of dialogical and visual group activities demonstrated how system

thinking facilitated definition of problems and aims, and propositions how to get there (e.g., Figure 2-2). Further, statements of the co-researchers (Table 1-1) of how group work facilitated system thinking and theoretical assessment of farming practice indicate increased competence in this regard and the potential to operationalize system thinking through co-inquiry.

As indicated above, creating relationships was fundamental to the approach. Conceptually, our results highlight that the operational co-inquiry steps and proposed methods are geared towards satisfying basic psychological needs, such as *autonomy* (joint decision-making, representation of individual goals), *competence* (contribute with own knowledge and ideas to the process), and *relatedness* (being part of a group, connected to the subject of inquiry). As Deci and Ryan (1985) pointed out, the fulfilment of these three basis needs is critical for stimulating/sustaining intrinsic motivation and as also shown by Restrepo et al. (2020) it increases enthusiasm of farmers when participating in transdisciplinary research.

## 2.5 Conclusions

The PAR in agroecology conducted with farmers showed that co-inquiry encourages horizontal learning and knowledge exchange between farmers and researchers and facilitates systems thinking and action to identify and test farm improvements and transition pathways. Testing and monitoring of proposed ideas by the system operators in practice earns better results, when the farming purposes of participating farmers, their activity system and the particular context are considered in a joint explorative assessment. Thereby problems, interests, and ideas for inquiry relevant to them are identified. Moreover, farmers become co-researchers, hence take an active role in deciding on suitable inquiry parameters and methods to set up and monitor experiments or to explore an issue of interest in the practical routine. Particularly, their role in reflective evaluation of process and outcomes leads to contextualization of the findings within their own activity system. This contextualization by farmers, rooted in their practical farming experience, is an important benefit of co-inquiry, as it cannot be done by academic researchers. Thereby an increased relevance of the research and co-ownership for participating farmers is achieved and the general principles of agroecology in research practice are operationalised.

We are aware of the limitations to apply the approach in other settings, where farmers might have less interest and/or capacities to participate in co-inquiry, or where farmers might be demanding more readily adoptable innovations.

These farmers could potentially benefit from knowledge created in co-inquiry processes conducted by their peer farmers when co-inquiry is conducted on monitor farms within a community of practice. Depending on the particular context, interests and available resources, farmers can be limited in integrating experimentation tasks into their farm routine. When co-ownership is achieved through joint decision making, these tasks can be delegated to scientists or technical support staff without compromising the relevance of the research for farmers.

We suggest that one promising target group for co-inquiry in agroecology research is the worldwide increasing number of particularly young farmers (often coming from an urban background and having academic or technical training in the field of agriculture) who settle in peri-urban and rural areas to realize agroecological farming like marked gardening or community supported agriculture. As in the case presented in this article, these farmers are local promoters of agroecology. We found that co-inquiry is promising to support these farmers as important facilitators of agroecological transition processes.

The results clearly showed that in co-inquiry both scientists and farmers need to engage in activities that do not belong to their original activity system. Therefore, the success of the collaboration depends heavily on individuals' ability and willingness to acquaint themselves with the new practices. Hence, skills that are not learned within the original activity system are essential for operationalizing co-inquiry. This partly explains also why such collaborations are still seldom found. We therefore point to the need for training of agroecology scholars in methods for co-learning, and to encourage those scientists already using elements of co-inquiry or similar approaches in their work with farmers or other food system actors, to explicitly refer in their publications to the methods they use to achieve transdisciplinary co-creation of contextualized knowledge in agroecological studies. This would facilitate co-learning between academic peers to advance these methods within the field of agroecology.

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## Chapter 2

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## CHAPTER 3

### **Social innovation for agroecological transitions: studying relationship and role building in transdisciplinary initiatives for local food system development<sup>15</sup>**

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#### **Abstract**

The concept of social innovation (SI) is gaining attention in agroecological transition research to study how local multi-stakeholder initiatives establish new social practices for transition support. Considering first retrospective studies about outcomes of SI, this study addresses the gap of lacking case-specific insight views of how new relationship and role building occur, and how co-development of social practices can be facilitated. We conducted qualitative process-oriented action research in a three-year transdisciplinary process to set up a Participatory Guarantee System in Northern Patagonia, Argentina, with the objectives to i) systematically document the process and analyse ambitions to change relationships; ii) identify strategies implemented to facilitate change relationships; and iii) analyse changes in role understandings and enactment. Results show that SI evolved when narratives of change about social needs and pathways for change in relationships and roles were shared in different facilitated stakeholder environments, and a socially constructed mandate for support institutions was created for coordination. Building new relationships was facilitated by strategies of trust-building, co-development of rules, horizontal decision-making, and novel work methods. Change in role understanding and enactment was found crucial, as participating groups needed to expand their activity system towards new tasks and responsibilities. Enactment of expanded roles was restricted when individual benefits were uncertain and delayed, highlighting the need to articulate and elaborate on role expectations at the outset of SI. The study provides transferable insights about how transdisciplinary approaches can facilitate SI in local transition initiatives to develop new social practices in the support of agroecological transitions.

**Keywords:** participatory guarantee system; transdisciplinary research; narratives of change; stakeholder environments; role concepts

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### 3.1 Introduction

Transformations towards sustainable food systems are considered a mayor challenge for current and future human development. Agroecology is proposed as a guiding concept for food systems' transitions, comprising *socially driven innovation* in sustainable agricultural and food practices, regional ecological and economic cycling, and local actor governance for food sovereignty. Whereas in other fields of development and innovation research *social innovation* has extensively been studied and conceptualized as a critical driver for social change (i.e., Bock, 2016; Campopiano & Bassani, 2021; Moulaert, 2013; Neumeier, 2012; Rajasekhar et al., 2020), only recently it is gaining attention in the field of sustainability transformation research (i.e., Haskell et al., 2021; Backhaus et al., 2017; Desa & Jia, 2020), and agroecological transition studies (i.e., Chiffolleau & Loconto, 2018a). Sustainability transformation research seeks to solve 'wicked problems' regarding the identification and support of leverage points for changing social practice in the development and operationalization of workable strategies for food systems' sustainability transitions (Herrero et al., 2020; Wojtynia et al., 2021).

Commonly used theories in agricultural and food systems' sustainability transitions suggests that change needed in production, food supply, consumption and institutional rearrangements evolves in innovation niches, where actors co-innovate alternative practices, technologies and institutions (Moors et al., 2004; Pigford et al., 2018; El Bilali, 2019b). Wezel et al. (2016) and Anderson et al. (2021) theorize that agroecological territories are important places where innovation niches develop and expand when relevant actors are put at the centre of attention in the development of sustainable farming, conservation, and food practices. Local food actors (such as producers, consumers, and support organizations) are considered critical drivers of transition in local food systems (Wezel et al., 2016). The call for actor-orientation, agency, social mobilization and new forms of local governance point to the pronounced role of organizational, institutional and social change needed (Anderson et al., 2021), and further questions the widespread focus on technological innovation in agriculture and food systems for change (Röling & Wagemakers, 2000). Applied to local agroecological food systems' transitions, innovation niches manifest in alternative food networks (see Elzen et al., 2017 for different examples), creating direct consumer-producer linkages (Opitz et al., 2017), sustainable consumption practices

(Jaeger-Erben et al., 2015), and providing learning and governance strategies for food sovereignty (Pimbert, 2017).

Successful multi-stakeholder approaches in innovation niches are based on new and/or reconfigured social relations, organizations, and institutions, hence outcomes are considered *social innovations*. Although there is no single agreed definition of social innovation (Eichler & Schwarz, 2019; Avelino et al., 2019), the definition of social innovation as a '*process that involves a change in social relations, involving new ways of doing, organizing, framing and/or knowing*' by Haxeltine et al. (2017) is used in various fields of application. Central to the process is '*a new combination and/or new configuration of social practices in certain areas of action or social contexts*' (Howaldt & Kopp, 2012). The new social practices produce solutions (products, services, models, markets, processes, etc.) that: i) satisfy social needs (content/product dimension), ii) lead to better relationships between actors (process dimension), and iii) improve capabilities of actors in sustainable use of resources (empowerment dimension) (Caulier-Grice et al., 2012; Moulaert, 2013).

Applied to agroecological transitions, the above three characterizing dimensions of social innovation can be found in the recently consolidated principles of agroecology at the food system level. The principles of *connectivity, participation, governance, co-creation of knowledge, social values, and fairness* (Wezel et al., 2020) provide normative guidance for required changes of social practice (social innovation) in agroecological transitions. Both the concept of social innovation and the concept of agroecology are based on the recognition of complexity, context-specificity, and actor-orientation as critical components of change processes (Avelino et al., 2019; El Bilali, 2019a; Juárez et al., 2018). To gain better understanding of processes and outcomes of social innovation in agroecology transitions, specific cases need to be assessed from an actor and social practice perspective within their specific context (Chiffolleau & Loconto, 2018a; Haskell et al., 2021; Kluvankova et al., 2021).

For this purpose, some empirical studies used theoretical frameworks of social innovation to analyse agroecological transition processes. They reveal the different ways in which concepts of social innovation can help identify and assess social practices that are developing in niches and in relation to agroecology transitions. Specific agroecological niche approaches were assessed by, for instance, Mert-Cakal & Miele (2020), who studied Community Supported Agriculture to show how the approach addresses social innovation,

and identified factors that enable and constrain its transfer to macro-scales in a national context. From the international agroecology movement perspective, Juárez et al. (2018) identified burdens and potentials experienced by activists at the interface between global and local action, in their work to change the food regime through transformative social innovation. Structures of regional civic food networks in Brazil and how they gradually provoke changes in the food environment through changes in multiple-actor relationships were studied by Coehlo de Souza et al. (2021).

Participatory Guarantee System (PGS) is another relevant actor-oriented niche approach in the support of agroecology transitions that is increasingly implemented around the globe, only recently gaining attention by social innovation research. In its origins, PGS are locally focused quality assurance systems for smallholder production systems, alternative to third party organic certification to reduce certification costs and bureaucracy for farmers, and to assure stable access to markets (Källander, 2008). Broader conceptions situate PGS in participatory social change processes in the development of local production and marketing mechanisms, food security, direct producer-consumer linkages, peer-to-peer learning, empowerment for local food system governance and improved natural resource management (Home et al., 2017; López Cifuentes et al., 2018). A global study on PGS showed that multi-stakeholder platforms established through PGS can play an important role in fostering spin-off social processes of collective action for territorial development, e.g., sharing information on new practices, collective marketing and seed management, micro credit systems, socialized pricing or locally committed consumer groups (Bouagnimbeck, 2014). Studies assessed potentials and constraints of PGS from general social perspectives (Bouagnimbeck, 2014; Cuéllar-Padilla & Calle-Collado, 2011), or more specifically regarding capacity building (Binder & Vogl, 2018), empowerment (Home et al., 2017), institutional change (Niederle et al., 2020), implementation of agroecological principles (Hirata et al., 2019), or motivation for participation (Hruschka et al., 2021; López Cifuentes et al., 2018). Only few studies assessed PGS based on the concept of social innovation, e.g., studying potentials of direct consumer-producer relationships (Alberio & Moralli, 2021), agroecology network development (Rover et al., 2017) and producers' motivation for participation and choice of PGS instead of third party certification (Sacchi, 2019).

Common to the above empirical studies of social innovation in agroecological transitions in general, and related to PGS, is that they analyse social innovation

from a retrospective ‘outside’ perspective, hence they study initiatives (single, or multi case studies) that are already established, although at different stages of maturation. Whereas retrospective analysis contributes to the understanding of innovations, hence primarily of the outcomes of the innovation process (Pettigrew, 1997), the analysis of *how* social innovation occurs through new relationship building requires perspectives ‘from within’ (Akrich et al., 2002) and ‘in the making’ (Chiffoleau & Loconto, 2018a; Kluvankova et al., 2021). Relating to PGS, the above studies analysed institutional, organizational, and learning related aspects and challenges to show how PGS potentially or already contributes to agroecology transitions through satisfying social needs and *changed relationships between actors*, their empowerment, and new institutional arrangements. However, they do not provide satisfactory empirical insight-view explanations about *how changes in relationships between actors* occur and how the co-development of multi-stakeholder social innovation initiatives are facilitated to support agroecological transitions.

Ambitions for changing relationships of a social innovation initiative to facilitate agroecological transitions can be revealed by analysing narratives of change, co-developed during the innovation process, to understand arguments for change (problem narratives), ideas of how to change (solution narratives), and power narratives (‘who can’ narratives) (Wittmayer et al., 2019). The analysis of strategies and activities implemented by an initiative based on the above narrative framing provides insights into new ways to facilitate changes in relationships in the support of sustainability transitions (c.f., Haxeltine et al., 2017). To further analyse how changes in relationships occur, Wittmayer et al. (2017) proposed the concept of *roles*. They argue that changes in actors’ single roles and role constellations can provide new opportunities in multi-actor collaboration for transitions, as roles are ‘*socially constructed and therefore open to negotiation and change*’. They further theorize that changes in role understandings and respective enactment of roles by actors can be taken as an indicator for changes in relationships and new forms of governance in multi-actor collaboration. The authors call for empirical grounding to analyse actors’ roles in social innovation for transitions.

In the framework of a transdisciplinary research project that explores local agroecological transitions pathways in Argentina, we addressed the above issues within an empirical case study on the transdisciplinary development and implementation of a PGS from a social innovation perspective. The overall

aim was to study ‘from within’ and ‘in the making’, and thereby to provide insight views of how social innovation in support of agroecological transitions in a local food system and related changes in relationships and understanding and enactment of individual roles and role constellations occurred. Our work approaches *roles* as recognizable activities (*tasks and responsibilities*) of social groups in a specific social context (farmers and processors, consumers, lecturers, researchers, extension workers). Based on a qualitative action research approach, we use systematic process documentation of setting up a PGS and participants’ perceptions to reveal how social innovation evolves, how relationships and roles between actors change, and which implications this has for the facilitation of social innovation, and for the support of social innovation as one key trigger for and driver of agroecological transitions in local food systems.

For this purpose, our three specific objectives were to: i) systematically document the transdisciplinary process and involved reconfigurations of relationships, and to analyse narratives of change co-developed by the stakeholders involved to reveal ambitions of the initiative to change relationships; ii) identify implementation strategies and activities conducted by the initiative to assess how ambitions were operationalized in practice, and which actions were taken to facilitate change relationships; and iii) identify changes in role understandings and enactment of roles, as perceived by the participating stakeholder groups, and to assess implications of role changes for improved agroecological transition support.

## 3.2 Materials and methods

### ***Study location***

The case study was conducted in the Andean valley region *Comarca Andina del Paralelo 42*, a territory between parallels 41°30' and 44°55' South, and 71°20' and 71°42' West of the provinces of Río Negro and Chubut, Argentina. The human population has been growing rapidly in the region over the last decades, due to high national and international migration fluxes. The territory counts several dispersed and rapidly growing urban and peri-urban centres, connected by a strong flow of labour, goods, and capital. Surrounded by mountainous forest landscapes, diverse agricultural production (fruits, vegetables, hops, cereals, and small to medium animal production with varying intensities) takes place in the productive valleys and on terraces. Local food consumption relies to a large extent on imports from other regions of the country, although, whenever possible, parts of the population choose

local products and thereby engage in sustainable consumption practices. According to Cardozo et al. (2022), there are 2600 farmers in the study region, out of which 96% work on a small scale for family consumption and/or selling of surpluses. Farms are characterized by mixed small and some medium scale production systems, under conventional management and a growing number under agroecological management approaches, such as organic farming, market gardening, community supported agriculture, community gardening and small farms for self-consumption (Frank et al., 2020). Local products are usually sold via direct marketing (on-farm, social media, home delivery and farmer markets), local retailers and informal bartering.

Such farming and food practices are situated in the national context of Argentina, where land-use dynamics provide a distinct example of rapid land-use change from diversified small and medium size farming, to large scale monoculture and export-oriented agro-industrial systems, including vast conversion of natural forest and grassland biomes (see e.g. Carreño et al., 2012; Grau & Aide, 2008; Satorre, 2005). Moreover, in the context of a persistent economic crisis and negative effects of the COVID-19 pandemic, including raising inflation, poverty, and unemployment indexes (e.g., Donza, 2022; Harari & Bil, 2022), alternative livelihood strategies are developing (see e.g., Frank et al., 2022a; Gras & Hernández, 2021).

### ***Transdisciplinary research approach***

The study region was chosen in the framework of a transdisciplinary research project that explores transition pathways toward agroecological farming in Argentina. The region can be considered as a niche where farmers experienced in organic and agroecological management and new agroecological farming and food projects, as well as institutions that focus on agroecology, are present. One such facility is the recently established research institute for agroecology, the undergraduate study program on agroecology (unique in the country), and the technical study program on organic crop production at the National University of Rio Negro. These circumstances were expected to facilitate the implementation of the transdisciplinary approach. Following the general research steps established for transdisciplinary research processes, which are problem formulation and team building, knowledge co-creation, and reintegration of newly gained knowledge into academic and real-world practice (Christinck & Kaufmann, 2018), this study builds on a previously conducted stakeholder and problem analysis which was carried out to identify relevant research issues and practical problems and solution-oriented ideas articulated by local stakeholders (Frank et al., 2020).

### ***Participating stakeholder groups***

Considering that *relevant stakeholders* are those who have interest in, are affected by, or have the power to facilitate or constrain innovation or change (Lelea et al., 2014), the stakeholders who actively participated in the PGS development engaged in the process voluntarily, due to their interest in and expected benefits from the process and outcomes (Table 3-1). In food systems, actors often play multiple roles (e.g., all humans are food consumers), hence they can collaborate in representation of different stakeholder groups. In the PGS development process (see result Section 3.3 for detailed documentation), several individuals, such as students or lecturers, were also producers, or participated as consumers. Therefore, in every group activity, participants were asked to explain which stakeholder group they were representing.

### ***Collection of qualitative materials***

Given the explorative and action-oriented research approach, the first author participated as facilitating researcher (Estensoro, 2015) in the PGS initiative from December 2018 to December 2021. He collected the materials for qualitative analysis during the diverse group activities (see result Section 3.3). All dialog-based activities (meetings and workshops) were audio-recorded with previous permission of all participants, clarifying the use of strictly anonymized records for the present research purpose. Information obtained by different participatory group work tools implemented during the above activities were used for analysis (rich picture, brainstorming, problem ranking). Memos, field notes and participant observation were used to feed information into the chronological documentation of the PGS development process under study, to reflect on the process, and to document observations from those activities that were not audio-recorded. These were facilitation group and board meetings (during 2018/19 on a weekly basis, during 2020/21 monthly), farm visits (n=10), and assemblies (n=2).

### ***Qualitative analysis***

Audio recordings of multi-stakeholder meetings (n=7) and workshops (n=5) in Spanish language (17:30 hours or records) were transcribed using a basic transcription mode to completely transcribe the literal content. Transcripts were then introduced into a qualitative data analysis software (ATLAS.ti) for qualitative content analysis, a flexible but structured method for qualitative-interpretative analysis of (text) material. Qualitative content analysis consists of systematic analysis of documented communication, based on certain rules and led by theory (Mayring & Fenzl, 2014).

Table 3-1 Representation and initial incentives of stakeholder groups participating in the PGS initiative

Stakeholder group	Description	Number of representing individuals (range per group activity)	General incentive for participation
■ Producers	Small to medium farmers (horticulture, animal husbandry, beekeeping, herbs, wild collection, berries, and fruits) and processors (marmalade, mustard, juices, vinegar, pasta, cosmetics, essential oils, cheese).	Varying (5 – 20)	Become direct user of the PGS/ support local market development
■ Consumers	Local residents with varying socio-economic background (not systematically assessed). Generally, with some previous interest in sustainable consumption.	Varying (2 – 50)	Become direct user of the PGS/ support local market development
■ Students	Students of the study programs agroecology (graduate) and organic vegetable production (technical degree); one student from audio-visual media study program.	Varying; 4 permanent (4 – 8)	Obtain practical experience in their field of study, social work assignment within study program
■ Lecturers	Director of the study program organic vegetable production. Other lecturers (horticulture, beekeeping, aromatics)	1 permanent; 2 sporadically (1 – 4)	Support students; interest related to their academic activities
■ Researchers	First author; PhD scholar in agroecology research and two supervisors (co-authors and supervisors)	1 Permanent; 2 for backstopping	Conduct transdisciplinary research as part of PhD project
■ Extension	Employees of the local state extension agency for agriculture	Sporadically (1 – 2)	Facilitate local agricultural development projects

Category development for the systematic documentation and analysis of the process, and the derivation of narratives of change was guided by analytical questions proposed by Haxeltine et al. (2017), addressing: i) documentation of social innovation initiative and involved reconfiguration of relationships (codes: doing, organizing, framing, knowing); ii) ambitions to change social practice in the support of sustainability transitions (codes: arguments for change, ideas for how to change, power to change); and iii) implementation strategies and concrete actions to succeed (deductive concepts: roles, trust,

rules, decision-making, work methods). Role perceptions and definitions were deduced from the collected material, differentiating between the participating stakeholder groups, including participant observation regarding actual enactment and challenges for enactment. The analysis draws on multi-stakeholder dialogues and collective activities developed over a period of more than three years of intensive collaboration, to provide contextualized in-depth results and explanations of and relationships between observed phenomena (Guzmán & Rist, 2018), accounting for the context-specific nature of social innovation, and transdisciplinary collaboration in general (Lang et al., 2012).

### 3.3 Results

#### ***Reconfiguration of relationships: social innovation in the making***

The systematic documentation of the Participatory Guarantee System (PGS) development process (time reference: December 2018 to December 2021) provides the basis for assessing the innovation process, and for understanding how new relationships and social practices evolved. The documentation presents a detailed picture of the non-predetermined process, in particular illustrating key activities conducted, involvement of stakeholder groups in the different co-development phases and activities, and respective key objectives pursued (Figure 3-1).

Linkages between stakeholder groups, needs assessments, and initial ideation of a PGS as a strategy for collaborative action to support local agroecological food system development evolved in the pre-project phases, basically in three different situations, representing different stakeholder environments. The first situation was a multi-stakeholder innovation platform, initiated by the local state extension agency for agriculture to incentivize exchange and learning about agroecology at the local level (producer – extension – research – academic study environment). Here, different stakeholder groups started interacting through expert presentations, dialogue, discussion, and practical on-farm demonstration activities: i) farmers and processors, hitherto referred to as producers, with interest and practical farming experience in agroecology; ii) state extension officers; iii) students and lecturers of the undergraduate study program agroecology at the local university, and researchers (first author; with backstopping support by the co-authors). The second situation took place when the students and lecturers of the above study program went through a theoretical learning process in the framework of a study module about third party certification schemes for organic agriculture and about

alternative group certification systems, such as PGS (academic study environment).

The third situation evolved during the initial step of the transdisciplinary research project (stakeholder analysis; see methods in Section 3.2) conducted by the first author (research – local food system actor environment). Both in the interactions on the innovation platform and during stakeholder analysis, producers shared their problem situations regarding agroecological farming and marketing practices, and their interests and ideas for institutionalizing collective efforts to support agroecological farming and food practices at the local level (see Frank et al., 2020 for details).

Based on the problem and idea framing within the three different multi-stakeholder environments, interests of the different involved stakeholder groups in PGS co-development were identified and shared, giving the impulse for students, lecturers, and researchers to establish a facilitation group to pursue and coordinate the shared interest. For this purpose, in addition to the producers who had participated in the previous activities, a larger group of local producers, and in particular local consumers, were invited through massive public announcements (i.e., flyers, explanatory videos, social media, radio, personal invitations,) to participate in informative meetings about the PGS concept (see Figure 3-1; intro meetings). Consumers had not been represented in the above stakeholder environments, therefore they were included into the process at this stage. However, consumers' needs, and interests were at the centre of the pre-project dialogues, as consumers' views are implicitly represented in and inherent to all forms of human dialogue relating to local food production and consumption. From the outset, participation in the facilitation group was open to all stakeholder groups, however, the continuously committed working group consisted of students, lecturers and the first author.

As illustrated in Figure 3-1, the further process included a series of group activities, organized, and moderated by the facilitation group, with some logistical and monetary support provided by the state extension office, and involving different stakeholder groups, according to the respective objectives of activities. The introductory meetings (intro meetings) with producers and consumers and subsequent disaggregated meetings with producers/consumers only (follow-up meetings), served to conduct a detailed status-quo problem analysis. Here, challenges related to local farming and food practices from the farmers' and consumers' stance were discussed, in light of perspectives about how a PGS could contribute to solving key problems, and

about how to identify and implement creative ideas for local agroecological transitions.

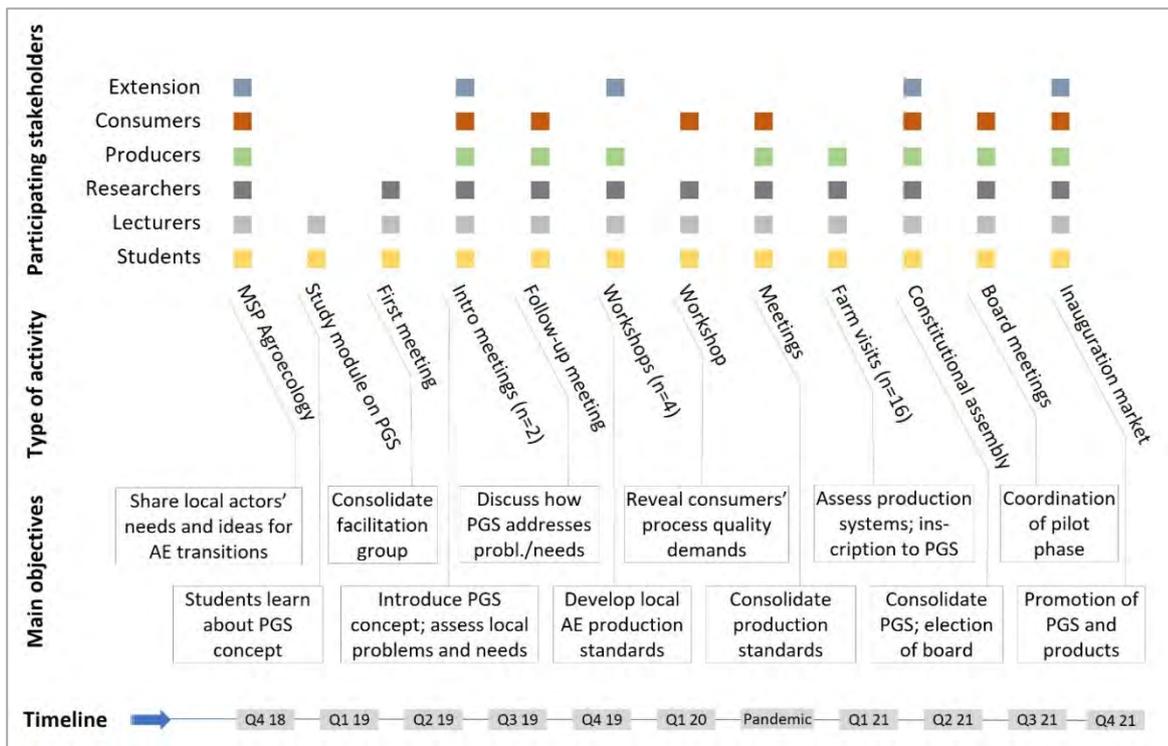


Figure 3-1 Systematic documentation of the PGS co-development process

In continuation, a series of thematic workshops was conducted, where adapted production standards for local agroecological production were co-developed with producers representing different production segments, such as crop production, animal production, and processing. Simultaneously, identification of process and product quality expectations of local consumers was addressed in a consumer workshop, to feed the co-development of standards, and to incentivize consumers' engagement in the PGS development and implementation process. Drafted production standards were consolidated in a multi-stakeholder meeting with participation of all involved stakeholder groups (except for extension, as they were not available).

In continuation, the facilitation group, with sporadic active participation of producers and consumers, drafted the organizational and regulatory structure for the PGS, and organized field visits to farms and processing sites of producers interested in taking part in the PGS. Participation in the field visits was open to all interested stakeholder groups, following the objectives to: i) conduct a basic farm characterization using a structured questionnaire to document quantitative and qualitative farm information; ii) discuss problems

and future management ideas of producers, based on the developed standards; iii) formally inscribe interested producers into the PGS; and iv) promote experience exchange and mutual learning. Thereafter, the formally integrated group of producers and representatives from all other involved stakeholder groups officially founded the PGS in a constitutional assembly. Here, the draft production standards and organizational and regulatory documents were finally consolidated in group work and adopted in plenary. A PGS board, including representatives from all participating stakeholder groups, was elected, and the name and the logo for the PGS were selected in a participatory process. During the first pilot phase of the PGS, as of May 2021, the PGS board started working on administrating the subscription of other interested producers, and by organizing and participating in diffusion events, such as farmer markets, and stands at different local and regional fairs. Furthermore, representatives of producers, students, lecturers, researchers, and extension participated in regional and national PGS exchange meetings, and agroecology congresses.

### ***Ambitions for changing relationships: narratives of change***

Information exchanged in multi-stakeholder interactions during the PGS co-development process was analysed to deduct narratives of change, helping to understand the ambitions of the initiative to change relationships, and the underlying reasoning. The narratives elucidated ambitions for changing relationships between the participating stakeholder groups in the support of agroecology (Figure 3-2). Statements by the different stakeholder groups pointed to: i) the problem situation of missing formalized relationships between local food actors; ii) ideas for how to improve institutionalization of relationships and role definitions through a PGS; and iii) conditions needed for the initiative to trigger change regarding relationship-building, participation of different groups, and decision making.

The narratives describe the need for reconfiguring existing and for building new relationships and social practices to put into practice the technical/production related ambitions, namely: i) the definition of locally adapted ecological production standards, ii) the differentiation of ecological products through labelling, iii) the provision of new incentives for local producers to sustain, improve, and expand ecological production, and iv) to

provide healthy and local food to consumers through improvements of process and product quality of local production.<sup>16</sup>

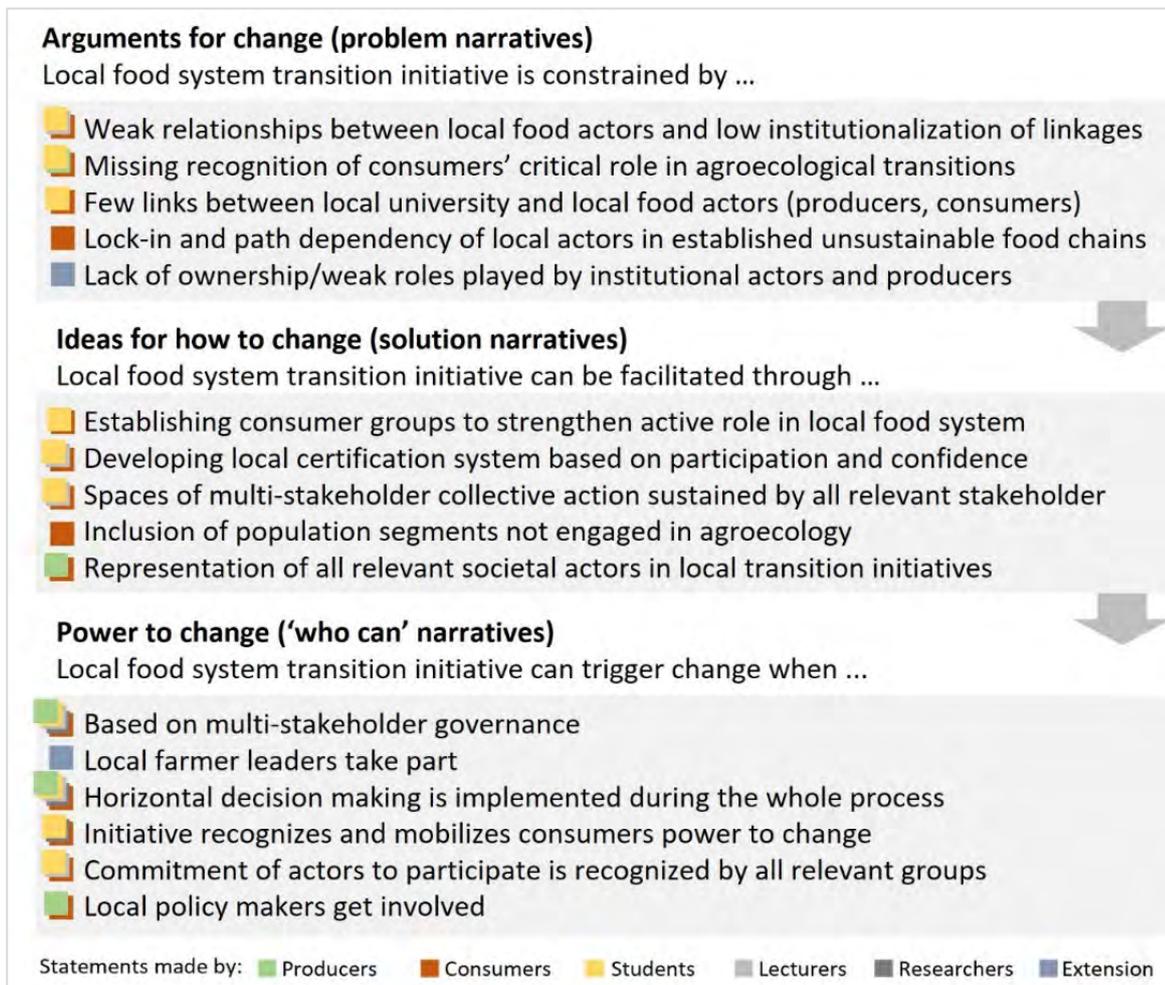


Figure 3-2 Narratives of change 'institutionalization of relationships'

In other words, the narratives about institutionalization of relationships (see Figure 3-2) explain that the multiple stakeholder dialogues highlighted the assumption that social innovation is a precondition and vehicle for changes in farming practice, consumption practice, and development support practice (extension, research).

In turn, weak social innovation capacity was perceived as a major constraint for local food-system transitions. Statements made by consumers only

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<sup>16</sup> Co-development of narratives of change regarding production, marketing, and consumption related issues were central part of the documented process (output: co-developed agroecological production standards, and certification scheme), but not included in the analysis that emphasized on the social innovation process.

indicate the importance of their representation and perspectives in the development of narratives of change.

***Facilitating change in relationships: implementation strategies***

In addition to the narrative of change, the analysis led to the classification of rationales for needed changes in relationships to successfully implement the PGS. With rationales, we refer to the co-developed reasoning, i.e., aims and expected effects framed by the initiative to develop the specific course of action. To each rational, strategies and implementation activities were assigned to assess how the aims to achieve expected effects were transformed by the initiative into concrete strategies and activities at the operational level (Table 3-2). The classification shows that change in relationships was addressed through strategies and activities to *(re-)define roles*, to *build trust*, to establish *accepted rules* and *decision-making structures*, and to *implement new work methods*.

As illustrated in Table 3-2, strategies to facilitate relationship building were employed through collaborative action and collaboration at eye level during the *co-development process*, supported by group facilitation methods. Moreover, the aspect of new relationship building was reflected in the *outcomes* of the process, namely the trust-based peer-to-peer certification mechanisms established through the PGS. At all stages, the process was open to all stakeholder groups interested in taking part, supported by massive public announcement of activities. Mixed-stakeholder activities were prioritized to foster relationship- and trust-building, and moderation methods were employed to allow all stakeholder groups (in particular producers and consumers) to actively engage and bring in their perspective and knowledge in discussions and decision making. Activities ‘out of the classroom situation’, such as meetings and assemblies on member farms and production sites, and interactions at farmer markets organized by the PGS initiative, were valued by all groups as a strategy to encourage relationship building through informal and vivid production-related demonstration and dialogue in-situ.

All participating groups perceived that relationship-building was supported by the shared understanding that the collaboration process is an opportunity to mutually learn about current problems in the local food system, agroecological food production and farming practices, and about new ideas for multi-stakeholder transition support approaches. Consensus-based and horizontal process planning, development of rules (standards, certification rules and sanctions), and decision-making were perceived as helpful to

challenge power asymmetries, as different perspectives, needs, and ideas are represented and negotiated.

Common to the strategies developed and activities conducted is that they were all geared towards stimulating participation and ownership through group governance by the PGS users. Participation, ownership, and group governance were underlying concepts employed to support relationship building.

During group reflections made at different stages of the process, some challenges which hindered relationship building in the implementation of the above strategies were identified. Firstly, the lack of continuous participation in activities by the same producers and consumers was perceived by the facilitation group as a burden to build stable working relationships and to perpetuate group governance. From the producer and consumer perspective, the analysis revealed that they generally appreciated the co-development and bottom-up approach, based on new confident human relationships (trust as the central component of PGS), to create proximity within their peer groups for local marketing, learning, and collective action in the support of agroecology.

However, some producers' statements and observed behaviour revealed their perspective that the purpose of the newly established relationships was mainly to define a clear mandate for the support institutions to operate the PGS, based on the social needs and ideas framed by producers and consumers. This perspective helped the facilitation group to revise their objective of achieving active participation in all aspects, and to take the mandate as normative basis to advance the operationalization of the PGS.

All participating groups underlined the need for building relationships with the local political decision-makers. This was emphasized through invitations of officials at different stages and by increasing public visibility of the PGS through diffusion strategies. Participating groups further complained the absence of political representatives in the process, despite their relevance (power) in anchoring the PGS in legal and policy terms. Local policy makers and food safety authorities did not show interest in actively participating in the co-development process, nor did they show openness to receive the proposed mandate formulated by producers and consumers (e.g., through providing public policies or funding in the support of the PGS objectives). However, during the process, some interest and support declarations were

received from individual representatives of these groups, showing the social innovation potential of the PGS by influencing the wider institutional context.

***Role understanding and enactment: supporting agroecological transitions***

Despite the identified rationales and underlying concepts, levels of commitment of producers and consumers varied greatly during the entire co-development process. This was further explored by analysing changes in role understanding and enactment of new roles (tasks and responsibilities).

Table 3-2 Rationales linked to implemented strategies and activities

Cat.	Rationales		Strategies and actions implemented
	Aims	Expected effects	
<b>Roles</b>	<ul style="list-style-type: none"> <li>- Relevant stakeholders are included, and shared understanding of roles developed (distribution of tasks and responsibilities and alignment of expectations and willingness/capability to assume assigned roles)</li> </ul>	<ul style="list-style-type: none"> <li>- Local support and acceptance of PGS is assured through inclusion of relevant stakeholders</li> <li>- Producers, consumers, and local institutions actively participate in the development and operation of the PGS</li> </ul>	<ul style="list-style-type: none"> <li>- Distribution of tasks and responsibilities in meetings and workshops</li> <li>- Reflecting on roles during meetings and assemblies to align expectations and willingness/capabilities</li> <li>- Provision of opportunities to everybody who wants to contribute to get involved</li> <li>- Highlighting the need for continuous participation in activities to make the PGS work</li> </ul>
<b>Trust</b>	<ul style="list-style-type: none"> <li>- Trustful relationships within and between stakeholder groups are built (in particular between producers, and between consumers and producers)</li> </ul>	<ul style="list-style-type: none"> <li>- Consumers and producers rely on the PGS and become promoters in their peer-groups</li> <li>- New learning opportunities when problems are frankly shared among producers</li> </ul>	<ul style="list-style-type: none"> <li>- Co-development of transparent and documented structures and processes (production standards, PGS regulations)</li> <li>- Multi-stakeholder meetings to share expectations towards PGS and for group-building (participatory tools)</li> <li>- Cross farm visits with consumers and peer producers to build trust for learning and improved compliance with standards</li> <li>- Multi-stakeholder PGS board</li> </ul>

Continued next page.

<b>Rules</b>	<ul style="list-style-type: none"> <li>- Adapted and accepted rules for PGS are co-developed and implemented in local practice</li> <li>- Level of bureaucracy is adapted to demands of PGS group (reduced bureaucracy)</li> </ul>	<ul style="list-style-type: none"> <li>- Increased acceptance and ownership over processes and contents of stakeholder groups</li> <li>- New social institutions establish (group-based certification scheme; agreed rights and obligations)</li> </ul>	<ul style="list-style-type: none"> <li>- Co-development of adapted and accepted rules during workshops and in assembly by the user group (using principle of consensus)</li> <li>- Group-based co-development of standards and organizational regulations, adaptation, and consolidation in assembly</li> </ul>
<b>Decision-making</b>	<ul style="list-style-type: none"> <li>- PGS is based on horizontal and consensus-based decision making</li> <li>- All stakeholder groups have proportional vote in assembly</li> </ul>	<ul style="list-style-type: none"> <li>- Ownership and acceptance of decisions is enhanced</li> </ul>	<ul style="list-style-type: none"> <li>- The PGS is sustained by a horizontal organizational structure</li> <li>- Moderated discussion for consent-building</li> <li>- All stakeholder groups vote for representatives from the different groups to be elected for the PGS board</li> </ul>
<b>Work methods</b>	<ul style="list-style-type: none"> <li>- Work is conducted effectively in mixed groups</li> <li>- Enhanced participation is achieved</li> <li>- Enabling learning environments are established</li> </ul>	<ul style="list-style-type: none"> <li>- Increased participation of producers and consumers</li> <li>- Participants change from defensive towards proactive involvement (from mistrust towards mutual support)</li> <li>- Co-learning, evaluation and advice takes place on farms and producer markets</li> </ul>	<ul style="list-style-type: none"> <li>- Co-development of work mode and proceedings during activities</li> <li>- Use of participatory methods to facilitate interactive and creative group work</li> <li>- Use new places for meetings and exchange between stakeholder groups (e.g., farm visits, producer markets)</li> <li>- The PGS co-development process itself involved extensive learning about how to work in self-organized groups</li> </ul>

The analysis of statements made by participants (representing the different stakeholder groups) showed that shared role understanding by all groups referred to the responsibility (and right) to take part in the horizontal decision-making at all stages and to be represented in the PGS board. When it came to the identification and distribution of tasks and responsibilities necessary to operate, further develop, and promote the PGS, self-perceptions of roles by the different groups indicated changes in role understanding (Table 3-3). All

groups highlighted that the illustrated changes were needed, generally, as they helped institutionalizing the former scattered relationships between the participating stakeholder groups in the support of agroecological transitions in the local food system (see narratives of change in Figure 3-2).

More specifically, producers and consumers perceived changes about taking roles beyond their core activity system. For producers, this change involved becoming active change agents beyond the farm gate, for consumers, it was to assume a prosumer role in the local food system. In particular, the expanded role of producers and consumers pointed to their active involvement in the definition of social needs and contextualization of demands to: i) support more agroecological production, marketing and consumption practices and ii) increase the representation and active involvement of these groups as drivers of change, by implementing new practices, modelling how production, marketing and consumption can be done differently when based on the principles of agroecology, and by promoting success stories and learnings experienced in the local food system.

Students' statements indicated that they expanded their role understanding from being academic classroom learners, towards taking on leader tasks and responsibilities in the administration of the PGS, becoming facilitators of PGS group activities, and building extracurricular capacities by conducting a collaborative "real world" process with other local food actors. Furthermore, they explained that the role changes helped revise theoretical assumption through practical experience, to take the lead in transforming theoretical ideas into locally adapted innovations, in the support of agroecological transitions, to learn from producers about agroecological management and challenges in practice, and thereby to be better prepared for the requirements of their future profession as experts in agroecology.

Lecturers and researchers perceived changes towards transdisciplinary integration of the academic environment into local food system change initiatives, in terms of formal institutional attachment of the PGS to the university and by using the PGS as a platform for the transdisciplinary definition of research questions relevant for advancing agroecology in the local food system and beyond. Furthermore, the researcher, by co-facilitating the process with students and lecturers, and by simultaneously doing action research 'from within', engaged in the process at the interface between academic research and societal change processes, proposed for transformative research in general, and for agroecological research in particular.

Table 3-3 Role understanding by participating stakeholder groups

Role conception: <span style="color: green;">■</span> Producers <span style="color: orange;">■</span> Consumers <span style="color: yellow;">■</span> Students <span style="color: grey;">■</span> Lecturers <span style="color: darkgrey;">■</span> Researchers <span style="color: blue;">■</span> Extension	
<span style="color: green;">■</span>	Co-develop production standards; produce and market agroecological products complying with agreed standards; promote PGS through use of logo, on-farm information for peers and customers, participation in PGS markets and cross-visits, and promotion within their grassroots organizations (marketing groups, farmers associations); provide experience-based peer-to-peer transition support; collaborate with research and extension to co-create knowledge about agroecological practices.
<span style="color: orange;">■</span>	Co-develop production standards with producers; organize cross-visits together with students; learn about how food is produced and building trust by taking part in cross-visits; promote PGS and healthy, local and seasonal consumption in their consumer peer groups; recognize power to make a difference through individual purchasing decisions (local economy, cleaner local production).
<span style="color: yellow;">■</span>	Coordinate and administrate PGS (secretary); facilitate group meetings; use and expand their outreach and contributions to local civil society change processes to promote agroecology and PGS; learn from “real world” multi-stakeholder collaboration (processes and contents) for future professional career.
<span style="color: grey;">■</span>	Coordinate PGS development; facilitate group processes; formal anchoring of PGS in the university organization; build relationships with civil society through PGS; provide knowledge (certification systems, production) for definition of standards; identify problems and research questions, relevant for producers.
<span style="color: darkgrey;">■</span>	Provide methodological guidance and facilitation of PGS development; co-produce and share science-based knowledge from the PGS process, and identify problems and further research questions, relevant for local actors and for agroecological transition research.
<span style="color: blue;">■</span>	Provide institutional and logistical support of PGS and activities (link with governmental institutions to support PGS at the local legal and policy level)

The analysis showed that role understanding and enactment was overall congruent in the case of students, lecturers, researchers, and extension, those groups with immediate tangible incentives for participation, and remuneration for time allocation to the project (see also Table 3-1). However, incongruencies were observed between the above *role understandings* of producers and consumers (retrieved from dialogues, representing thinking/speaking), and the actual *enactment of the roles* (doing) by the two groups during the process. Most pronounced was the lack of continuous participation in group activities (development of standards and regulations, board meetings and assembly, farm visits), and in organizational tasks regarding markets, cross-visits, and other diffusion events.

The assessment of related reasons, challenges, and ideas for improvement was the subject of group work during the second assembly in 2022. It became evident that the most frequently mentioned limitations for enactment of the new roles by producers were self-attributed to overall high workload within their farm and marketing activities, and missing time for continuous participation in PGS meetings.

Furthermore, producers and consumers stated their expectation that the institutional stakeholders should operate the PGS as part of their remunerated professional mission (see also initial incentives for participation by different groups in Table 3-1). In addition, missing direct incentives to take on a more active role were highlighted by the two groups. For instance, the consumers' suggestion to integrate remuneration schemes for consumers to carry out tasks in the PGS (reduced prices on PGS certified products, non-marketable produce for free). Producers explained their important role and primary resource allocation in production and marketing, emphasizing the integration of PGS tasks into these activities (as in their role understanding; see Table 3-3). For instance, they suggested implementing compulsory tasks for producers to support role enactment (e.g., through a cross-farm-visit schedule and assignment of PGS producers to different visits by the PGS board). The above suggestions had not yet been implemented at the time of analysis for this study.

In addition to the above arguments of missing incentives for participation explained by producers and consumers, representatives of the two groups mentioned two main hindering factors for commitment to play new roles. Firstly, the uncertainty about receiving direct benefits from the PGS or not, and the time delay to receive benefits. For instance, higher incomes and improved production results for producers, or more identifiable healthy products on the local markets for consumers. Secondly, the context-specific factor for role enactment in light of the challenging economic situation of some producers and consumers caused by the severe and persistent economic crisis in Argentina, where investments in processes that promise longer term benefits were regarded as less relevant than struggling to satisfy today's basic needs.

### **3.4 Discussion**

Conversant with the concept of social innovation, agroecological transition research found that new social practices in innovation niches are triggers and drivers of change in local food systems towards sustainability (Chiffolleau & Loconto, 2018b; Coelho de Souza et al., 2021; El Bilali, 2019a; Juárez et al., 2018; Haskell et al., 2021). These retrospective empirical and review studies have illustrated the potentials of such new social practices, thus the outcomes of social innovation processes, to facilitate expansion and institutionalisation of agroecology in and beyond innovation niches. Using the example of a PGS co-development process, our study adds another layer of insights to this body

of research by addressing the call to gain a better understanding of how social innovation '*in the making*' leads to such new practices through a novel multi-stakeholder relationship building, and changes in role understandings and enactment of involved stakeholder groups.

The systematically documented PGS co-development process showed that different stakeholder groups raised and articulated the perceived social needs for innovation in the support of agroecology. This happened in different stakeholder environments, hence, in situations where local stakeholder groups exchanged needs, experiences, and ideas of how to change farming and food practices in the local food system, and how to build supporting relationships between producers, consumers and academic teaching, research and agricultural extension practice. These first interactions within and between different stakeholder environments were facilitated through transdisciplinary approaches, namely a multi-stakeholder innovation platform for agroecological development in the local food system (c.f., Nederlof et al., 2011), a praxis-oriented academic agroecology education approach (c.f., Francis et al., 2016), and a stakeholder identification and analysis approach at the outset of a transdisciplinary research project on agroecology (Christinck & Kaufmann, 2018; Frank et al., 2020). These approaches were implemented simultaneously and resulted in new multi-stakeholder learning environments and common ground for collective action, bringing together stakeholder groups with common interests. In particular, they enabled the groups to better recognize and share their own position in the local food system, as well as their needs for participating in the development of new social practices to influence the wider social context in the support of agroecological transitions. Multi-stakeholder exchanges facilitated sharing of different incentives to join, and perspectives from within the different stakeholder groups' frames of reference, related to different knowledge, objectives, values, and attitudes (Mezirow, 2000).

The thus induced social learning was found to be an important source of social innovation, reflected in the co-developed narratives of change (see Section 3.2). This aligns well with the aim of social learning, as defined by Delgado and Rist (2006) in Murti et al., (2020) as '*allowing participants recognizing how the one-sided pursuit of their individual interests is part of the problems they are facing and uncover, through this, untapped potentials for changing constraining wider societal structure*'. Such social learning situations have the potential to gradually change individual frames of reference, as they support co-creating new insights and knowledge, stimulating change of attitudes and

values, and thereby facilitating relationship building towards common sustainability goals (Pel et al., 2020).

Our analysis showed that the above transdisciplinary approaches and the following PGS co-development process facilitated the joint definition of a socially agreed mandate for the involved institutional stakeholders (lecturers, undergraduate students, and researchers) to consolidate articulated needs into a social innovation initiative. They used this mandate to connect the different stakeholder environments by promoting the PGS co-development idea among a wider number of local producers, consumers, and other relevant local actors, and by facilitating the initiation of coordinated multi-stakeholder action. They played the socially accepted role of innovation brokers (Klerkx & Leeuwis, 2009) or intermediaries (Vasin et al., 2017), creating linkages and opportunities for relationship building, and establishing conditions that levered social innovation to develop. Motivation of lecturers, students, and researchers to leave the 'academic comfort zone' to support development processes relevant for society, and coordination efforts were found to be key to consolidate 'roaming' needs and ideas and to include the wider interested local community into a directed co-development process of new social practices (development of agroecological production standards, and group-based certification schemes).

Narratives of change deduced from dialogues that evolved during the first informative and the follow-up multi-stakeholder meetings showed that the multi-stakeholder interactions helped participants address the conceptual dimensions of social innovation (Caulier-Grice et al., 2012; Moulaert, 2013). They identified i) *social needs*, such as sustainability concerns and related ambitions to transform the local food system, ii) demands for *better relationships* in order to operationalise these ambitions, and iii) possible solutions, geared towards *increasing the stakeholders' capacities to better use available resources* within their food and farming practices. For instance, deficits in institutionalising social arrangements for transition support were highlighted, and the need for quality relationships, new forms of governance, collaborative action, and active participation of underrepresented groups (in particular consumers and producers) (Caulier-Grice et al., 2012). As dialogues and resulting narratives of change were developed through above transdisciplinary approaches, these approaches we found well suited to facilitate social innovation and related new quality relationship building towards a common sustainability goal (Christinck & Kaufmann, 2018; Frank, et al., 2022b; Restrepo et al., 2020).

Other authors describe improved quality relationships that evolve through social innovation initiatives as being based on equality, reciprocity, mutual respect and mutual help (Avelino et al., 2019), and characterize them by open communication and enthusiasm for group experimentation to develop a shared vision of change and individual and collective empowerment (Pel et al., 2020). In this regard, narratives of change revealed that participating groups became aware of and shared their *individual affectedness* (e.g., challenges to sustainably change production or consumption practice, and weak social relationships to facilitate such changes). The solution and ‘who can’ narratives illustrated the shared need to change relationships in order to move from individual affectedness towards *collective attachment* to a problem situation and engagement in ideating solutions. This process is considered to be critical for successful social rearrangements in transdisciplinary initiatives (Lamine, 2018), and enhances required agency and new forms of governance of local actor groups by increasing their room for manoeuvre in support of agroecology at the territory level (Anderson et al., 2021). In this regard, the assessed process showed that narratives of change helped the initiative i) identify the specific local (dis-)enabling environment to realize social innovation, ii) understand the context of why change in social relations is important to support agroecological transitions, and iii) plan viable actions adapted to and potentially influencing the local contexts. Thereby, social innovation is advanced, and able to develop multi-stakeholder strategies and collaborative actions that potentially change the wider social context (c.f., Kluvankova et al., 2021), when dialogues help participants to ‘*recognize structure and context not as barriers to action, but as essentially involved in its [action] production*’ (Pettigrew, 1997).

Strategies and activities co-developed and implemented to operationalize ambitions (see Table 3-2) were geared towards stimulating participation, ownership, and group-based governance. These concepts are characteristic to social innovation initiatives in agriculture and food systems (Chiffolleau & Loconto, 2018b). By revealing how these concepts were translated into strategies and activities, our results add to the conceptual understanding that social innovation in the support of local agroecological transitions can be facilitated through new relationships, enhanced by trust building, co-development of agreed rules, horizontal decision-making structures, and innovative work methods beyond the usual. The various strategies and activities were identified and tested in response to emerging challenges in the dynamic process (trial and error, learning by doing), showing the required ability of social innovation initiatives to experiment under conditions of

instability and unpredictability, which are by definition levers of innovation (Akrich et al., 2002). Testing different pathways for relationship building (illustrated in Table 3-2), and improved participation of involved groups ‘in the making’, was found to be key in the search of best practices for the maintenance and expansion of the PGS. The thus developed best practices provide the basis for longer-term social innovation that go along with profound changes of routines and beliefs (Haskell et al., 2021).

Strategies and activities for building new working relationships were found to be highly interlinked with processes of reflection and revision of the participating groups’ understanding of roles and role constellations (Wittmayer et al., 2017). Considering that social roles in organizations (in our case the PGS initiative) can be defined as *a set of behavioural expectations attached to a position in an organized set of social relationships* (Sluss et al., 2011), the studied process has to be regarded as a pilot case, as role changes establish when social expectations and acceptance of new values and norms are realized in the wider social practice. For instance, when the general social expectation towards producers to rely on agroecological production standards becomes a socially recognized general demand of other local food actors, producers are likely to accept the new role (c.f., Wittmayer et al., 2017). When social values and behaviours are radically and persistently changed in the wider social context, the transformative potential of the social innovation initiative can develop (Avelino et al., 2019).

Participating groups in the PGS initiative realized the need for role changes and aimed to establish new role understandings in the wider local social practice. This was illustrated, for instance, when producers expressed their expectations towards consumers to change buying and consumption behaviour, to support local producers and the local economy, and to actively participate in the definition of production standards and PGS control schemes. As other research on agroecological innovation niches found (e.g., Elzen et al., 2017; Jaeger-Erben et al., 2015; Opitz et al., 2017), perceptions of producers and consumers highlighted the need for change in their role understanding to become agents of change (c.f., Home et al., 2017), thus to pilot new approaches to change and thereby to actively encourage their peer groups to adhere to redefined roles.

The studied process provided empirical grounding that changes in role understanding of one stakeholder group occur in relation to other stakeholder groups’ role understanding through articulating mutual expectations for change (Turner, 1990). Furthermore, we found that role changes go along with

an expansion of the usual activity system of stakeholder groups, when groups realize the necessity to take over new tasks and responsibilities to better support local transition processes. The pilot implementation of the PGS by a local initiative revealed to be a promising approach in the support of changing role understandings for agroecological transitions, as the participatory development of production standards, peer-to-peer control schemes, and promotion of such social practices in the wider social context required re-definition and enactment of new roles (May, 2008).

However, outcomes also showed that enactment of new roles differed between groups, influenced by immediate benefits that they expected to receive regardless the success of the initiative (e.g., students fulfil compulsory social work hours in the study program; researcher obtain study results), and perceived lack of immediate benefits for expanding the own activity system (e.g., producers and consumers take over additional tasks and responsibilities). The latter constraint is in line with review findings about missing evidence about motivations and expected benefits related to participation in PGS from the producers' perception (Kaufmann et al., 2020). Furthermore, it offers the possibility to continue studying the pilot process in the medium term to better evaluate longer-term outcomes regarding issues of benefits in relation to needed expansion of the participating groups' activity systems as one important success factor of social innovation to evolve, sustain and expand.

The identified gap between changes in mutual role understanding developed during multi-stakeholder dialogues, and enactment of new roles by producers and consumers in the further course of action can also be attributed to the needed alignment of expectations for change by other stakeholder groups with the acceptance by the respective group that is supposed to enact new roles. For instance, the expectations of the facilitation group towards producers and consumers to participate more actively (e.g., in board meetings, organization of cross-farm visits, etc.), and the expectations of the latter groups towards the facilitation group to coordinate the PGS and take over (work intensive) tasks. This needed mutual alignment (role making and role taking) was conceptualized in organizational working relationships by Sluss and collaborators (2011). They theorize role change as a process of reciprocation, where two parties (individuals or groups) exchange expectations regarding benefits of role change, and thereby develop mutual trust and understanding that facilitates enactment of redefined roles. In line with this argument, our findings show that social innovation initiatives must

explicitly address and negotiate roles through multi-stakeholder dialogues in order to achieve alignment of expectations and to increase the likelihood that actors assume redefined roles.

Participants' expectations of local policy makers to actively participate and support the social innovation initiative were found not to be reciprocated. This finding can be situated in the wider social innovation literature, where social innovation is steered by civil society actors in situations of absence of public support policies and where policy makers hardly fulfil their (socially expected) role of providing indispensable support in solving social needs (Juárez et al., 2018). However, social innovation is strengthened where governments actively participate (Gordon et al., 2017; e.g., Vercher et al., in press), and when non-profit initiatives provide civil society solutions for improved social-ecological governance (Baker & Mehmood, 2015; Folke et al., 2005) in agroecological food production and consumption. Audretsch et al., (2022) identified policy contributions for social innovation initiatives as *concrete policies* (in our case e.g., inclusion of third party certification into the national organic farming law, or municipal regulations in the support of smallholder producers to operate, such as land rights, and sanitary licenses), as well as *financial support* (e.g., covering personnel costs for PGS administration) and *physical means* (e.g., offices, transport). Our findings empirically show that support mechanisms mentioned by the involved groups, such as active participation of policy makers, new support policies and public financial means could likely facilitate enactment of needed role changes by both policy makers and producers and consumers. In the case of policy makers, role changes would imply that they start to actively participate in and support initiatives, and thereby respond to their mandate to consider social needs addressed by social innovation initiatives. In the case of producers and consumers, our findings add that role change could be facilitated when they are provided with remunerations for their engagement in the development of new social practices, as they contribute individual resources for 'experimental' agroecological transition initiatives with uncertain future sustain and individual benefit, and that go beyond individual production and or consumption aims.

### 3.5 Conclusions

By documenting the example of a transdisciplinary development process of a Participatory Guarantee System (PGS), this study analysed a single case of social innovation from within and in the making, responding to the call to gain a better understanding of how social innovation in the support of agroecological transitions evolves. Beyond the theoretical contributions made, insights gained can enlighten strategy development for social innovation initiatives and other transdisciplinary projects in agroecological transitions and contribute to a more coordinated development of policy support for agroecological production and consumption.

In particular, the study yields three principal insights: firstly, social innovation in local food systems starts-off through new transdisciplinary collaboration, when social needs and demands for change in food and farming practice are shared and translated into narratives of change, and if a socially constructed mandate for support institutions is created to coordinate activities. Secondly, building new working relationships between interested groups for transition support is facilitated by strategies of trust-building, co-development of agreed rules, horizontal decision-making structures, and innovative work methods; these strategies also proved to initiate change of role understanding of involved groups. Adding to other findings from retrospective studies in the field, we unveiled the importance of experimental testing (piloting) of such strategies in the making to identify context-specific shortcomings and challenges, and thereby to develop best practice hand-on knowledge for the maintenance and expansion of new social practices in time and space. In line with methodological and conceptual findings about advantages of studying social innovation 'from within' (Estensoro, 2015; Taylor Aiken, 2017), the employed action-oriented research approach was well suited to study single cases of 'social innovation in the making', to reveal first-hand and experience-based insights from the studied initiative about changes of social practice. Thirdly, we found that change in role understanding of participating groups is crucial for social innovation to evolve, as actor groups need to expand their activity system towards new tasks and responsibilities. When stakeholder groups start to enact new roles, multi-stakeholder initiatives gain room for manoeuvre to better reach their common goals. Enactment of such new roles is based on mutual understanding and trust building, and restricted when individual benefits are uncertain and delayed, and can be strengthened by provision of public policy support.

While the role concept proved helpful in gaining insights into changes in relationships, it was not sufficient to fully explain the observed discrepancy between the mutually perceived need for change in social practice and the actual engagement of consumers and producers in the course of action. Although representatives of these groups highlighted the importance of active participation of consumers and producers in the social innovation initiative, and showed enthusiasm to actively participate, the continuous participation, even in decision-making processes that required little efforts, was rather low. Future research could investigate aspects of commitment to better understand the gap between intentions to collaborate (by verbal commitment for concrete contributions in future), and the actual fulfilment of promises, to gain better understanding of how and why societal actors engage or not in the support of agroecological transitions at the local level.

Beyond the scrutinised challenges and potentials of social innovation initiatives to succeed in the support of agroecology, concrete pathways for developing and operationalizing new social practices were piloted in the studied case. They are currently still sustained and are expanding, and participants appreciate transdisciplinary social learning to better delimit and collaboratively increase their room for manoeuvre and to experiment with locally adapted bottom-up solutions. Moreover, identified pathways currently serve as example for a rapidly growing number of other new PGS and related agroecology initiatives in the Argentinian context and beyond that seek for changes of relationships and roles to align and translate sustainability ambitions into practical action for local food-system transitions based on the principles of agroecology.

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## CHAPTER 4

### Changing conditions for local food actors to operate towards agroecology during the COVID-19 pandemic<sup>17</sup>

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#### Abstract

Given the novel character of disturbances caused by the pandemic in food systems, initial studies have been conducted to stress the reinforced urgent need for food systems' transformation towards sustainability. First assessments, conducted in the early months of the pandemic, found that local food actors responded to changing production and marketing conditions by implementing alternative practices under the umbrella of agroecology. However, given the unprecedented and dynamic character of the pandemic in regional situations, and related context-specific changes caused in food system actors' operations, case studies are needed to assess in more detail under which changing conditions food actors implemented alternative practices. Moreover, the maintenance of practices as conditions normalize, and food actors' transformative potential in relation to the principles of agroecology, need further assessment. In response to these emerging issues, we provide insights into our case study research conducted during 2021 in a local food system in Argentina. The aim of this research was to study how changing conditions triggered local food actors to (re-)frame their objectives and activities regarding marketing, and to assess the relevance of agroecological principles as a means of responding to changing conditions and to unfold longer-term transitions. We identified local producer shops (n=5) and markets (n=4) that were established or consolidated by self-organized producer groups (SOPGs) during the first months of the pandemic. Using semi-structured interviews with SOPG members (n=12) and qualitative content analysis, we found that alternative practices were adopted in response to different changing conditions, and new needs and opportunities for producers and consumers brought about by the pandemic. Objectives pursued, and activities undertaken by the groups revealed reactive short-term mitigation strategies, and proactive longer-term transformative objectives. The relational analysis between practices and agroecological principles showed that the principles became important means of responding to changing

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conditions and to unfold longer-term transitions. The cases illustrate how local food actors operationalized agroecological principles, and in turn how principles can be used to investigate the nature and potentials of food actors' alternative practices, highlighting the relevance of agroecology to co-design sustainability transitions in local food systems and to mitigate possible future crisis.

**Keywords:** agroecological principles, agroecological transitions, shock-mitigation responses, transformative potential of local food actors, Argentina.

## 4.1 Introduction

The COVID-19 pandemic and measures implemented by governments at the global level to manage the pandemic have caused a systemic crisis, affecting food systems' performance, and processes along global and local agri-food supply chains. Negative consequences for established global chains highlight weaknesses of prevalent food production, distribution and consumption practices, and threaten sustainable human development (Rivera-Ferre et al., 2021; van der Ploeg, 2020). Impacts caused by the pandemic unfold in multiple areas, and through complex interrelations between social, economic, ecological, and human health factors. A distinction is made between direct impacts (the virus on human health) and indirect impacts, as a consequence of measures implemented to control the pandemic or through the effect of fear in the population (Rivera-Ferre et al., 2021; UNICEF, 2020). In response to these impacts, actions have been taken by groups or individuals in society or governments to prevent, compensate for, or adapt to emerging changes (USDA, 2021). There are hints that local food actors have responded to the consequences and impacts by developing immediate decentralized collective strategies, and by implementing alternative practices under the umbrella of agroecology (Tittonell et al., 2021; Zollet et al., 2021). However, the particular changing conditions under which such practices have been implemented and what potentials they unfold within local food systems' sustainability transitions in time and in relation to the principles of agroecology (Wezel et al., 2020) remain to be further explored.

Given the novel character of the pandemic and induced disruptions in prevalent global food systems, studies have been conducted and expert opinions published to understand the new situations, to reveal impacts, and to stress the hitherto known and, through the pandemic, reinforced urgent need for a transformation of food systems towards sustainability (HLPE, 2019;

IAASTD, 2009; IPES-Food, 2016). The studies have focused on a wide range of phenomena associated with the diverse food system actors impacted, including farmers, processors, retailers, consumers, as well as regulatory and policy-making entities and wage workers involved in agri-food sectors. For instance, disruptions in supply chains were assessed with regard to decreasing food security (e.g., Savary et al., 2020; Workie et al., 2020), to impacts on different food supply chain components and commodity groups in developing countries (Vyas et al., 2021), to labour availability, food systems' connectivity and international trade (Stephens et al., 2020; van der Ploeg, 2020), and to increasing inequality experienced by small scale food producers (Paganini et al., 2020). A review by Béné (2020) shows that by June 2020, indirect impacts caused by lockdowns and mobility restrictions led to loss of income, purchase power, and in consequence to a decrease of food security for poorer segments of populations in low and middle income countries.

These suddenly arising and challenging impacts have pushed local food system actors to immediately respond to the changing conditions within their specific context of operation (Frank & Amoroso, 2023; Zollet et al., 2021). Studies looking into such local responses were mainly conducted during the initial phase of the pandemic (March-June 2020), providing 'snapshots' of responses in the context of early lockdowns. For instance, studies on local and regional food systems in different countries around the globe, characterized by short supply chains and producer-consumer proximity, indicate high flexibility and adaptability of local actors to operate under changing conditions, by building on strong local relationships (Prosser et al., 2021; Thilmany et al., 2020), by taking advantage of (temporal) changes in consumption patterns (Bisoffi et al., 2021; Lal, 2020; Zollet et al., 2021), and by showing their growth potential (Nemes et al., 2021). In a cross-national study in the Latin American region, Tittonell et al. (2021) characterized initial responses of family farming and agroecology movements in the early months of the pandemic regarding their potential to mitigate threats towards food security. The study provides first indications of high resilience and potential for reconstruction of local actors in developing and implementing immediate strategies under lockdowns, based on producer-consumer links, short value chains, local and solidary economy, collective capacity, and cooperation within networks. Mostly, answers from development projects/initiatives were analysed, hence direct farmer perceptions were not considered (Tittonell et al., 2021).

These first findings, based mostly on large online surveys, from the initial phase of the pandemic, support the general narrative by advocates for

agroecology. The narrative uses the argumentation that reinforced and evidenced weaknesses of prevalent food systems and observed 'agroecological' responses of local food actors confirm that agroecology is the appropriate pathway for sustainability transitions in food systems (Altieri & Nicholls, 2020; Bisoffi et al., 2021; Gliessman, 2020; Gras & Hernández, 2021). However, given the unprecedented and dynamic character of the current pandemic, its varying implications in different regional situations, and related context-specific changes caused in food system actors operations, the above argumentation for agroecological food practices as appropriate responses to systemic shocks requires further, case study based, empirical evidence. Moreover, the maintenance and evolution of responses as conditions normalize, and the longer-term transformative potentials of practices implemented in relation to sustainability issues, such as consolidated in the principles of agroecology, need further assessment (Nemes et al., 2021).

Longer-term food-system transitions might be explainable by the consolidated principles of agroecology, proposed as a general framework to guide and monitor transitions at the plot, farm, and food system level (Wezel et al., 2020). Using the generically formulated principles for in-depth analysis of local responses by food actors under changing conditions may lead to better understanding of how suddenly changing conditions for producing, marketing and consuming food may trigger actors to develop and implement agroecological practices. By studying how actors (re-)frame their objectives under changing conditions and how the statements of agroecological principles are translated into concrete local action, the potential of agroecology for local transitions in the context of a systemic crisis and beyond can be approached. In turn, this knowledge can help to define the relevance of specific principles for actors to operate under changing conditions, and to better inform policy interventions to support local food actors. Appropriate support measures can help actors to potentialize their capacity to mitigate shocks through increased resilience and to use this crisis as an opportunity to unfold their longer-term transformative potential (Folke et al., 2010), by contributing to food security, sovereignty and reduction of vulnerability of smallholder food actors (Tittonell, 2020).

Conceptually, such analysis responds to the dynamic and unpredictable character of agroecological transitions, and the need for more inductive and constructivist research (Ollivier et al., 2018). It can be approached through the understanding of agri-food systems as purposeful human activity systems (Kaufmann & Hülsebusch, 2015), where actors operate within their frame of

reference (knowledge, objectives, values, attitudes etc.) towards their specific objectives, influenced by constraining or enhancing context conditions (Mezirow, 2000). For instance, at the farm decision-making level, Sutherland et al. (2011) conceptualized that major change processes towards sustainable management are often initiated in response to major trigger events. From this perspective, studying the diverse changing conditions caused by the pandemic that frame the individual and collective room for manoeuvre of local food actors for (re-)framing their objectives and actions is promising to understand what pushes actors to change from the usual.

Against this background, this study emphasized the Argentinean case, where in recent years agroecology is gaining momentum, and where the pandemic and the prevention measures have had severe impacts. The worldwide calculated COVID-19 Stringency Index shows that in a global comparison, Argentina was one of the countries with the strictest and longest lock-down and prevention measures implemented (Hale et al., 2021). National lockdown measures included strict local mobility restrictions, mandatory social isolation, distancing and closure of local markets and shops (put into force by the national decree Nº 260 in March 2020). Although agricultural production and marketing activities were officially exempt from lockdown, difficulties in obtaining circulation permits for local food actors were widely reported all over the country (Urcola & Nogueira, 2020)

Within our ongoing case study research on agroecological transition pathways in a local food system in Argentina, in April 2020 we responded to the sudden lockdown and its impacts on the local food system by starting a stepwise study. In a first step, we conducted an online-survey to assess how local farmers and processors in a local food system in Northern Patagonia perceived disruptions and impacts in the early stage of the pandemic (March-June 2020) to carry out activities for producing and marketing food, and what immediate strategies they proposed and implemented to cope with the restrictions and perceived impacts (Frank & Amoroso, 2023). We found that ninety percent of the respondents were affected in their farming and/or processing activities. In relation to specific impacts, among others, sale of products appeared as the most affected process and farmers and food processors stated their interests in establishing agroecological practices within civic food networks (c.f., Renting et al., 2012).

Based on these findings, in the second step of our study, we identified local producer shops and markets that were established or reinforced during the pandemic, for an in-depth case study. The overall aim was to study changing conditions, how they triggered actors to (re-)frame their objectives and activities regarding local marketing, and to assess the relevance of agroecological principles as a means of responding to changing conditions and to unfold longer-term transitions. The specific objectives were to i) reveal marketing conditions that changed during the pandemic for local food actors to operate; ii) identify objectives of, and activities conducted by, local producer groups to establish producer shops and markets; and to iii) understand how the objectives and activities carried out reflect agroecological principles as articulated by Wezel et al. (2020).

This study reports on an exemplary case ‘in the making’, providing insights into particular changing conditions under which alternative practices are implemented, and into how agroecological principles can be used as a lens to investigate characteristics and potentials of these practices regarding immediate shock mitigation aspects, and longer-term agroecological transitions. Thereby this study contributes with case study-based knowledge to better situate general narratives for agroecology as sustainability pathway in response to food systems’ crisis. In the following, we first present materials and methods used to approach the above objectives. In the results we give a brief characterization of the assessed producer shops and markets and present our analysis of changing conditions for market actors, objectives and activities conducted by the self-organized producer groups (SOPGs) who implemented the producer shops and markets, and the linkages of their objectives and activities with the agroecological principles. Finally, we discuss our findings in the light of learning opportunities from disruptions caused by the pandemic and from the responses by food actors regarding potentials of agroecology approaches to build alternative local food systems in context of crisis and beyond.

## 4.2 Materials and methods

### ***Study location***

The case study was conducted in the Andean valley region *Comarca Andina del Paralelo 42*, comprising territories between parallels 41°30' and 44°55' South, and 71°20' and 71°42' West of the provinces of Río Negro and Chubut, Argentina (Figure 4-1). The region is characterized by a cold temperate mountain climate (average precipitation 750 mm/a, average annual temp.

9,8°C) (Madariaga, 2009). The human population has been growing rapidly in the region over the last decades, due to high national and international migration fluxes.<sup>18</sup> The territory counts several dispersed and rapidly growing urban and peri-urban centres, connected by a strong flow of labour, goods and capital across the province border that divides the region. In socio-economic terms, tourism, the public sector, agricultural and forestry production, and a diversity of handcrafts are the main sources of income for the local population.

Surrounded by mountainous forest landscapes, diversified agricultural production takes place in the productive valleys and on terraces (fruits, vegetables, hops, cereals, and small to medium scale animal production with varying intensities). The main growing season is from November to March. Local food provision relies to a large amount on imports from other regions of the country, although parts of the population choose local products and thereby engage in sustainable consumption practices. To our knowledge, there is no data available that quantifies the amounts and types of food imports or the share of local production necessary to cover local food demands.

According to data estimated by the National Institute for Agricultural Technology (Cardozo et al., 2022), there are 2619 farmers in the study region, out of which 96% work on a small scale for family consumption and/or selling of small volumes. Vegetable production is estimated to take place on 101 ha in greenhouses and outdoors. Farms are characterized by mixed small and medium scale production systems, under conventional management and a growing number under agroecological-based management approaches, such as organic farming, market gardening, community supported agriculture, community gardening and small farms for self-consumption (Frank et al., 2020). Local products are usually sold via direct marketing (on-farm, social media, home delivery and farmer markets), local retailers and informal bartering.

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<sup>18</sup> The last official census in 2010 reported a total of 23392 inhabitants (INDEC 2010; retrieved from: <https://www.indec.gob.ar>)

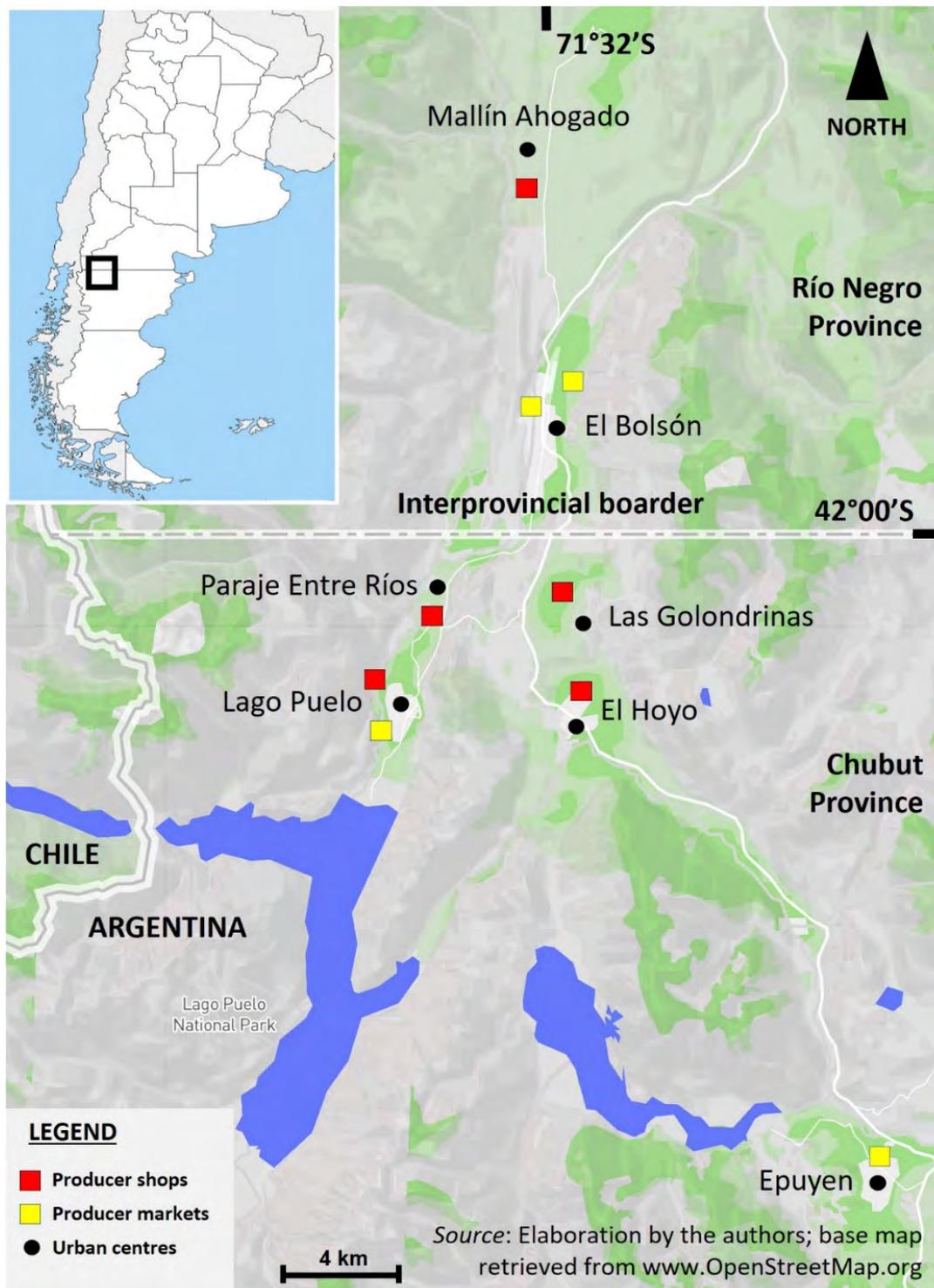


Figure 4-1 Map of the study region and assessed cases

### ***Data collection and analysis***

Based on our findings on emerging local marketing strategies in response to indirect impacts perceived by local farmers and processors (Frank & Amoroso, 2023), in March 2021 we mapped local producer shops (locally used term in Spanish: *mercados*) and markets (locally used term in Spanish: *ferias*) in the

study region. In consultation with local experts (extension service, advisors, researchers, farmers, and consumers) we identified all the shops (n=14) and markets that fulfilled our defined criteria (farmer/processor-led; food or mixed food/no-food; focus on direct marketing). Subsequently, we selected those cases (n=9) that were functioning during lockdown/restrictions between March and December 2020, or at least during some months in this period, in order to be able to observe effects of changing conditions for the market actors. Out of the selected cases, 6 (5 shops and 1 on-farm market) were established after March 2020 (i.e., during the pandemic), and 3 (markets) existed before that date. The distinguishing characteristics of producer shops and markets is detailed in the results (section 3.1). The identified shops and markets were visited to familiarize with the organizing groups (hereinafter referred to as *self-organized producer groups*: SOPGs), to learn from informal interactions how the shops/markets function, what motivates participating producers<sup>19</sup>, their objectives, and the challenges they face. The visits were conducted by the authors in collaboration with the local state extension service. Finally, during the visits we determined with the SOPGs their interest in participating in the consultative research through individual and group interviews.

Given the exploratory character of the study, a semi-structured interview method was chosen to capture and understand the interviewees' perceptions within the scope of the research objectives (Kvale, 2012), such as the history of the producer shops and markets, effects of the pandemic, objectives, activities, experiences, and future expectations of interviewees. Further, an open interview flow was used to provide space for the interview partners to also bring forward those relevant aspects that were not previously thought of by the researcher, and therefore to enrich the data and to reduce possible bias of the results. Where possible, group interviews were conducted with various members of the respective SOPG, to capture perceptions and knowledge of different individuals. This approach facilitated gaining insights into the representations, motivations, and interpretations of the participants in a situation of interaction not only with the interviewers, but also with other SOPG members. The dynamic interaction among group members recreates the social representations of the group on the issues under study, based on the discursive confrontation among participants. It is from this group interaction that the answers to the questions were further discussed,

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<sup>19</sup> In this article we adopt the term *producer* to refer to *farmers* (primary production) and *processors* (elaboration).

enhancing the richness of obtained data (Merton, 1987). Further, it provided the participants with greater cohesion and confidence at the time of answering in the dialogical mode proposed by the researchers (Kamberelis & Dimitriadis, 2011). For this study, the selection of interview partners was carried out by the consulted SOPG themselves, respecting their organizational dynamics (Beitin, 2002).

Based on insights from the first interactions with the SOPGs and the defined research objectives, a first guide for the semi-structured interviews was drafted. The draft guide was used for the first three interviews (February 2021) and adjusted based on a preliminary revision of transcripts. Then, the remaining interviews were conducted by the authors (see section Author Contributions) between August and October 2021. In total, 12 interviews were conducted, 8 with participants of the 6 producer shops that were established after March 2020, and 4 with participants of identified producer markets that were established before the pandemic started. In total, 5 group interviews and 8 individual interviews were conducted, with an average duration of 70 minutes (range from 30 minutes to 90 minutes).

All interview material (Spanish language) was transcribed using a basic transcription mode to completely transcribe the literal content. Transcripts were then introduced into a qualitative data analysis software (ATLAS.ti) for qualitative content analysis. Qualitative content analysis is a flexible but structured method for qualitative-interpretative analysis of (text) material. It is the systematic analysis of documented communication, based on certain rules and led by theory (Mayring & Fenzl, 2014). The structured analytical-interpretative process was guided by the development of concepts and categories (codes) that were applied to the text in order to sort the material with regard to content (coding), and to increase information density by reducing text volume. Figure 4-2 gives an overview of the qualitative data analysis framework, as employed in this study. The (sub-)categories and coding themes were developed by using a hybrid approach. The main analytical categories (1-5) were derived from the research objectives (deductive). Then, the sub-categories within the main categories 1-4, were developed based on the transcripts (inductive). For the analysis of linkages of objectives and activities with agroecological principles (category 5), the principles of agroecology that apply to the (local) food system level (as defined by Wezel et al., 2020) were taken as sub-categories and their definition (coding themes) were then used to reveal connections to objectives and activities conducted. Direct quotes of interview partners presented in the

results are coded by the interview ID, differentiating between group or individual interview (gr/ind).

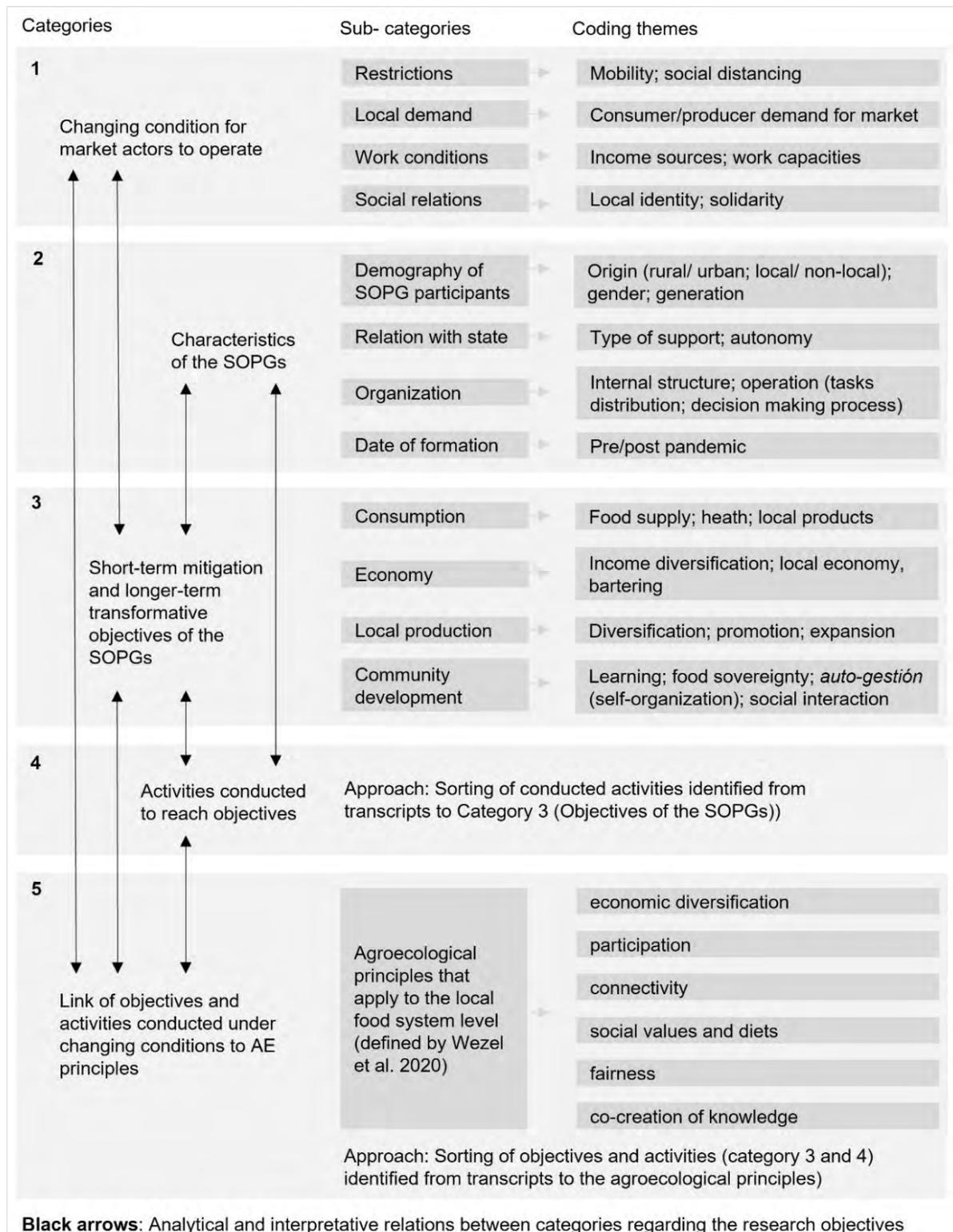


Figure 4-2 Qualitative content analysis framework

## 4.3 Results

### ***Characteristics of producer shops and markets***

Among the studied cases, two operational types of physical marketplaces were identified, where self-organized producer groups (SOPGs) and consumers, residents of the region or tourists, come together. The first type were the *producer markets* (n=3), which pre-existed the pandemic and were characterized by open-air spaces where producers offered their products at individual stalls. Producers participating in the markets organized to perform common tasks, such as communication, maintenance, or improvement of the markets' infrastructure. The second type were the *producer shops* (n=6) that were closed spaces, implementing a rotational shift-work scheme for selling products of all the participating producers.

In both operational types, responding to the principle of self-organization, most SOPGs established assembly structures and decisions were made by consensus. The type of products offered were similar in all assessed SOPGs. A variety of local food products, such as vegetables, fruits, marmalade, honey, sweets, juices and bakery goods, seeds, and seedlings, as well as handmade cosmetics, clothing, and other handicrafts were offered. In some cases, the product range was supplemented with products from other regions (community-based purchase), as availability of local fresh produce is seasonal.

Shops and markets were composed on average by 35 members (min=5 / max=88), with seasonal fluctuation. Participant profiles were heterogeneous in terms of age and socioeconomic level, including a high number of producers with an urban-rural migration background and a predominance of female participants in the SOPGs. Most of the producers had other sources of 'off-farm income', and only a few relied solely on the economic revenue from the shops and markets. Participating producers were farmers, some of them integrating processing of their crop and livestock products, and processors who bought raw materials mostly from within the SOPGs or from other local producers. Only in one case, pure re-sellers (traders) were represented within the SOPG.

### ***Changing conditions for market actors to operate***

Locally implemented lockdown measures in the study region came into force by 17<sup>th</sup> of March 2020, and were extended and modified in the subsequent months, legally justified by a high number of frequently changing national and

provincial decrees<sup>20</sup>. Most restrictions were implemented by law nearly until the end of 2020, such as the closure of the province borders between the Provinces of Rio Negro and Chubut (dividing the highly connected urban centres within the study region), strict curfews and later on, social distancing measures for the general population. Formally, agricultural activities were exempt from restrictions, while some established mixed farmer and handicraft markets were closed. Small-scale producers, including the participants of the SOPGs, were restricted in their mobility to cross provincial borders. The beginning of lockdowns coincided with the ending of the main agricultural production season in the region, affecting marketing of the local production.

Interview partners particularly perceived mobility restrictions and mandatory isolation as initial factors disrupting their operations. The relational analysis conducted by linking the other factors mentioned by the interview partners therefore starts with these two important new conditions (Figure 4-3).

The general context for the producer markets and shops to evolve during the pandemic was described by one interview partner as follows:

*Having the borders closed made us look a little more inward, and an economic crisis began to emerge from which you know that in this region most of the people ask for some jobs in the public sector or some private jobs, but most of them are self-supporting, artisans (...). It was this situation that made appear these markets (...). In some places they began to work as an economic alternative, let's say, for the crisis (I2-ind).*

Although the implementation of the markets was apparently conducted within a crisis situation, and, as we show in the following, aimed at satisfying basic needs of the local population, the notion of *new opportunities* with a positive connotation brought by the changing conditions was revealed from the market participants' narrations.

*The truth is that it [the pandemic] does not worry me much, on the contrary, I really like what we are doing here. We generated a link and very interesting discussion with the colleagues of the market group. And*

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<sup>20</sup> National decrees:

<https://www.boletinoficial.gob.ar/busquedaAvanzada/busquedaEspecial>; Chubut Province: <https://boletin.chubut.gov.ar/>; Rio Negro Province <https://defensoriarionegro.gov.ar/drn/normativas-provinciales/>

*well, I see this as an opportunity, not as a problem. For me this was an opportunity (I4-gr).*

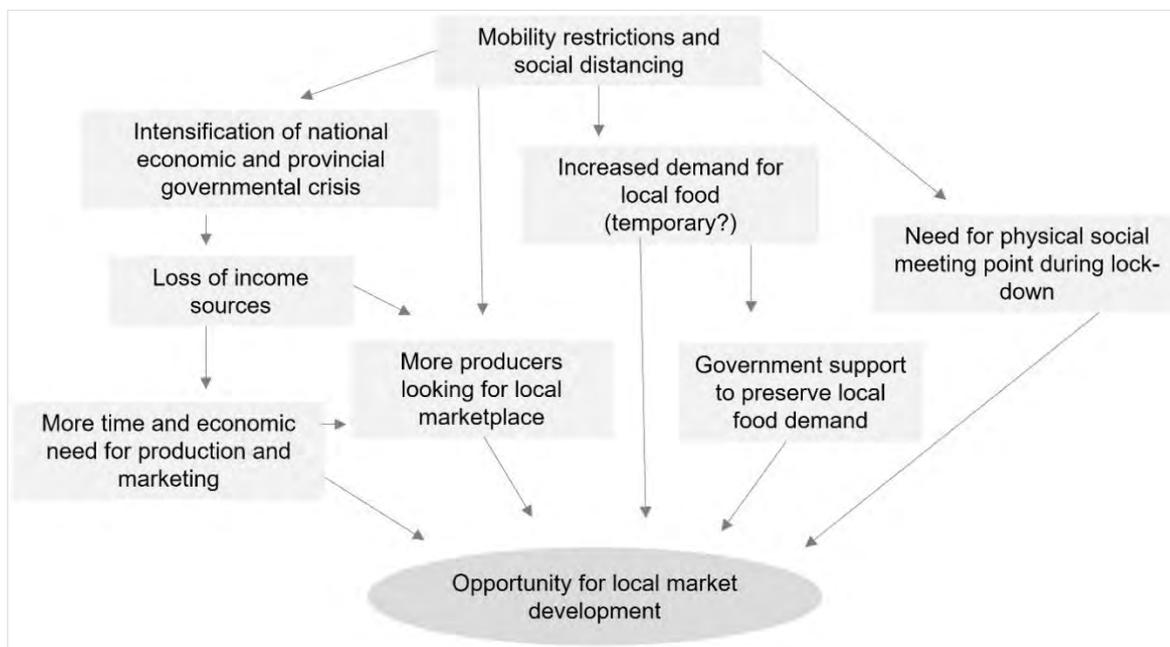


Figure 4-3 Relational chart of changing conditions for local market development, based on the interview partners' perceptions

When explaining the above context of restrictions (Figure 4-3), local producers also reported experiences from their role as consumers. On the consumer side, the lockdown led to increased demand of consumers to access food in the direct neighbourhood during strict curfews.

From the producer perspective, it was reported that loss of off-farm income due to the national economic crisis, before the pandemic and its further deterioration caused by the pandemic, led to an increased need to earn income from farming/processing and local marketing activities. In this regard, producers living and working in the Province of Chubut also referred to the ongoing provincial government crisis (e.g., leading to very long payment delays for public employees and strikes). Furthermore, in the entire study region, some producers were affected by severe fires that hit the region and burned 19605 hectares<sup>21</sup> of forest and agricultural land between February and March 2021. Moreover, mobility restrictions, inhibiting other businesses (e.g., tourism and wage work), and hindering marketing of products in other closed local or inter-regional markets, led to more available work time, to increased

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<sup>21</sup> Personal communication: Servicio Nacional de Manejo del Fuego, Government of Argentina

need to redirect produce to very local market channels, to innovate and to change habits:

*(...) because habits changed, although we lived in a certain rural environment, there was more time (...) that is to say, in the previous daily life there was not so much time to take advantage of all the apples, all the walnuts, everything, or to start cooking cakes or making bread (...). Someone who was an artisan became a baker, started making salads or sweets. (I4-gr).*

Given these circumstances, interview partners reported an increased demand of local producers for alternative physical marketplaces in the different residential locations (span. *parades*). Furthermore, emergency support of the local municipal governments to establish (temporary) local markets was highlighted as a new and favourable condition in some of the markets. This was explained in the context of temporary closures of some established mixed food and handcraft markets during the lockdown. Here the municipalities responded with support to provide alternative market options for local (food) producers. In some cases, local authorities provided plots for outdoor markets and buildings for indoor shops, mostly in community or municipality centres, which were closed during the lockdown. In other cases, public support was provided to cover expenses for the daily functioning of markets (i.e., gas or electricity) or to adjust sanitary requirements to the market demands.

Restrictions that affected the opening of local markets were the established distancing protocols for physical markets, in particular regarding the restricted number of people allowed in closed marketplaces. This led to the development of organizational schemes for the rotational attendance of the markets to adjust to the sanitary protocols and a distribution of tasks also considering personal situations of the participants, i.e., high risk groups were excluded from serving the public as sales personnel.

All assessed SOPGs reported that during the strict lockdown, the demand in the local markets, both regarding consumers and producers, was very high and dropped gradually as restrictions were lifted. However, this was also attributed to two seasonal particularities in the region. First, the decline of local fresh products offered in the off-season, and second, the pronounced seasonality of tourism as an important economic factor for the local economy.

Finally, interview partners' narratives emphasize that the exceptional emergency, and changes caused in the individual routines, stimulated critical personal and societal reflections, such as the need for strengthening and

revaluing grassroots initiatives for developing and transforming the local food system towards increased food sovereignty.

### ***Objectives of the SOPGs and activities conducted***

The analysis of objectives pursued by the different SOPGs under the changing conditions during the pandemic revealed three overall aims. These were: i) to permanently establish producer shops in the different residential areas within the study region, also beyond the pandemic, and/or to reinforce already existing producer markets; ii) to utilize the producer shops and markets as places of community development, and peer-learning through knowledge co-creation and exchange; and iii) to articulate and potentialize political concerns of food sovereignty through collective action.

These overarching and general aims were approached by the SOPGs through specific objectives and activities conducted to reach the objectives (Table 4-1). Objectives and activities conducted were found to be similar between cases, except for some obvious organizational objectives typical for the producer shop organization. Therefore, no comparative analysis was conducted, and differences highlighted only where they applied. The objectives showed a principal divide regarding their nature. There are *reactive, short-term mitigation objectives* of the SOPGs to provide emergency relief in direct response to conditions changed by the pandemic and immediate needs, and *proactive, longer-term transformative objectives* to work on post-pandemic growth of the producer shops and markets and on broader local food system development. Short-term mitigation objectives directly responded to the changing conditions (cf. section 3.1), both in terms of economic needs to generate alternative household income, to sustain local food supply, and to provide physical places for social interaction and solidarity-based peer-to-peer aid for the local population during lockdown. Therefore, they can be classified as *reactive*, as they directly *respond to changed conditions*. In contrast, longer-term transformative objectives have a more *proactive* notion, hence they reflect actors' objectives of *initiating change* to transform the local food system.

Further, based on the analytical categories (see Figure 4-2), it was revealed that the SOPGs' overall aims, specific objectives and activities conducted addressed different aspects of the local food system, i.e., *economy, production, consumption, and community development*. This distinction is used to group objectives in Table 4-1. It constitutes the first analytical step to highlight the diversity of objectives and activities conducted, subject to further analysis of linkages with the agroecological principles (section 3.3). The

diversity reveals the holistic and transformative approach pursued by the SOPGs; not only to mitigate impacts of the pandemic on local producers and consumers, but also to actively contribute to the development of local agroecological production, local and solidary economy, convergence and relation-building between local consumers and producers, and broader community development.

The heterogenous character of objectives and activities indicates that motivations of participating producers went beyond the individual purpose of generating and diversifying income (*economy*) and pointed to more community-oriented social and environmental concerns, for instance classified under *community development*, *consumption*, and *local production*.

Table 4-1 Objectives and activities of the SOPGs

Analytical categories		Specific objectives	Activities* conducted to reach objectives
Reactive short-term mitigation	Economy; Production; Consumption; Community development	<p>Generate alternative income sources in response to income losses caused by the pandemic crisis.</p> <p>Sustain local food offer supply during lockdown.</p> <p>Establish meeting points for social interaction and collective action during lockdown.</p> <p>Solidary peer-to-peer support to cope with socio-economic challenges.</p>	<ul style="list-style-type: none"> <li>- Collaborate with municipalities to open markets. (g)</li> <li>- Implement COVID protocols in the markets. (g)</li> <li>- Improve markets' physical infrastructure. (g)</li> <li>- Provide material/labour support by peers/consumers. (g)</li> <li>- Establish social media to organize/promote shops/markets. (g)</li> <li>- Ask peers to start farming/processing business. (i)</li> <li>- Exchange knowledge on farming/processing practices. (g)</li> <li>- Start producing beyond self-consumption. (i)</li> <li>- Implement bartering practices. (g)</li> <li>- Work voluntarily in market organization. (g)</li> <li>- Purchase staple food as community. (g)</li> </ul>

Continued next page.

Proactive longer-term transformative	Economy; Consumption	<p>Generate alternative and diversified income sources beyond shock mitigation.</p> <p>Create consumer-producer proximity without intermediaries.</p> <p>Expand and diversify markets in support of the local economy.</p> <p>Incentivize local/healthy/diversified consumption.</p>	<ul style="list-style-type: none"> <li>- Negotiate with municipalities for continuing support (physical places, food safety protocols, permits). (g)</li> <li>- Offer products on different local markets. (i)</li> <li>- Collectively define fair prices. (g)</li> <li>- Implement bartering practices. (g)</li> <li>- Purchase primary products from local peers. (i)</li> <li>- Use social media to attract more consumers. (g)</li> <li>- Share knowledge among producers and consumers (consumption and farming practices). (g)</li> <li>- Organize seed/seedling exchange events. (g)</li> <li>- Generate networks between markets to complement product ranges to attract consumers. (g)</li> </ul>
Proactive longer-term transformative	Production	<p>Expand and diversify markets based on local farming and processing practices.</p> <p>Strengthen local/agroecological production.</p>	<ul style="list-style-type: none"> <li>- Prioritize local (agroecological) products offered. (g)</li> <li>- Promote agroecological practices within the marketing groups. (g)</li> <li>- Ask peers to start farming/processing business. (i)</li> <li>- Purchase primary products from local peers. (i)</li> <li>- Organize seed exchange events. (g)</li> <li>- Start producing beyond self-consumption for sale. (i)</li> <li>- Offer trainings and workshops on agroecological practices. (g)</li> </ul>
	Community development	<p>Markets as social meeting points, and places of learning.</p> <p>Strengthen local and solidary social networks for collective action.</p>	<ul style="list-style-type: none"> <li>- Develop group-based and participatory organizational structures and tools for producer shops. (g)</li> <li>- Train participants in relevant organizational topics. (g)</li> <li>- Implement remuneration schemes for rotational attendance by market participants. (g)</li> <li>- Implement social media platforms to organize and promote markets. (g)</li> <li>- Exchange knowledge between peers and with other local markets (processing, market organization). (g)</li> <li>- Link market spaces with other community activities (workshops, trainings, events). (g)</li> <li>- Conduct solidarity peer activities to overcome economic crisis. (g)</li> <li>- Purchase staple food as community (food coops). (g)</li> </ul>

\*Conducted by individuals at the farm and processing level (i); at the SOPG level (g)

There were different motivations for objectives represented in the different SOPGs, explained by one interview partner as follows:

*Until today we are thinking and rethinking what we want to be as a market, if we want to be a market with certain characteristics, or a simply commercial market. (...) there is a group of colleagues who have a beautiful and harmonious commercial vision, I say harmonious because it is not within the framework of capitalist commerce, that is, just to make money, but it is thought from a more communitarian point of view, but it is still a commercial vision. Then there is another group that is more interested in being there for community reasons, without looking so much at the commercial aspect, which is the case of many people who participate and do not sell much (...). Then there is another group of colleagues who are thinking about "how can we organize it so that we can fulfil both needs, let's say?" (I2-ind).*

By analysing the nature of the activities that the SOPGs prompted (Table 4-1), it was revealed that only some activities were carried out by individuals at the farm- or processing-activity level, such as to produce more, to diversify production based preferentially on local resources (brought in or bartered from peers), and to start selling through different marketing channels. All other actions were taken at the shop/market activity system level (e.g., organizational and training activities) and done to reinforce linkages between shops and markets with the local communities (cultural events, workshops, fundraising, etc.). Remarkably, these activities reflect important investments of human and social capital by the SOPGs to reach their objectives. Most of the activities which were directly related to the producer shop organization were conducted by participants *ad honorem*.

Moreover, activities were identified that aimed at the increase of human and social capitals through changes in relationships between actors and co-learning within the SOPGs (e.g., through participatory and group-based organization of the producer shops, trainings and knowledge co-creation and exchange activities), and with the local communities (e.g., through raising consumer awareness of local production and consumption practices and through consumer involvement in the producer shops and markets). In this context, *knowledge exchange, participation, togetherness, empathy, solidarity, tolerance, trust, commitment, awareness, and autonomy* were frequently used in the interview partners' descriptions of the SOPGs' relations, their objectives and activities, their engagement with the local community, and their values and future aspirations. The groups pursued a combination of

direct marketing-related and socio-cultural and political objectives and activities. However, the analysis of activities showed that the marketing-related objectives were emphasized, while community development was less represented in concrete activities.

Reported challenges encountered in the autonomous, participatory, and solidarity-based approach implemented by the SOPGs were the high amount of time to be invested by individuals *ad honorem*; managing group conflicts and decision-making in the organization of activities, assuring continuous participation of producers, particularly during normalization of conditions after lockdown ended, and seasonal decrease of economic revenues from selling in the markets. In this regard, the SOPGs that implemented the producer shops reported that some producers stopped participating after lockdown ended and when the high selling season was over. However, those SOPG members who kept up with the shop or market activities stated a pronounced commitment to continue in the collective construction process, pointing at the long-term establishment of producer shops and markets as instruments for local food-system transition towards food sovereignty.

### ***Linkages of objectives and activities with agroecological principles and how they respond to changing conditions***

Figure 4-4 shows the multiple linkages between the objectives of the SOPGs and the agroecological principles. These linkages are explained in the following for each principle also regarding how they respond to the changing conditions (see Section Changing conditions for market actors to operate, page 126 ff) In order to give more meaning to the principles, each of them is introduced by citing its definition according to Wezel et al. (2020).

**Economic diversification:** *'Diversify on-farm incomes by ensuring that small-scale farmers have greater financial independence and value addition opportunities while enabling them to respond to demand from consumers.'* One key objective of the SOPGs was to generate new income sources for local producers, based on local and solidarity marketing approaches, and direct consumer-producer relations without intermediaries. Although the assessed producer markets existed before the pandemic, and producers who participated in the new producer shops had produced and marketed locally before, it became clear that by having a growing number of producer shops to market their products, they were incentivized to conduct activities to increase and/or diversify their production and marketing during the pandemic. Thereby, they were able to partially serve the (temporary) increased demand of local consumers. However, it needs to be underlined that most of the

producers in the assessed SOPGs did not make their living from on-farm or processing income alone. In this sense the markets provided a platform to generate additional income to increase financial independence of the households by combining on-farm or processing income with other off-farm incomes. Further, the objective of supporting the development of local and agroecological production practices showed the motivation to incentivize local farm-level transitions beyond the individual production horizon and through collective marketing. In this regard, interview partners highlighted the need to diversify product ranges offered in the shops and markets to attract consumers and to respond to consumer demands.

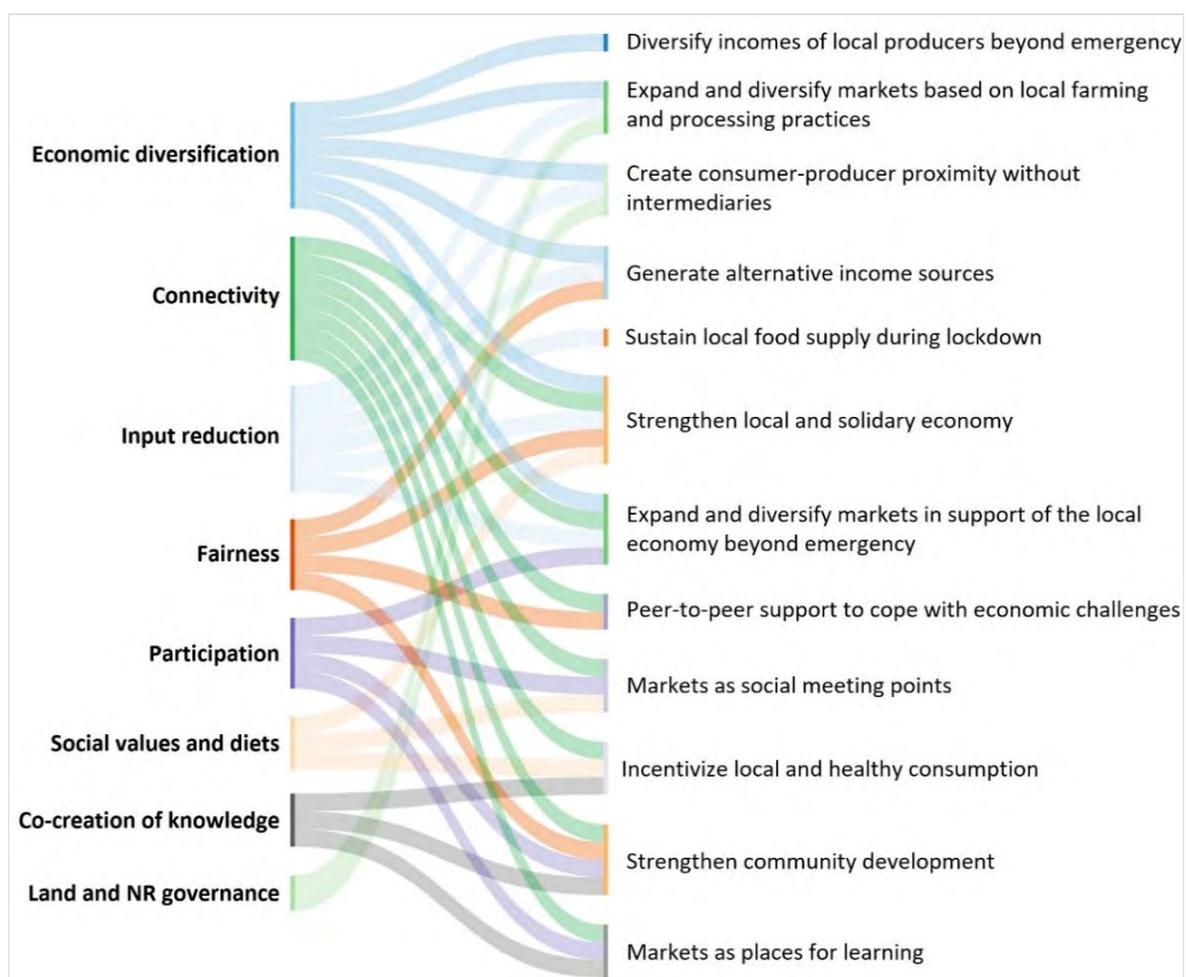


Figure 4-4 Assignment of SOPGs' objectives and agroecological principles

**Input reduction:** *'Reduce or eliminate dependency on purchased inputs and increase self-sufficiency.'* The high relevance of this principle during times of mobility restrictions, temporary input-supply disruptions for producers and consumers, and mandatory social isolation of consumers was shown by the response of local actors who established producer shops and markets to

sustain local food supply during lockdown, responding to increased demand to produce, market and consume locally. Further, the articulated reliance on preferably local resources (such as flour, fruits, and vegetables) by processors, and local seed production and exchange by farmers, directly responded to this principle. However, the principle was not fully applied. This was explained by the problem of (temporarily) limited local availability of certain products for production and consumption. Here, the SOPGs worked in collaboration with national farmer organizations, organic retailers, and food coops to obtain inputs needed in processing, such as sugar, coconut oil, etc., and products to increase product ranges for consumers in the markets (sugar, fruits, vegetables, yerba mate, etc.).

**Fairness:** *'Support dignified and robust livelihoods for all actors engaged in food systems, especially small-scale food producers, based on fair trade, fair employment and fair treatment of intellectual property rights.'* The support of robust livelihoods by producers and local consumers participating in the markets became evident through the objectives and related activities to sustain local food supply during lockdown, to provide solidary-based peer-to-peer support to cope with economic challenges in times of economic crisis (and other catastrophes, such as the fires). Fair trade was encouraged through direct producer-consumer marketing without intermediaries, in some SOPGs through definition of prices based on production cost. Aiming to establish producer shops and markets as places of social interaction and learning, the SOPGs encouraged transparent communication of price structures to consumers, coupled with awareness-raising activities related to local and agroecological production. Whereas the groups' motivations to establish and operate the producer shops were principally based on volunteering, some groups made use of remuneration schemes for worktime provided by group members to serve the public. Thereby, where remuneration schemes were implemented, the groups developed mechanisms to approach issues of fair employment, within a context of economic need for income, to operate the shops.

**Social values and diets:** *'Build food systems based on the culture, identity, tradition, social and gender equity of local communities that provide healthy, diversified, seasonally and culturally appropriate diets.'* Identified objectives and activities of the SOPGs are related to this principle, particularly with respect to facilitation of exchange of local knowledge on agroecological production, marketing, and consumption practices. Motivations expressed by interview partners in this regard were to incentivize local and healthy

consumption, and to enhance the implementation of agroecological farming practices. Diversification of diets was directly addressed by the SOPGs through the ambition to expand the range of products available in the shops and markets for local consumers, and by offering different types of healthy products, partly little known to local consumers. This principle also reflects cultural practices of parts of the local population who follow alternative and healthy lifestyles and emphasize solidarity and autonomy aspirations. Interview partners reported that local identity-building was encouraged through the shops and markets as social meeting points for collective action during social isolation, an example of how activities responded to the changing conditions.

**Land and natural resource governance:** *'Strengthen institutional arrangements to improve, including the recognition and support of family farmers, smallholders, and peasant food producers as sustainable managers of natural and genetic resources.* 'The SOPGs constitute new community-based institutional arrangements to form producer shops and markets. Interview partners characterized the shops and markets as places of institutional and organizational innovation to build an alternative local food system based on food sovereignty. Indeed, the new institutional arrangements adopted by the groups did not directly refer to land and natural resource governance. However, the SOPGs geared their objectives towards building a platform to facilitate broader institutional innovation within the local food system, also regarding management of natural and genetic resources (e.g., land rights and local seed production). Solidarity-based objectives and activities within the SOPGs were reinforced by the changing conditions: for instance, through peer-to-peer support to cope with economic challenges at the household level, through establishment of bartering systems, and through the objective to strengthen social community interaction (for example, through fundraising and campaigns to collaborate with the victims of the fires). Further, the emergency support provided by local governments was explained as a result of the new situation caused by the pandemic. However, in most cases, this support was temporarily limited to the emergency situation. Only in the case of pre-existing markets and in the case of one producer shop, did the government prove continued support through longer-term contracts to sustain the shop beyond the emergency situation. Hence, in these cases, the new situation helped to encourage local governments to support the new institutional arrangements that were created by the SOPGs. However, interview partners underlined the rather conflicting relation between the SOPGs and local authorities, and the lack of support for local agricultural

development in general. Reference was made to the absence of territorial land-use regulations, pressure by the real estate sector, and missing recognition by local governments of local (smallholder) farmers as capable and sustainable managers of locally limited agricultural lands.

**Connectivity:** *'Ensure proximity and confidence between producers and consumers through promotion of fair and short distribution networks and by re-embedding food systems into local economies.'* Connectivity was most obviously reflected in the objectives and activities of the SOPGs. This principle is inherent to the main objectives of the groups as they emphasized consumer-producer and producer-producer proximity through short distribution networks and strengthening local economies. Furthermore, the producer shops and markets were seen to play an important role as places for social interaction, joint learning, and collective politically motivated action. These functions are also reflected in the implementation of the principles of fairness, participation, and knowledge co-creation. The producer shops were established under changed conditions and with direct consumer participation. Consumer participation was particularly pronounced in the reported support of consumers in the construction of the shops (e.g., in form of donations or volunteer work). In turn, the SOPGs' objectives and activities aimed at incentivizing solidary economy, and relationship-building between consumers and producers. This was even more pronounced with respect to the bartering practices conducted by the SOPGs, when producers took the role of consumers through exchange of products for self-consumption.

**Participation:** *'Encourage social organization and greater participation in decision-making by food producers and consumers to support decentralized governance and local adaptive management of agricultural and food systems.'* Increased connectivity between the involved actor groups and the agency of the SOPGs to implement the shops and markets can be regarded as a product of new social organization. Furthermore, the groups aimed at developing new social organizational structures and processes for the shops' functioning and for its integration into local community development, based on multi-actor participation, horizontal decision making and peer learning (see also Table 4-1). Regarding decision making, the groups opted for consensus-based processes, requiring more participation in debates compared to majority vote processes. Local adaptive management was encouraged and implemented when the SOPGs readily responded to the various changing conditions (see Figure 4-3), by opening new markets and by developing new organizational arrangements.

**Co-creation of knowledge:** *‘Enhance co-creation and horizontal sharing of knowledge including local and scientific innovation, especially through farmer-to-farmer exchange.’* Activities conducted by the SOPGs showed that horizontal learning was approached through informal and formal learning. Informal learning occurred as part of the daily marketing activities (e.g., exchange of knowledge on alternative production and consumption practices, learning about organizational issues). Formal learning events were organized by the SOPGs, such as trainings for participants on topics of market administration and price definition (in some of the shops, provided by group members and/or by the local public extension agency). The implementation of new marketing formats under new conditions led to an increased need for learning by involved actors. Interview partner highlighted the importance and richness of horizontal learning processes that evolved within and between the SOPGs and with consumers, and how these learning processes enriched the collective processes (see also principles *connectivity, participation, and governance*).

#### 4.4 Discussion

Up to now most studies related to the COVID-19 pandemic crisis and local food system actors’ adaptations to changing conditions were conducted in the early months of the pandemic, based mostly on online surveys (e.g. Tiftonell et al., 2021; Zollet et al., 2021), and on expert opinions (e.g., Nemes et al., 2021; Worstell, 2020). We opted for a qualitative case study using in-person semi-structured interview methods with individuals and groups to obtain in-depth insight from first-hand local food actors’ perceptions, during 2021, when conditions stabilized, and on-going processes had been in place for more than twelve months. We studied how self-organized producer groups (SOPGs) adapted their marketing objectives and activities under changing conditions caused by the pandemic crisis, considering agroecological principles to understand emerging change processes.

The analysis of changing conditions supports our previous findings in the case study region, showing disruptions in local food actors’ operations mainly caused by mobility restrictions, closures of principal roads, the provincial borders, and some local markets (c.f., Frank & Amoroso, 2023). In consequence, local producers’ marketing and access to inputs were most affected, and they faced overall economic challenges to generate income. For consumers, access to places where to purchase food was restricted to very local options in the neighbourhoods. The important impact of the closure of

provincial borders, both for consumers to purchase food, and for producers to reach consumers and to purchase production inputs, is explained by the high social and commercial interconnectedness within the rural-urban continuums in the study region (Bondel, 2009). Within this context, the changed conditions triggered local food actors to focus on and to reorganize local marketing, based on collective action.

Due to the mobility restrictions and health protocols during lockdown, several farmer and handicraft markets were closed in the study area. These altered conditions supported the formation of SOPGs and the opening of producer shops, attended by one or two people, offering products from all participating producers. Within the SOPGs, the presence of producers with urban-rural migration backgrounds helped to promote links with urban environments and with consumer groups, realize activities within the markets and connect to other community development activities, beyond mere marketing transactions (Craviotti et al., 2021). Another important condition for the SOPGs to implement their responses was the increased engagement by the local government to establish the producer shops. As analysed by Ejarque et al. (in press), in the early 2000s, when some of the pre-pandemic markets were established in the study region, local governments also provided support. However, the quality of collaboration was variable between different markets and often ephemeral (Ejarque et al., in press). This risk was also observed in some of our cases: where public institutions provided temporary support during lockdown, it turned into a conflicting situation in some of the SOPGs in the course of normalization of conditions, when the state (re-)claimed the facilities (buildings, plots) for other purposes, such as for community activities or sports. This reported conflict, on the one hand, evidenced the objectives of the emerging SOPGs to sustain and expand the established producer shops, markets, and networks beyond the emergency situation. On the other hand, it explains the desire for autonomy underlined by some of the groups. Here, our results suggest that under normalization of conditions, governments' commitment in favor of local food system development based on agroecology needs to be guaranteed to sustain and expand local transition initiatives over time.

Overall, our findings agree with those of other studies regarding the high capacity of local food actors to respond to the changing conditions caused by the pandemic. While other studies showed this capacity at the onset of the pandemic, our study adds that the capacity was maintained over time and under gradual normalization of conditions. In particular, this was shown by

the SOPGs' longer-term objectives and activities conducted to keep producer shops and markets going. The reactive and immediate shock mitigation potential, also found by other studies in the early stages of the pandemic, was illustrated by the characterization of the producer shops and markets, and by the diverse objectives and activities brought to the territory by the SOPGs (c.f., Table 4-1). Most other studies in the field related this potential to concepts of resilience (Béné, 2020; Perrin & Martin, 2021; Savary et al., 2020; Thilmany et al., 2020; Tittonell et al., 2021). Regarding the short-term mitigation objectives of the SOPGs, we found this argumentation reasonable, when resilience is considered as *'the ability to cope with shocks and to keep functioning in much the same kind of way'* (Walker, 2020). However, looking at the longer-term objectives and activities of the SOPGs, it becomes clear, that the groups' aims and objectives did not strive at keeping the local food system functioning in much the same kind of way, but to radically change its structure. This shows the transformative potential of actors to operate in complex adaptive systems, as conceptualized for sustainability transitions in general (Hölscher et al., 2018), and more particular in our case, for agroecological transitions in food systems (Wezel et al., 2020). In resilience thinking, this transformative aspect explains that the SOPGs responded to disturbances by working towards new domains, reorganizing the local food system's structure, redefining values and aims, and contributing to increased resilience of the envisaged transformed local food system (Folke et al., 2010).

Regarding agroecological transitions reflected in our cases, we found that actors' responses under changing conditions were consonant with agroecological principles. By emphasizing healthy and local food production and consumption, and by promoting a common identity and reinforcing local ties, the assessed producer shops and markets and the organizational structures implemented by the SOPGs, conceptually relate to civic food networks (Renting et al., 2012), and to agroecological transitions promoted by such networks (González De Molina & Lopez-Garcia, 2021). In particular, we found that the objectives and activities of the SOPGs aimed at the revaluation of social, cultural and environmental meanings of food, and of changing relationships between producers and consumers to gain control over food production and distribution processes (c.f., Opitz et al., 2017; Renting et al., 2012).

The translation of this transformative potential into concrete actions was encouraged by the changing conditions. Changed conditions led to the occurrence of shared and complementary immediate needs of local producers

and consumers, for instance, the need for social interaction and solidarity-based peer-to-peer support in times of economic crisis, as well as the need of local producers to generate alternative and diversified incomes, and the need of consumers to purchase food locally. To address these and other identified needs, social and human capital was immediately mobilized by the SOPGs to (re-)organize local food supply chains in alternative networks under suddenly changing conditions. This mobilization confirms the high ability of SOPGs to readily respond to changing conditions by making use of available capitals. Moreover, the mobilization of social and human capital facilitated joint visioning and learning for local food system development, fostered social and organizational embeddedness of marketing activities in local communities, based on solidarity and shared values (Chiffoleau, 2009). This highlighted the relevance of direct physical producer shops and markets as places for producer-producer, consumer-producer, and consumer-consumer interactions. However, the interactions went beyond the issues of generating alternative incomes and to access food. They offered space for the above social purposes (Golsberg et al., 2010). Whereas in other regions, alternative marketing through digital channels was most pronounced during lockdowns (Cendón et al., 2021; Craviotti et al., 2021; Gutiérrez et al., 2021), consumers' preference of physical places linked to the social/emotional dimension of purchasing food was also revealed by Butu et al. (2020), who studied digitalization efforts for direct marketing during lockdown.

Longer-term proactive objectives and activities of the SOPGs, such as the permanent establishment of producer shops and activities to promote solidary economy and local agroecological farming and consumption practices further indicate that the groups are committed to sustain and expand their innovative practices beyond lockdown. Apparently, this finding is not surprising, as most producers were interested and/or actively engaged in alternative food practices before the pandemic. Nevertheless, it shows that changing conditions led to new needs articulated by producers and pushed them to change from the usual. The proactive character indicates that they took advantage of the changing conditions to realize their aims. This was shown by critical reflections and learning regarding sustainability of food practices within the SOPGs and with the local community. Thereby, new opportunities facilitated collective change in objectives and actions, based on learning by doing. These learning by doing processes were triggered by the changing conditions, hence new situations encouraged learning within the SOPGs. Restrictions and protocols required learning about new market organization formats (processes and structures). Further, the groups reported

that learning was addressed and enacted regarding agroecological production and consumption practices, highlighting the relevance of horizontal learning processes for agroecological transitions (Anderson et al., 2019). In this sense, the crisis situation can be qualified as a trigger event for learning by local food actors to innovate. A lasting outcome of the collective processes is the improved preparedness (resilience, transformative potential) of actors to readily respond to future crisis, based on the learning from concrete (positive) experience (Kolb, 1984), and based on the newly gained knowledge, as well as newly established social networks and institutional arrangements in civic food networks. This was illustrated by the development of the new producer shop formats and by the novel strategy of reselling staple food products bought-in from other regions within the SOPGs and to local consumers, in line with the concept of food coops (c.f., Little et al., 2010).

The relevance and potential of agroecological principles for these alternative networks to develop and to operate under changing conditions was shown by the explanatory analysis of multiple interrelations of the SOPGs' objectives and activities with the principles of agroecology (Wezel et al., 2020). The changing conditions triggered change of action towards agroecology, showing that agroecology principles became a relevant means to respond and adapt to changing conditions. This was, although to varying extents, found for all principles considered in the analysis, and most pronounced regarding the principle of economic diversification and those related to social aspects (connectivity, participation, governance, knowledge co-creation). These principles were at the centre of the SOPGs' objectives and activities. The adaptive management in response to a sudden shock situation was primarily based on the operationalization of the principles of participation and connectivity.

Connectivity refers to the important role of consumers in agroecological transitions in food systems. In our concrete case, we showed the high relevance of connectivity and participation for the implementation and maintenance of the producer shops and markets. In line with other studies (e.g., Cendón et al., 2021; Prosser et al., 2021), increased demand for local (agroecological) food within the established civic food networks was reported by the SOPGs, based on their observation of high demand in the markets by local consumers during lockdown, and continuity of the shops' and markets' functioning and frequentation after lockdown ended. Other studies found growing consumer demand and changes in consumption behaviour, either due to changing preferences for healthy food (Bisoffi et al., 2021), decrease in

purchase power (Workie et al., 2020), easier access to food, or ideological-political positioning linked to consumer-producer proximity and knowledge about where and how food is produced (Craviotti et al., 2021). Our case shows that the issue of access to marketplaces and food also played an important role during lockdown, leading to (temporary) changes in buying behaviour of local consumers. Further, from the assessed cases, substantial organizational and material support of the SOPGs by consumers revealed a further interest by consumers to contribute to the growth of alternative local marketing.

Our study gives only limited insight into consumers' roles because it did not cover consumers' perceptions on the SOPGs and the implemented producer shops and markets. Furthermore, changes in consumers' behaviour during the expected future normalization of conditions need to be monitored. Reflections made by the interview partners from the SOPGs regarding the maintenance and growth of the producer shops and markets highlighted the important role of consumers' buying behaviour and, their preferences for agroecological products, and their interest in actively contributing to local agroecological transitions (c.f., Cendón et al., 2021). While we found some activities that are very likely to be sustained by the SOPGs and the participating community under normalization of conditions, such as bartering, food coop community purchases, and further consolidation of the producer shops and markets, the sustainability of changes in consumer behaviour remains the big unknown variable with regard to lasting changes brought about by the pandemic (Bisoffi et al., 2021). To assess the role of consumers, and to better identify consumers' motivations and preferences for buying local food and to participate in alternative markets, we are currently conducting further consumer research related to the producer shops and markets in the study region. We consider it important to better understand why or why not consumers supported the local alternative markets in the context of the pandemic and under normalization of conditions, also taking into consideration possible socio-economic and cultural differences in the local population. This will contribute to the debate of limitations of alternative food networks to grow and to move out of niches (Sarmiento, 2017), and to contribute to scaling of agroecological transitions (González De Molina & Lopez-Garcia, 2021).

## 4.5 Conclusions

In light of findings from other recent research on the COVID-19 pandemic crisis and local food system actors' adaptations to changing conditions, our study responds to the call for in-depth case research to elucidate changing conditions for local actors to develop local markets and to assess the relevance of agroecological principles as a means of responding to changing conditions and to unfold longer-term transitions.

Although projections regarding the sustainability and evolution of the social processes that drove the assessed collective responses are difficult to make, our results showed that agroecological principles became important means to implement concrete local actions for transitions in a crisis situation. Moreover, we argue that through collective learning and action, encouraged by a difficult crisis situation, local food actors became better prepared for future changing conditions related to crises. They realized their capacity to act, increasing their self-determination. By showing that actors change their actions towards agroecology when new needs and opportunities arise from a crisis, it can be expected that future food crises will possibly provide additional triggers for actors to implement further local agroecological food-system transition strategies.

Finally, our study showed how the consolidated agroecological principles can be used to qualitatively investigate characteristics, potentials, and constraints of local actions for transitions in order to better grasp agroecological pathways enacted in real territories, and to provide decision support for policy makers to foster and potentialize such new local and community-based institutional arrangements.

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## CHAPTER 5

### General discussion and conclusions

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The overall purpose of the research conducted in the framework of this dissertation is to contribute to the transdisciplinary development of transition pathways towards agroecological farming and local food system practice. Using a transdisciplinary action research approach, within the selected study theme, specific research problems and objectives were co-developed with farmers and other local food system actors (processors, consumers, agroecology students, lecturers, extension workers and researchers) in a case study. Participatory action research methods were used to build partnerships and to conduct the research in three sub-projects (SPs).

In this final chapter, the main research findings are discussed in relation to their contribution to the co-development of agroecological transition pathways and involved social rearrangements in agroecological innovation niches, particularly in:

- i. collaboration between farmers and researchers for participatory action research;
- ii. multi-stakeholder collaboration in social innovation initiatives for agroecology transition support at the local food system level; and
- iii. local food actor-driven initiatives for local market development in a situation of crisis.

Furthermore, methodological reflections and their significance for the development of transdisciplinary action research approaches in agroecology are discussed. Finally, critical reflections of the research process and lessons learned are scrutinised, followed by suggestions for further research and general conclusions.

#### **5.1 Contributions to the co-development of agroecological transition pathways**

Alternative pathways co-developed and tested in territories are considered innovations that potentially contribute to wider food systems transitions (see Intro 1.3.3). Results from the SPs provide different insights into local co-development processes in agroecological innovation niches, i.e., in spaces where innovative practices are developed and tested through learning and

experimentation in multi-stakeholder collaboration (El Bilali, 2019; Tittonell, 2019). Findings show that the assessed processes addressed the three relevant implications for the sustainability of agroecological transition pathways, identified by Schwarz et al. (2022). Although with varying foci, they addressed: i) building *social capital* by establishing new multi-stakeholder collaboration and learning opportunities to gain *improved knowledge of the benefits of agroecology* by all stakeholder groups involved; ii) strengthening *collaborative action* and *collective institutions* to address required changes in power relations in the local food system and supply chains; and iii) targeting *changes in consumer behaviour and diets*. In SP I, this was approached through conceptualising and piloting a co-inquiry approach for participatory action research with farmers as co-researchers. Findings show that compared to other methods, the adopted co-inquiry approach provided capacity building and learning opportunities for groups of co-researchers, by facilitating extended roles of farmers as co-researchers and thereby encouraging horizontal learning. Based on systems thinking, it facilitated a joint explorative assessment of the systems operators' purposes, context, and experience, and through joint choice of methodology, experimentation, and reflection. In SP II, the social innovation initiative co-developed and tested a Participatory Guarantee System through collective action and social capital building for multi-stakeholder learning about agroecology, and to institutionalise local agroecological transition support, involving consumers' perspectives and active participation. In SP III, local actor-driven marketing strategies and collective organisation based on geographical proximity and agroecological principles showed potentials of local multi-stakeholder groups to mitigate challenges caused by the pandemic in production, marketing, and consumption, to generate new income opportunities for producers, and to strengthen collective organisation and learning in local agroecological production, marketing, and consumption development under changing conditions.

By co-assessing development possibilities in a local case study, the research accounts for the site-specificity of innovation processes, in particular in the development of agroecology-based farming and local food systems where multi-stakeholder learning is embedded and shaped by particular social, political, economic, and institutional contexts (Baker & Mehmood, 2015; Hall, 2007). Using this innovation system perspective, the assessed processes provide insights into novel forms of multi-stakeholder collaboration-building and involved changes in social practice, both with direct involvement of R&D organisations (SP I and SP II) and without such direct involvement (SP III).

Based on the social-ecological understanding of farming and food systems (Section 1.3.1, page 5 ff), it was shown that the studied initiatives were using changes in social practice to facilitate the development and implementation of new ecological practices (technical and economic management practices). This important insight underlines that transition pathways seek to discover how social actors make the desired technological and economical change possible (Dixon, 2011). For instance, co-inquiry for farm assessment and experimentation with new economic management practices led to changes in agroecological horticulture production. Similarly, new social practices were established for the development of agroecological production standards and socially embedded certification mechanisms, promoting local production, marketing, and consumption approaches. This shows that the approaches involved learning processes to comprehend that changes in social relations are associated with changes in socio-ecological relations. Participating groups gained awareness of and critically revised human environment interactions at the farm and local food system level to collectively find new ways of relating to each other and to jointly develop adapted and accepted measures for agroecological production, marketing and consumption, based on new forms of governance (Haxeltine et al., 2017; Renting et al., 2012). Thus, the findings contribute to empirical evidence that changes in social-ecological interactions are critical factors of change in the development of sustainable communities (Baker & Mehmood, 2015).

As Wojtynia et al. (2021) found, different stakeholder groups involved in agricultural sector transitions commonly share expectations regarding social and ecological needs for and goals towards sustainability. However, the authors identified substantial disagreement in terms of economic transition strategies, in particular attributed to the persistent growth-oriented regime paradigm, and to open questions of how the holistic agroecological approach can fit into, or alter this paradigm (Wojtynia et al., 2021). In SP I, by conducting a co-inquiry, the group of co-researchers identified economic challenges and lack of knowledge on how to better monitor and evaluate the agroecological horticulture production in economic terms, to improve economic viability of their farms, and to transparently communicate product price calculations based on production costs to consumers and other interested groups.<sup>22</sup> Price

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<sup>22</sup> The co-developed economic assessment tool, and results obtained through farm data collection were fed into a spin-off project, where in collaboration with farmers and extension workers, an interdisciplinary team developed a digital decision support tool

definition and communication of process quality aspects was also addressed by the SOPGs, and by the PGS initiative (SPs II and III). Here it was revealed that the processes helped sharing and advancing economic aspect of agroecology, by co-developing economic knowledge and pathways for economic development of agroecological production, marketing and consumption practice (D'Annolfo et al., 2017). In turn, the potential of transition initiatives was highlighted to co-construct local evidence and awareness about the economic dimension of agroecology, to improve economic viability through collaborative approaches, to transparently communicate production costs, considering social and ecological benefits, and to co-develop and promote solidarity-based economic alternatives (e.g., food coops, contract farming, and bartering systems) (Laforge et al., 2017; Opitz et al., 2017; Renting et al., 2012). However, the pursuit of transition pathways was also constrained by reported uncertainties of particularly farmers and processors regarding direct economic benefit gains from the participation in the initiatives. This aspect is further discussed below.

### 5.1.1 Facilitating new collaboration

The development of transition pathways requires *facilitation* (see Section 1.3.4, page 15). The systematic documentation and analysis of the multi-stakeholder processes evidenced that participating groups started realising the need, and the advantages of building multi-stakeholder collaboration to increase their room for manoeuvre, compared to individual strategies. In other words, they developed the shared expectation that by working in multi-stakeholder groups they can achieve results that could not be achieved alone (Camarinha-Matos & Afsarmanesh, 2008). Here, the concept of *collaboration* is useful to understand why facilitation is enhanced through initiatives that work together towards a common goal, and what constraints collaboration face in practice. Collaboration is not only considered the opposite of competition (Schiller et al., 2015), but also differs qualitatively from *networking* (information exchange) and *cooperation* (adjustment of activities and sharing resources to work towards compatible individual goals) (Camarinha-Matos & Afsarmanesh, 2008, pp. 52–53). *Collaboration* is 'a process in which entities share information, resources, and responsibilities to jointly plan, implement, and evaluate a program of activities to achieve a common goal' (Camarinha-Matos & Afsarmanesh, 2008, p. 53). Based on this

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for economic monitoring and evaluation, adapted to different agroecological production systems (see <http://coceplad.com/sig>).

definition, agroecological transition research and development approaches use the realm of *collaboration* to facilitate transitions (see, for instance Lacombe et al., 2018; Schiller et al., 2015), often without clarifying the concept, and using the term interchangeably with the term cooperation (e.g., Piñeiro et al., 2021).

Findings from the stakeholder identification and situation analysis (see Section 1.4.3.1 and Frank et al., 2019), and from the three SP's showed that the initiatives indeed strived for *collaboration*, by building new partnerships and organisation structures, and by conducting processes of collective action towards a common goal. However, findings also illustrate important insights regarding limitations to bring collaboration into practice. Firstly, regarding *resource sharing* and *responsibilities*, challenges in 'sharing' human resources, and responsibilities were identified. They refer to continuous active participation and take-over of tasks and responsibilities, e.g., by farmers in SP I and SP III, and by farmers and consumers in SP II. Secondly, whereas active participation in the *joint planning of activities*, including dialogical problem and idea framing was observed in all cases, mobilising (human) resources and responsibilities in the implementation stages was found challenging. For instance, this was identified as a challenge in conducting experimentation tasks by farmers in SP I, in the continuous participation of producers and consumers in the co-development and implementation of the PGS in SP II, and in the active participation of SOPG members in the organisational tasks to operate the markets SP III.

In line with other research on the role of collaboration in agricultural sustainability transition, the findings confirm that factors for successful collaboration are related to stakeholder relationships (roles, capacities, trust and commitment), objectives (also related to expected benefits), and technical means (Lamine, 2018; Schiller et al., 2015). The analysis of processes revealed detailed strategies, methods, and exemplary activities, how to build collaboration for transition support in practice (see Table 1-2, page 24; Table 2-3, page 64; Table 3-2, page 95; Table 4-1, page 131). In addition, the findings indicate that the issue of defining and working towards a *common goal* needs further attention to understand limitations for building collaboration. Clarifying incentives for and expected benefits from participating in a collaborative initiative was found to be critical (c.f., Hoffmann et al., 2007) to account for perceived uncertainties regarding expected (short-term) benefits of farmers and consumers.

Furthermore, it was revealed that the *common goal* or objective in multi-stakeholder collaboration needs alignment with subordinated individual goals (Vangen & Huxham, 2012). In other words, individuals and different participating stakeholder groups tend to have very individual goals or objectives that they expect to better reach by working towards a common goal in collaboration. For instance, farmers and processors sought to improve sustainability of their production in terms of economic return and income while contributing to ecological and social sustainability; consumers aimed to access healthy and local food, and to create awareness of sustainable food practices in the local community; the researchers' aim was to conduct transdisciplinary research in the framework of a doctoral project; extension officers aimed at connecting with their project work in the support of local development (see Table 3-1, page 87). Here, on the one hand, the need to clarify these very heterogeneous individual goals in the formation phase and to purposefully align the definition of an overarching *common goal* was highlighted. On the other hand, it was stressed that such alignment helps the different groups to recognise that individual goals can be achieved through working towards a common goal in collaboration (Vangen & Huxham, 2012). This was, for instance, illustrated by the change narratives obtained in SP II (Figure 3-2, page 92), and the farm situation analysis conducted in SP II (see Figure 2-2, page 58), which helped to jointly frame the complexity of problems and identify solutions, and to delimit which specific goals can viably be worked on in a determined collaborative process.

The co-inquiry approach (SP I) and the social innovation process (SP II) further point to the indispensable need for facilitated multi-stakeholder dialogues around agroecology, to share expectations and goals at the outset of the formation phase, and to revise them iteratively during the innovation process, thus to actively managing goals in collaboration (Lamine, 2018; Vangen & Huxham, 2012). Whereas, these issues are core to methodological approaches for collaboration and multi-stakeholder partnerships and learning (e.g., Brown & Lambert, 2012; Pretty, 1995), they are weakly addressed in collaboration for agroecology transition support, for instance in co-design approaches (Lacombe et al., 2018). Here, the dissertation provides empirical insights into new approaches towards multi-stakeholder pathway development, that can help better addressing goal considerations of participating practitioners, and constraints to achieve such alignment for improved collaboration in practice. In SP I it was discussed that the alignment of goals, thus the representation of individual goals also helped satisfying basic psychological needs of participants in terms of autonomy (Deci & Ryan, 1985), increasing intrinsic

motivation and enthusiasm to participate in transdisciplinary projects (Restrepo et al., 2020).

### **5.1.2 Changing relationships, role understanding and enactment**

Relationship building and changes in existing relationships for improved collaboration are critical preconditions for co-developing new social practices in the support of sustainability transitions (Haxeltine et al., 2017; Wittmayer et al., 2015). Results revealed that relationship-building to co-develop agroecology transition initiatives at the local level can be facilitated through the coordination of a combination of parallel, and initially formally unconnected transdisciplinary approaches. These were multi-stakeholder innovation platforms (Nederlof et al., 2011), praxis-oriented academic agroecology education approaches (Francis et al., 2016), and stakeholder identification and situation analysis at the outset of a transdisciplinary research project on agroecology (Christinck & Kaufmann, 2018; Frank et al., 2020). In the further course of the research process, other approaches towards relationship-building were identified. The piloted co-inquiry approach (SP I) was identified as another specific approach for participatory action research with farmers in transition that better supports building relationships of trust between practitioners and academia (Levitan, 2019), compared to co-design approaches for agroecological farming system development that miss out active participation of farmers and collaboration at eye level in the different project stages (Lacombe et al., 2018). In the SOPGs (SP III), building new relationships was inherent to the responses of local actors to the changing conditions caused by the COVID-19 pandemic, i.e., to be able to organise the different collective marketing activities. Here, no facilitated approach was used. Actors built on previously existing local networks and knowledge about facilitation of horizontal grassroots group processes (c.f., Mbugua et al., 2019), and started to create and strengthen relationships under restricted mobility conditions that pushed them to coordinate with direct peers and other local food actors to build collaboration (Prosser et al., 2021; Thilmany et al., 2020). Indeed, the analysis of activities conducted by these groups showed that the SOPGs explicitly worked towards the objective of increasing human and social capitals through changes in relationships within the SOPGs and with the wider community (see Table 4-1, page 131). The findings from three very different processes highlight that agroecological transition initiatives (grassroots, or facilitated R&D multi-stakeholder processes) need to be understood as spaces of social construction of new human relationships to build alternative collaboration (Gernert et al.,

2018) and to construct new institutional arrangements (Haxeltine et al., 2017). New insights into relationship-building in such initiatives were revealed by the analysis.

Firstly, in the initial (pre-project) phase of the PGS initiative, it was illustrated that concrete *opportunities for local relationship building* were created through networking within and between different stakeholder environments (see Section 3.3, page 88 f). Brokers or intermediaries coordinated activities between different stakeholder environments, to bring together different stakeholder groups (Klerkx & Leeuwis, 2009; Vasin et al., 2017). In particular, it was found that trusted working relationship-building in local multi-stakeholder transition initiatives can be constructed by: i) exchanging perspectives between stakeholder groups about agroecological transitions and their facilitation at the farm and local level; ii) identifying common social needs, problems and ideas for problem-solving; and iii) reflecting on values, assumptions, goals, and positionality of involved group representatives (Lamine, 2018; Popa et al., 2015).

Secondly, the results obtained indicate that relationship-building needs to be understood as an *ongoing, dynamic, and uncertain process*, that is constructed gradually in collaboration. Whereas in the literature on conceptual and methodological approaches for collaboration and other forms of multi-stakeholder partnerships, relationship building is often equalled to team formation (Figure 1-3, page 19) and described as an initial project step that is concluded at the outset of a group process, obtained perceptions of participants indicate that relationship-building is a process that is constructed gradually, and that can be interrupted through varying levels of active and continuous participation, or disengagement of participants. Methods used to facilitate relationship building are discussed in Section 5.2.

Changes in role understandings of participating actor groups in transition initiatives is considered key to change in social practice and to facilitate change towards sustainability (Wittmayer et al., 2017). This is also of particular relevance in the co-development of alternatives in agroecological innovation niches (e.g., Elzen et al., 2017; Jaeger-Erben et al., 2015; Opitz et al., 2017). This means for producers and consumers to become change agents (c.f., Home et al., 2017), and for researchers and extension workers to get involved as subjects of change, and at eye level with other participating groups (Ison et al., 2000; Taylor Aiken, 2017). Findings from SP I and SP II contribute to the understanding of role changes, both regarding new insights into role *understanding* and role *enactment* to facilitate agroecological transitions.

Overall, participating groups were able to reflect on required own and others' role changes and functions of such changes (Turner, 1990) in the collaborative development of transition pathways (see, for instance Figure 3-2, page 92). In the case of the group of students that took a leading role in the co-development of the PGS (SP II), the analysis showed that they changed their role understanding from being academic classroom learners, towards taking on leader tasks and responsibilities in the administration of the PGS. They became facilitators of PGS group activities, gained extracurricular capacities by conducting a collaborative "real world" process with other local food actors (Francis et al., 2016), which encouraged the students to reflect on and revise theoretical assumptions through practical experience (Kolb, 1984). The change of role understanding and enactment was encouraged through intrinsic motivations (Deci & Ryan, 1985) to learn about and to contribute to agroecological developments, and extrinsic motivations to fulfil social work hours as part of their study program.

In SP I, co-researchers (horticultural farmers) appreciated extended roles, gained in the co-inquiry process, enabling them to actively take part at eye level in the joint explorative assessment of their farming purposes, context, and experience, and in the joint choice of methodology for experimentation and reflection. These results confirm the conceptual assumptions underlying the choice of a co-inquiry approach, as it increased control and active participation of farmers, encourages role changes, which are poorly addressed in other transdisciplinary approaches for collaborative research (Brandt et al., 2013; Vilsmaier et al., 2015; Zscheischler & Rogga, 2015).

Enactment of new roles implied taking over new tasks and responsibilities that habitually do not belong to the own activity system (see Engeström, 1987 for a detailed conceptualization of activity systems). Thus, stakeholder groups had to expand their habitual activity system to integrate new tasks and responsibilities, requiring changes of their work routines based on the active reflection and revision of their habitual routines (Kaufmann, 2019). In the case of co-researchers in the co-inquiry (SP I), role changes related to activities of data collection and recording of production data, in the PGS initiative (SP II), several groups were encouraged to change their roles (see Table 3-3, page 98), and in the SOPGs (SP III), producers and consumers were encouraged to take over organisational task in the collective market operations, and to actively participate in community development activities. Hence, role changes for successful collaboration in multi-stakeholder transition initiatives depend largely on the individuals' abilities and willingness to expand their activity

system and to respond to expectations of other groups towards changes of roles (Turner, 1990).

The important contribution here is that the different participating stakeholder groups in transition initiatives need to gain *understanding* of the new role in order to individually evaluate and take a decision to assume the new role through *enactment*. This points to challenges found in other transdisciplinary projects, where societal actors, such as farmers and researchers, found it difficult to *understand* and therefore to *enact* their new role (see Grin et al., 2004, pp. 131–134). In the assessed cases, such understanding about role changes and challenges to assume new roles developed as part of the collaboration processes, through (social) learning. For instance, in the PGS initiative and in the co-inquiry, roles and envisaged role changes were framed in the dialogical stages (see Section 2.3, page 54 ff and Section 3.3, page 88 ff) and reflected throughout. Thereby, participants were in the position to reflect and become aware of establishes routines that often hinder co-development processes (Ingram et al., 2020). Furthermore, it was found that role changes of societal stakeholders in transdisciplinary collaboration widely depend on the predisposition to engage in exploratory processes that have both an academic objective and the objective to solve real world problems (Häberli et al., 2001).

### 5.1.3 Creating learning opportunities

As outlined in the literature review (Section 1.3.3, page 9 ff), innovation systems and innovation niches are conceptualised as learning and experimentation spaces, where stakeholders build collaboration and co-development processes and products (El Bilali, 2019; Lundvall, 1992; Tittonell, 2019). The important role of generating new learning capacities to facilitate transitions was emphasised by Darnhofer (2015). When learning environments are created in multi-stakeholder collaboration, the concept of social learning is used to refer to learning that evolves in processes of collective action (Ison et al., 2007), and where *'learners construct their understanding by using and contributing to a range of common resources and, importantly, through active participation in practice'* (Morgan, 2011). Similar reasoning is used in *expansive learning* (Engeström & Sannino, 2020). Expansive learning conceptualises collective learning as processes where new knowledge is co-created in mediated process, in contrast to the understanding of learning as the acquisition of existing knowledge. When such learning takes place, *'both the learners and the problem situations are transformed'*

(Engeström & Sannino, 2020). Such learning approaches potentially better suit collaborative co-develop of agroecological alternatives in transitions, as they encourage actors to learn from proper experience about *new ways of knowing and doing* in co-innovation processes and to develop agency (Vänninen et al., 2015), and to better account for unpredictability and uncertainty of the outcomes of transition pathways (Darnhofer, 2015, p. 25).

The established explorative, experience-guided, and group-based learning processes involved both social and expansive learning. The analysed perceptions of participants in the three studied processes underlined that learning was considered an important means to guide change of action, i.e., to co-develop new transition pathways (Elzen et al., 2012; Sutherland et al., 2012; van der Ploeg et al., 2004). This was referred to the collaborative processes (learning about how to collaborate), and to the co-developed problems and solution strains (learning about new farming, marketing, and consumption practice). As discussed in the three articles (Chapter 2, Chapter 3 and Chapter 4), in all assessed collaborations, social and expansive learning situations were created, and learning capacities built that helped participants to gradually change individual frames of reference (Mezirow, 2000). They gained new insights and knowledge, stimulating change of attitudes and values, and thereby facilitating collaboration-building as well as critical reflection about experienced constraints when working towards common sustainability goals (Pel et al., 2020).

In the case of co-inquiry (SP I), learning environments were co-constructed through participatory action research methods (see Section 2.3, page 54 and Table 5-1 in the following sub-section). In the PGS initiative (SP II), learning in different stakeholder environments was consolidated into a multi-stakeholder co-development process, where farmers, consumers, students, lecturers, researchers, and extension workers conducted co-learning during facilitated dialogical activities and farm visits. They gained new perspectives and integrated knowledge about different perspectives towards agroecology, about different local transition pathways, and about concrete agroecological farming and food practices. Here, for instance, considerable learning about re-definition of roles, trust-building, rules, decision-making structures, and new work methods was identified. These learning contents are all related to (re-)shaping social practices, i.e., about the *how to collaborate* effectively in agroecological transition initiatives. Furthermore, the contents point to supportive conditions suggested to facilitate social innovation and social learning for agroecological transitions (Rossi, 2020).

Co-learning opportunities and learning capacities were also developed in the SOPGs (SP III). Specific objectives and activities that the groups co-developed and implemented to learn about *how to collaborate* were identified. The groups operated in a situation where learning-by-doing was an essential prerequisite to immediately co-develop production and marketing strategies and activities in response to the changing conditions caused by the COVID-19 pandemic (e.g., organisational skills to operate the producer shops, and organisation of food coops). Furthermore, they created formal and informal spaces for learning about agroecological production and consumption practices (see Table 4-1, page 131). The mobilisation of social and human capital facilitated joint visioning and learning for local agroecological food system development, and fostered social and organisational embeddedness of marketing activities in local communities, based on solidarity and shared values (Chiffoleau, 2009).

In summary, three main empirical contributions to learning-related aspects in agroecological transition initiatives were identified:

- i. that social and expansive learning outcomes in new multi-stakeholder transition initiatives involve important experience-based learnings for participating groups and individuals about '*how to collaborate*' in the development of transition pathways, thus they gain lasting capacities to organise learning and collaborative action across different food system stakeholder groups;
- ii. that multi-stakeholder collaboration in innovation niches help participating groups gain important skills in the discovery of alternative pathways (e.g., regarding group-based farm assessment, on-farm experimentation with agroecological practices, group certification schemes); and
- iii. that changing conditions for local food actors to operate (crisis) trigger pathway co-development through learning-by-doing, and increase the innovation capacity of self-organised grassroots initiatives to realise their transformative aims.

## 5.2 Reflection on methods and recommendations for further research

For the present dissertation, a transdisciplinary action research approach was used to explore, co-develop and test agroecological transition pathways with local stakeholders. The methodological choice was based on the understanding of transdisciplinarity as an approach that permits co-learning through concrete experience, and that is *'a reflexive, integrative, method-driven scientific principle aiming at the solution or transition of societal problems and concurrently of related scientific problems by differentiating and integrating knowledge from various scientific and societal bodies of knowledge'* (Lang et al. 2012). In this section, reflections on the action research methods used, and critical personal reflections on the overall transdisciplinary research processes are presented and complemented with recommendation for further research.

As described in Chapter 1 (Section 1.1, page 1 ff and Section 1.3.6, page 18), in the case of agroecology and related transitions, the principal conceptual argument for transdisciplinary action research approaches is that site-specific, collaborative, and democratic problem framing, experimentation, and evaluation and sharing of results in real world situations (territories) are considered, empowering food actors to have a stake in the entire research process, and obtaining contextualised results that can be readily implemented in practice. Furthermore, the approaches are suggested to facilitate the establishment of mutual learning environments for increased reflexivity of involved stakeholders, and thereby to be aware of positionality and change of role understanding and enactment of both researchers and food actors.

In SP I, co-inquiry from the PAR family (Heron, 1996; Heron & Reason, 2008) was identified as advantageous to better account for the general principles of agroecological research (Table 2-1, page 52), and to address identified drawbacks of other methods for agroecology research at the farm level with farmers, such as the limited roles and the low level of control the farmers have, especially in defining scope and methods for joint research, and the missing integration of farmers' experiential knowing. Although, PAR methods are not a blueprint, but need contextualisation to specific fields and settings of application (Reason & Bradbury, 2005), the study revealed advantages of conducting agroecology research using the conceptualised theoretical grounding of co-inquiry, and established co-inquiry stages, providing useful guidance for other researchers and interested groups of farmers to adopt and further advance the approach and selected methods (see conceptual

representation Figure 2-1, page 51). Particularly, the proposed methodological approach can inform research and development work with conventional farmer groups interested in jointly investigating their current farm management system to identify and experiment with alternative agroecological practices.

Different tools tested in the pilot co-inquiry were found useful in facilitating the different stages of the group process (Table 5-1): scope definition, situation analysis, planning of experiments, reflection, and adaptation of experiments. They were selected from the wide range of tools suggested for building and conducting collaborative multi-stakeholder partnerships (see Brown & Lambert, 2012), and for participatory action and learning in agriculture and rural development (see Pretty, 1995). Furthermore, the personal experience of the initiating co-researcher of being involved and to facilitate transdisciplinary group processes was a supporting component to conduct the research (Schrot et al., 2020).

Video-recorded recalls at the beginning of group sessions was found to be useful to memorise the previous group work, and to connect with the content of the upcoming sessions. Furthermore, participants reported that they valued the approach to gain protagonism and to record their perspectives of the co-inquiry process and contents. Such empowerment through use of participatory video was also found by Richardson-Ngwenya et al. (2019). Moreover, the video material supported the systematic documentation and analysis of the process, as part of the triangulation through use of mixed methods (Falkembach & Carillo, 2015; Schmidt & Luger, 2015).

Beyond methods, the pilot process proved to lever positive attitude-building towards working in a group of co-researchers in a democratic way and at eye level (Bray, 2000; Pimbert, 2017). Participants' perceptions indicate that co-researchers, representing academia and practitioners, were able to share and critically discuss their positionality and reflect on their assumptions and roles in the particular collaboration and in agroecological transition processes in general, thereby accounting for increased reflexivity, as called for in transdisciplinary sustainability research (Popa et al., 2015).

In SP II, the selected transdisciplinary action-research approach resulted in the participation of the researcher in the co-development of a participatory guarantee system as an instrument to facilitate farm and local food-system transitions.

Table 5-1 Group tools used in the pilot co-inquiry

Scope definition and group formation	<p><b>Workshop</b> with farmers (visual <b>brainstorming</b>, <b>ranking</b> of topics, <b>focussed discussions</b> to exchange and learn from farmers knowledge, <b>farm visits</b>, and <b>transect walks</b>, <b>informal exchange</b> with farmers, and <b>interviewing</b> methods.</p> <p><b>Introduction to the co-inquiry approach</b> (objectives).</p>
Situation and problem analysis	<p><b>Activity system mapping</b> by co-researchers (visualisation of farm management areas, and management practices/tasks).</p> <p><b>Problem and solution tree</b> for identified issues from the activity mapping.</p> <p><b>Focussed discussion for methodological choice</b> for experimentation in practice.</p>
Experimentation in practice	<p><b>Recording</b> of field data, memos, and field observations by the initiating researchers.</p> <p><b>Participation in farming activities</b> including <b>informal exchange</b> about the experimentation process, observations, and findings.</p> <p><b>Focussed reflection</b> about experimentation procedures and adaptation.</p>
Iterative reflection	<p><b>Participatory video, guided reflection rounds</b></p>

Based on the epistemological understanding of action research as a means to ‘*solve pertinent, practical and contextualised problems*’ (Levin & Ravn, 2007), the researcher engaged in a co-learning processes with societal actors to jointly work on solutions for socially recognised practical problems, and at the same time conducted the research to generate scientific insight views of social innovation ‘*from within*’ and ‘*in the making*’ (c.f., Estensoro, 2015). Two general challenges of action research were addressed in this research process. Firstly, the challenge of how to engage with the diverse local farming and food actors to conduct an action research process situation (Levin & Ravn, 2007) was addressed by implementing an extended exploratory phase at the outset of the research process, as it is suggested to conduct the first phase of a transdisciplinary research process (see Chapter 1, 1.4.3). This phase allowed the researcher to start-off with the field research from an ‘open stance’, to identify local stakeholders and their perceptions of contextualised problems, demands and possible solutions, to integrate previous researcher’s

knowledge with the local knowledge (both scientific and practical), and to dispose the required amount of time to interact with and relate to the societal stakeholders (Reason & Bradbury, 2005, p. 1 ff). Methods used for this exploratory phase (see Table 1-2, page 24) provided the required information and linkages to engage in purposeful multi-stakeholder action (c.f., Lelea et al., 2014), and to start building working relationships (see Section 1.4.3.1, page 23 f). Secondly, the challenge for the researcher engaged in action research to collaborate in a problem-solving process with local stakeholders to find solutions to local problems, and to simultaneously produce systematic and new scientific insights (Levin & Ravn, 2007; Schrot et al., 2020) was addressed by implementing several strategies and methods with varying success by learning from experience:

- i. iteration between definition of research problems based on scientific literature and exchange with local researchers from different disciplines, and local problem analysis and solution-finding with stakeholders, integrating this knowledge to formulate specific research problems;
- ii. systematic and chronological documentation of the collaboration processes and contents from the outset of the project;
- iii. synthetisation of group work contents, and findings that are informative for the group (documentation, recalls and discussion input in future activities, sharing with others interested), and that can be used for content analysis;
- iv. identification of relevant specific information that the researcher needs to collect with research participants to address identified scientific problems (to reduce the quantity of group activities that “only” deal with data collection, and to punctually conduct more focused data collection activities with stakeholders (who had interest in solving the specific local problems));
- v. selection of participatory group work tools that serve the local stakeholders to address the specific local problems, and that provide materials for analysing the scientific research problem;
- vi. awareness to suddenly emerging new problem situations in the case study region that are unexplored by scientific research, and that might be relevant to gain new scientific insights within the

selected research theme (e.g., changing conditions caused by the COVID-19 pandemic).

These strategies were found to be helpful to improve facilitation of social innovation processes for agroecological transitions, as part of an action research process, and to simultaneously address research problems. It was revealed that the action researcher became part of a social innovation process, involving learning and skill development of all participating groups, reflection on research practice, and local societal problem-solving practice (Estensoro, 2015; Karlsen & Larrea, 2016).

Qualitative research methods were found useful to conduct the explorative action research, as they allowed for transparent documentation of the entire research process, and to gain in-depth insights into participants' perceptions from the diverse documented dialogue situations (Strauss & Corbin, 1997). They allowed combining group activities with data collection (see bullet point iv. and v. above), and to reconstruct the diverse information in the iterative process analysis and interpretation. The engagement of the action researcher in the social innovation processes as a participating subject was best represented by qualitative research, as here, the interdependency of perspectives between researcher and research subject is not seen as a disturbing factor, but as an integral component of research process and outcomes (Lamnek, 2005).

### **5.2.1 Critical reflections on the applied transdisciplinary research approach**

In September 2018, I started the first field work phase in the case study region, having the general, theoretical grounded research proposal at hand to conduct a stakeholder identification and situation analysis in order to specify with local food actors, the specific local research problems and pathways to address selected problems in a collaborative research process. The objectives of this initial proposal were to: i) identify and characterise agroecological production systems and relevant stakeholders; ii) build peer-to-peer transition groups for collaborative learning, action, and reflection; and iii) tailor and test site and farm-type-specific transition pathways towards agroecology. Based on my previous practical agricultural and academic experience in Argentina, I was familiar with the socio-cultural context and with the “real world” problem situation that informed the initial research proposal. However, I arrived in the study region as a newcomer, and with elevated

expectation towards societal actors to participate in the proposed research. Whereas my initial “newcomer” position challenged reaching interested actors and building working relationships with practitioners, I also experienced this position as an advantage when conducting the stakeholder identification and situation analysis, as I was impartial and open to approach everyone without prejudices.

The acceptance of the Research Institute for Natural Resources, Agroecology and Rural Development (IRNAD) at the National University of Rio Negro to collaborate in the realisation of field research for the case study was combined with the interest of the involved local research group to gain insights into the proposed research approach, and to introduce new perspectives in the case study region on the co-development of new collaborative research pathways with the growing number of food actors concerned with agroecology. These were encouraging and at the same time challenging starting conditions. Although I had the required skills and mentoring in transdisciplinary research suggested for early-career researchers (Jaeger-Erben et al., 2015), I started learning about engaged research in an unknown environment, while acting (Levin & Ravn, 2007).

During the stakeholder identification and situation analysis (see Section 1.4.3.1, page 23), I got empirical experience with the conceptually known issues of gaining understanding of the specific socio-cultural context, finding ways to explain the theoretical grounding of my proposal to raise interest among local stakeholder groups and institutions, building operational management structures, coordinating group activities, and starting to build trusted working relationships (c.f., Häberli et al., 2001; Jaeger-Erben et al., 2015). The analysis of stakeholders’ perceptions about challenges for building transdisciplinary collaboration in the study region revealed: i) failure of past intervention projects; ii) cultural diversity of the local population; iii) heterogeneity of production types and scales; iv) individual time restrictions; and v) ideological barriers between ecological and conventional farmers (see Frank et al., 2019).

At that time, from my perspective as the initiating researcher, I experienced the challenges of translating the locally not established approach and the accompanying different role understandings to the relevant systems of local actors (Frank et al., 2019), and to identify with the stakeholders tangible profits, for them to participate in the research. In turn, I was encouraged to leave the “academic comfort zone”, meaning to find the right conceptual explanations and linguistical means to persuasively relate theoretical

concepts about transdisciplinarity and agroecology to the real-life situations of local food actors, and academic peers from other disciplines (Häberli et al., 2001).

Indeed, during the various exchanges with local actors at this point of the research, I gained the impression that overall, different actors groups were interested in the proposal, and seemed to be concerned with sustainability issues and interested in exploring agroecological transition pathways in a collaborative process. Particularly, this was indicated by the many interest statements I received during initial dialogues to engage in proposed activities. Then I realised few commitments of actors to participation. Some of the reasons were then addressed in the analysis of this research. Apart from the above challenges perceived by local actors for collaborative action, I realised that during dialogues about sustainability issues and agroecology at the farm and local food system level, the ‘overwhelming’ complexity of problems and related change pathways was revealed, leading to considerations of how to address/reduce this complexity in a collaborative process to find viable solution pathways.

I continued proactively getting in touch with local actor groups, promoting the research proposal (see example flyer in Appendix 1a that was widely shared with local actor groups), doing interviews, visiting farms, participating in farmer and food events, and in extension activities. In continuation, I organised two workshops, one with local organisations’ representatives, and one with farmers to share findings from the first research phase and to prioritise identified problems and ideas for collaborative research in the exploration of transition pathways with interested farmers. Even though only few of the previously identified farmers attended the workshop (although they had confirmed attendance), one group of farmers confirmed interest in starting a collaborative research process (Chapter 1), while others were interested in the topics but did not commit to any active participation. Simultaneously, the identified local interest to address a set of identified and prioritised problems by developing a participatory guarantee system (PGS) with local farmers and consumers was consolidated in the local multi-stakeholder innovation platform (Mesa Agroecología). I was invited to join the first meeting of a group of students and lecturers to start thinking about strategies to respond to the local demand articulated by farmers and consumers (Chapter 2).

From my view, these two formation processes exemplified the necessity to go through a process of ‘social construction of interest’, including the social

diffusion of the proposal through the diverse activities conducted, the dialogue between local actors about the proposal, and the gaining of a certain 'local stance' for me as a newcomer proposing something new. These factors helped build interest to finally connect with the stakeholders interested in the proposed work and committed to participation. Furthermore, the alignment of the research proposal with other local development processes was fundamental to increasing interest and to building alliances with different interested and committed groups. Potentials and constraints for the subsequent intensive and goal-led collaborative processes in SP I and SP II are part of the analysis provided in the respective Chapter 2 and Chapter 3.

At the half-way mark of the project term, the COVID-19 pandemic interrupted the collaborative processes in the two SPs. In my role as action researcher, conducting research on the co-development of agroecological transition pathways, I was encouraged to critically reflect on possible implications of the new situation, caused by strict lockdowns, on the local food system actors and how they develop responses within their agroecological transition trajectories. Together with the second supervisor of this thesis, we developed and conducted a survey to learn about impacts perceived by local farmers and processors, and based on the findings, we developed the SP III in an interdisciplinary team with three researchers from the social sciences (Chapter 3). The interdisciplinary collaboration, supported by the local state extension office, enriched the methodological framework development, and embedded the study into a local extension project to support established local marketing initiatives during the COVID-19 pandemic, enhancing mutual learning between the project team and the SOPGs.

As described in this dissertation, the claim of transdisciplinary research for agroecology is to build new context-dependent collaboration with food actors to do situated research towards shared sustainability goals, and as an inherent component of this process, to gradually reframe the way collaboration is understood and enacted by all involved groups. The conducted "pilot" research process illustrates that this claim can be translated into research practice. However, the findings presented in Chapter 2 underline, among other factors, the extended time requirements in collaboration to build new relationships, change role understandings of food actors (and researchers), and enactment to change social practices. For transdisciplinary social innovation and research processes, this means that time frames go beyond common short-term project terms, and usual funding schemes that are not appropriate (Häberli et al., 2001). This also highlights the importance of

longer-term permanence of researchers in territories where they engage in transition pathways co-development. Karlsen et al. (2016) explain this requirement as *nativeness*, the requirement of researchers to take part in territorial co-development processes to identify with challenges and problems that local food actors face, and to undergo a change towards being co-developers of socially sound solutions (Ison et al., 2000; Lamine, 2018).

The experiences made contribute to the so far limited number of systematically documented experience-based studies that report on challenges and potentials for early-career researchers when conducting transdisciplinary sustainability research (Jaeger-Erben et al., 2015). Methods used to facilitate the research process provide an example for other scholars that are interested in exploring new ways of how to collaborate with local food actors in the co-develop of transition pathways towards agroecology. In this regard, the reported research process and lessons learnt can be considered a “pioneer” experience for the involved stakeholders in the development of transdisciplinary approaches for agroecology research in Argentina.

### **5.2.2 Recommendations for further research**

The exploratory and process-oriented co-inquiry conducted in this study unveils further research demands and issues that could be addressed collaboratively in the co-development of transition pathways at the farm and local food system level.

In SP I, the present study focussed on the scientific analysis of the *how* and *who* of co-inquiries (SP I), while experiments with pertinent solutions for the participating farmer group were conducted, but not scientifically analysed (farm economic assessment, systematic recording of yields, calculation of production costs and revenues, market price definition based on production costs). Future studies could investigate such experiments conducted in co-inquiries and results obtained, to assess the robustness, validity and suitability of experimental designs and results for the local farmers’ communities to change their management towards agroecological farming, also compared to results obtained from disciplinary reductionist experiments conducted under controlled conditions, such as experimental stations. As the pilot process was conducted over a relatively short time, involving “learning about co-inquiry by doing”, it is recommended to F, to gain better understanding of evolution and institutionalisation of working-relationships over time. Moreover, research into effects of including a wider group of researchers from different disciplinary fields into co-inquiry groups would be interesting, to assess how

such interdisciplinary groups engage in and enrich transdisciplinary system analysis and solution development, thus for research to be able to better respond to the holistic assessment and solution development, required for agroecological farm redesign. Future research could use the conceptual basis and implementation steps developed in this dissertation to further test and advance the approach with farmers having other characteristics, i.e., in terms of farming purposes and objectives, socioeconomic situations, production types, scales, and current stages within individual and regional transition trajectories. For instance, in the *pampa humeda* region in Argentina, where large scale agro-industrial farming shapes the farming and food regime, and concurrently a growing number of large scale conventional farmers get interested in agroecological practices and demand transition support, institutionalisation of co-inquiry as a pathway to support farm level transitions could be further explored (see Section 1.1. and Domínguez, 2019). Here, potentials of integrating co-inquiries into well institutionalised agricultural innovation platforms, such as the CREA approach, could be further addressed (Tittonell et al., 2020).<sup>23</sup>

In SP II, the study of social innovation identified the relevance of role changes by different local food actor groups, to open new transition pathways. It was shown that role changes for successful collaboration in multi-stakeholder transition initiatives depend largely on the individuals' abilities and willingness to expand their activity system, and to respond to expectations of other groups towards changes of roles. Further research is needed to address issues of abilities and willingness (related to capacity building and commitment) specifically and in more detail, and the influence of expectations of other stakeholder groups towards assuming expanded roles (related to effective communication and negotiation of expectations and effects on actual enactment of new roles). Missing active participation and support by state decision makers in the SI initiative was perceived by the participating groups as limiting factor for success. Comparative studies assessing PGS development under different conditions, i.e., where policy participation occurs (e.g., in Bolivia, and other provinces in Argentina), could provide insights into how policy development in the framework of social innovation initiatives at the local level could expand the success of new pathways to be institutionalised through national legislations and local governance structures over time.

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<sup>23</sup> CREA is an Argentinean non-profit civil association made up of and led by agricultural entrepreneurs who meet in groups to share experiences and knowledge.

The transformative potential of social innovation initiatives (Haxeltine et al., 2017) to contribute to wider agroecological transitions needs further research over time and scales, as scaling is considered an integral part of social innovation to unfold its transformative potentials. When social innovation initiatives relate to other institutional change processes and the wider societal context, new social practices gradually contribute to regime and broader social change processes (Haxeltine et al., 2017). Similarly, further research on the evolution of local marketing group strategies (SP III), and their longer-term transformative potential under normalisation of conditions after the pandemic could provide better understanding to sustain and expand local market developments in agroecological innovation niches, by studying longer-term changes of consumer preferences, increase of local agroecological primary and secondary production volumes, expansion of local marketing practices, and if they gradually alter established farming and food practices. Cross-sectional studies including other similar agroecological niche innovations could provide further insights into regime-niche interactions and particular changing regime conditions in Argentina (e.g., through environmental policies or structural changes of consumer demands) that favour niche developments' scaling and related adaptations of regime functioning (Ingram, 2018).

### **5.3 General conclusions**

Agroecology has recently been consolidated as an overarching concept to guide sustainability transitions in farming and food systems. For the co-development of transition pathways towards agroecology, multi-stakeholder and actor-oriented transdisciplinary research approaches are currently being developed to facilitate co-learning and active participation of the relevant societal actors in problem framing, knowledge co-production and integration of new knowledge into farming, food, and scientific research practice.

By focussing on the Argentinean case, where agroecological research and co-development of transition pathways in agroecological innovation niches is only recently gaining momentum, in this dissertation, a transdisciplinary case study was implemented to co-develop farm and local food-system transition pathways.

Participatory action research with a group of horticultural farmers in transition showed that through a joint explorative assessment of the farmers' purposes, context, and experience, and through joint choice of methodology, experimentation and reflection, co-inquiry facilitates the co-development of

contextualised and actionable solutions that are tested by the system operators within their farming practice, based on experiential and social learning. Moreover, the approach was found empowering for interest farmer groups to become co-developers of practical solutions adapted to their farm situation and transition trajectories, and to further expand their self-perceived role as local promoters of agroecological farming and food practice.

The systematic documentation of how a participatory guarantee system for collaborative agroecological production standard definition and labelling of local agroecological products was co-developed and piloted, showed that social innovation in local food systems starts-off through new transdisciplinary collaboration. When social needs and demands for change in food and farming practice are shared in different local stakeholder environments, new narratives of change develop in multi-stakeholder discourses to guide shared ambitions of participating groups, and to create a socially constructed mandate for support institutions to coordinate activities. Moreover, the analysis of shared rationales and activities conducted by the multi-stakeholder group revealed that building new working relationships is facilitated by strategies of trust-building, co-development of agreed rules, horizontal decision-making structures, and innovative work methods. These strategies and activities conducted also proved to initiate change of role understanding of involved groups, which is considered critical for new social practices to evolve. Here, the findings indicated that when stakeholder groups start to enact new roles, multi-stakeholder initiatives gain room for manoeuvre to better reach their common goals. Enactment of such new roles is based on mutual understanding and trust building, and restricted when individual benefits are uncertain and delayed.

For the first time, the generically formulated principles of agroecology were used for in-depth analysis of a co-development process conducted by self-organised local marketing groups (SOPGs) (farmers, processors, and consumers) in response to changing conditions for production and marketing during a unique and severe crisis situation. This analysis showed how suddenly changing conditions for producing, marketing and consuming food, triggered actors to develop and implement agroecological practices, pursuing both immediate short-term objectives to cope with the crisis situation, and longer-term transition objectives. In turn, it was shown that agroecological principles became an important basis for local food actors to implement coping strategies in a crisis situation, indicating the potential of agroecological practices to contribute to resilience building, when they are translated by local

food actors into adapted strategies. Although projections regarding the sustainability and evolution of the developed marketing strategies under normalisation of conditions are difficult to make, the case showed that actors change their actions toward agroecology when new needs and opportunities arise from a crisis. Such change was facilitated by social and experience-based learning that increased the actors' resilience and transformative potentials to readily respond to future crisis, based on the newly gained knowledge, as well as newly established social networks and institutional arrangements for local agroecological food system co-development.

Overall, this dissertation contributed to the understanding of how new social agroecological practices for research, for social innovation initiatives, and for grassroots food actor-driven initiatives can be co-developed and facilitated. It was revealed that the development and operationalisation of such new practices requires the development of a specific common goal, which can be addressed in a collaborative process, and that it requires substantial changes in the participating stakeholders' role understandings. Such understanding about one's own role changes and expectations towards changes of other stakeholders' roles is gained in dialogical group process, while enactment of new roles has to be gradually incorporated into established work routines. Enactment of new roles, i.e., taking over new tasks and responsibilities in multi-stakeholder collaboration, was found to be challenging, as stakeholders had to incorporate new routines into their activity system, by acquiring new skills and by reorganising established routines. Another limitation for enactment was found in the missing immediate benefits from actively participating in a transition pathway co-development process, whose outcomes and concrete profits for the different groups are inherently unknown. These limitations can be addressed, when multi-stakeholder dialogues are geared towards the formulation of a normative and socially constructed mandate for public support organisations (e.g., research and development organisations) to coordinate the implementation of co-developed transition pathways. Furthermore, reserving funds for stakeholders' own topic-related activities within project budgets, such as action funds, or local innovation support funds, are suggested to recognise the voluntary contributions of societal stakeholders in transdisciplinary co-development processes. Such contributions require the adoption of expanded roles to experiment with new alternative practices that promise to solve socially relevant sustainability problems that go beyond the immediate goals of individuals and expected short-term benefits.

The facilitated and studied transdisciplinary research process provided a pioneer experience in the Argentinean context of agroecological transition research. It illustrates how the investigation of science-based research problems can be purposefully integrated with transdisciplinary co-development of solutions that are perceived as relevant by local food actors to operate towards agroecology, thereby addressing the transformative claim of transdisciplinary sustainability research.

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## APPENDIX

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### Appendix 1: Exemplary materials used to establish local collaboration

*a: Flyer to raise interest of local actors in the collaboration proposal*

**Construyamos juntos la agricultura ecológica**



Invitación a participar en un intercambio de experiencias  
y conocimiento en Agroecología en la Comarca Andina

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## El desafío

La agricultura ecológica basada en los principios de la agroecología nos ofrece diversas herramientas para mejorar el manejo de las chacras, cuidando los recursos productivos y creando nuevas perspectivas sociales y económicas para las familias productoras. A través de la producción, transformación y comercialización local de alimentos diversos, frescos y sanos se crean nuevos vínculos entre productores y consumidores, fortaleciendo el desarrollo de comunidades que sostienen la producción agropecuaria familiar y el medio ambiente para futuras generaciones.

Productoras y productores en la Comarca Andina cuentan con diferentes experiencias en el manejo ecológico de sus chacras (hortalizas, frutas, granos, lácteos, carnes y otros) y desarrollan formas alternativas de comercialización. Por un lado se ha generado conocimiento importante y nuevas ideas en el manejo ecológico, adaptado a las condiciones productivas de la zona a través de la experimentación en sus chacras. Por otro lado continuamente enfrentan nuevos problemas a resolver.

En este sentido el desafío es cómo podemos aprovechar de las experiencias y conocimientos existentes en la Comarca para seguir construyendo la agricultura ecológica, brindando acceso y apoyo a productores vecinos interesados en implementar nuevas prácticas agroecológicas.

Proyectos agroecológicos en diferentes partes del mundo han mostrado que el intercambio de conocimiento y el acompañamiento entre productores a través de jornadas y demostraciones prácticas en las chacras puede ayudar a crear ideas nuevas y superar desafíos. Además, productoras y productores sin experiencia en producción ecológica pueden beneficiarse de un acompañamiento en la implementación de nuevas prácticas en sus chacras.

## **La propuesta**

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La presente propuesta pretende construir espacios para compartir experiencias, desarrollar juntos estrategias de manejo y experimentar con prácticas nuevas en las chacras de los participantes.

Ofrezco la facilitación de un proceso grupal, con el fin de impulsar un intercambio de conocimiento sobre manejo agroecológico de chacras y comercialización asociativa de productos agroecológicos. De esta manera se busca probar formas nuevas de colaboración entre productores, investigación agropecuaria y otros actores relevantes para entrar en un proceso de aprendizaje conjunto y crear resultados relevantes y aplicables para todos los participantes.

Inspirado por mis trabajos en chacras agroecológicas en diferentes partes del mundo, estudios de agricultura ecológica y trabajo de investigación participativa, veo un gran potencial en realizar actividades beneficiosas para los participantes cuando se decidan en conjunto los temas y formas de trabajo, partiendo de los intereses concretos articulados por los productores.

## **Invitación**

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Invito a todas las productoras y productores a sumarse a este espacio de desarrollo participativo de prácticas agroecológicas, a contactarme para acordar una visita en su chacra y a participar en un primer encuentro informativo (fecha a ser anunciada). Invito a los que tienen experiencia en agricultura ecológica, en la transformación de alimentos ecológicos y mercados asociativos, y a los que en vez de experiencia tiene interés en aprender e implementar manejos alternativos en sus chacras.

Además invito a grupos de productores, asociaciones u organizaciones para hablar de posibles interacciones en las actividades a desarrollar.

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***b: Guide for first interaction with local farmers***

- i. How do I introduce myself, and how do I explain the project proposal and my expectations of the collaboration with local stakeholders? (a detailed narrative was prepared in advance)
  
- ii. Information/understanding the visited farmer should have after the meeting:
  - Understanding of my introductory statement and scope of the proposal for collaboration;
  - Time schedule and tentative date for the first proposed group meeting;
  - My contact details.
  
- iii. Information/understanding that I expect from the visit:
  - First insight into the production system and the farmers' profile;
  - The farmer's understanding of agroecology and transition pathways
  - Thematic interests, ideas, or needs for possible participation in the research process;
  - Family and farm labour situation (other people on the farm who might be interested);
  - Relations of the farmer to other farmers/ relevant actors (contacts?);
  - Information about other farmers or places/events/groups where I can meet other farmers;
  - Expression of interest/availability of the farmer to participate in a first group meeting;
  - Logistical needs/constraints for possible participation (transport, time, etc.).

## Appendix 2: Memorandum of understanding for collaboration in SP I and SP II



### Consentimiento informado

#### 1. Propósito y contrapartes

El presente documento de consentimiento informado tiene el propósito de formalizar la colaboración en el marco del proyecto para la conceptualización e implementación de un Sistema Participativo de Garantía (proyecto SPG) para productos agroecológicos en la Comarca Andina del paralelo 42 entre las contrapartes:

- a. *Grupo iniciador* del proyecto SPG conformado por estudiantes y docentes de la carrera de Agroecología de la Universidad Río Negro; aquí representado por el Ing. Agr. Eduardo Martínez y
- b. *Markus Frank* en el marco de su proyecto de doctorado 'Explorando vías de transición hacia manejos agroecológicos en la Comarca Andina del Paralelo 42', llevado a cabo entre el Instituto Alemán para la Agricultura en zonas Tropicales y Subtropicales, Alemania y el Instituto de Investigaciones en Recursos Naturales, Agroecología y Desarrollo Rural de la Universidad de Río Negro.

#### 2. Objetivos de la colaboración

El proyecto SPG tiene el objetivo principal de conformar un grupo de actores múltiples locales con el fin de conceptualizar y constituir un SPG en la Comarca Andina en un proceso colaborativo.

El proyecto de investigación del doctorando Markus Frank tiene el objetivo general de explorar vías de transición hacia manejos agroecológicos en un estudio de caso, usando un enfoque transdisciplinario. Esto implica actividades de investigación de acción con actores múltiples en el contexto del desarrollo y análisis de vías de transición.

En este marco, Markus Frank se sumó al proyecto SPG en su rol de investigador, con el objetivo de acompañar el grupo iniciador en la planificación y conducción del proceso colaborativo con actores múltiples. En su función de investigador de acción, Markus Frank apoya el grupo con conocimientos en agroecología, certificación y metodologías de facilitación de grupos, documentando el proceso y resultados en forma de grabaciones de reuniones, resúmenes de observación de participantes y entrevistas, con el fin de analizar y publicar la información recolectada como parte su proyecto de doctorado.

#### 3. Uso de información recolectada

Las contrapartes consensuan que:

- el grupo iniciador está de acuerdo con la documentación de actividades en el proyecto SPG y el análisis de la información documentada con fines de investigación por parte de Markus Frank;
- Markus Frank usará la información recolectada exclusivamente para fines de investigación en el marco de su proyecto de doctorado y de forma anonimizada;
- Los resultados científicos del proyecto de investigación de Markus Frank serán utilizados para publicaciones científicas, con autoría de Markus Frank;
- Se abre la opción de usar la información sistematizada del proceso del proyecto SPG para la elaboración de material de difusión con autoría compartida entre el grupo iniciador y Markus Frank.

#### 4. Duración

Se consensua una duración abierta de colaboración, considerando factores determinantes de terminación que están fuera de control de las contrapartes, como discontinuación del proyecto SPG y disponibilidad de recursos para el trabajo de campo de Markus Frank en la zona del proyecto.

Ing. Agr. Eduardo E. Martínez  
Director TPVO  
Sede Andina UNRN

Ing. Agr. Eduardo Martínez

Markus Frank

## Acuerdo de colaboración

### 1. Propósito y contrapartes

El presente documento de consentimiento informado tiene el propósito de formalizar la colaboración entre el grupo gestivo de la Chacra Rizoma, El Bolsón, Argentina, y el Instituto Alemán para la Agricultura en zonas Tropicales y Subtropicales, Alemania (DITSL), aquí representado por Markus Frank, en el marco del proyecto de investigación 'Explorando vías de transición hacia manejos agroecológicos en la Comarca Andina del Paralelo 42', llevado a cabo entre DITSL y el Instituto de Investigaciones en Recursos Naturales, Agroecología y Desarrollo Rural de la Universidad de Río Negro.

### 2. Objetivos de la colaboración

El proyecto de investigación tiene el objetivo general de explorar vías de transición hacia manejos agroecológicos en un estudio de caso en la Comarca Andina, usando un enfoque transdisciplinario. Esto implica actividades de investigación de acción con actores múltiples en el contexto del desarrollo y análisis de vías de transición.

En el marco de la presente colaboración, se realiza una sistematización participativa del manejo de la Chacra Rizoma entre el grupo gestivo de Rizoma y facilitado por Markus Frank, con los objetivos de i) explicitar el manejo de la chacra e identificar fortalezas y debilidades; iii) co-crear ideas y conocimiento para mejoras de manejo; iv) experimentar con mejoras identificadas en la chacra; v) compartir y evaluar la experiencia y conocimientos con otros productores interesados de la zona.

Siguiendo los principios de la investigación de acción para la co-creación de conocimientos en agroecología, las contrapartes trabajan de forma horizontal, tomando decisiones en conjunto y con el compromiso del seguimiento de las actividades acordadas, que incluyen reuniones, implementación y monitoreo de mejoras en chacra, y actividades para la difusión de resultados. En su función de investigador de acción, Markus Frank apoya al grupo con conocimientos, logística y recursos para la implementación y monitoreo de mejoras, y con metodologías de facilitación de grupo, documentando el proceso y resultados en forma de grabaciones de reuniones, resúmenes de observación de actividades y entrevistas, con el fin de analizar y publicar la información recolectada como parte de su proyecto de doctorado.

### 3. Uso de información recolectada

Las contrapartes consensuan que:

- el grupo gestivo de Rizoma está de acuerdo con la documentación de las actividades realizadas y con el análisis de la información recolectada con fines de investigación por parte de Markus Frank;
- Markus Frank usará la información recolectada exclusivamente para fines de investigación en el marco de su proyecto de doctorado y de forma anonimizada;
- los resultados científicos del proyecto de investigación de Markus Frank serán utilizados para publicaciones científicas, con autoría de Markus Frank;
- se abre la posibilidad de usar la información sistematizada para la elaboración de material de difusión con autoría compartida entre el grupo gestivo y Markus Frank.

### 4. Duración

Se consensua una duración de la colaboración hasta el 30 de Junio del 2020, con la posibilidad de extensión consensuada entre las contrapartes y considerando factores determinantes de terminación anterior a la fecha acordada que están fuera de control de las contrapartes.

 Casandra Del Valle Galegos

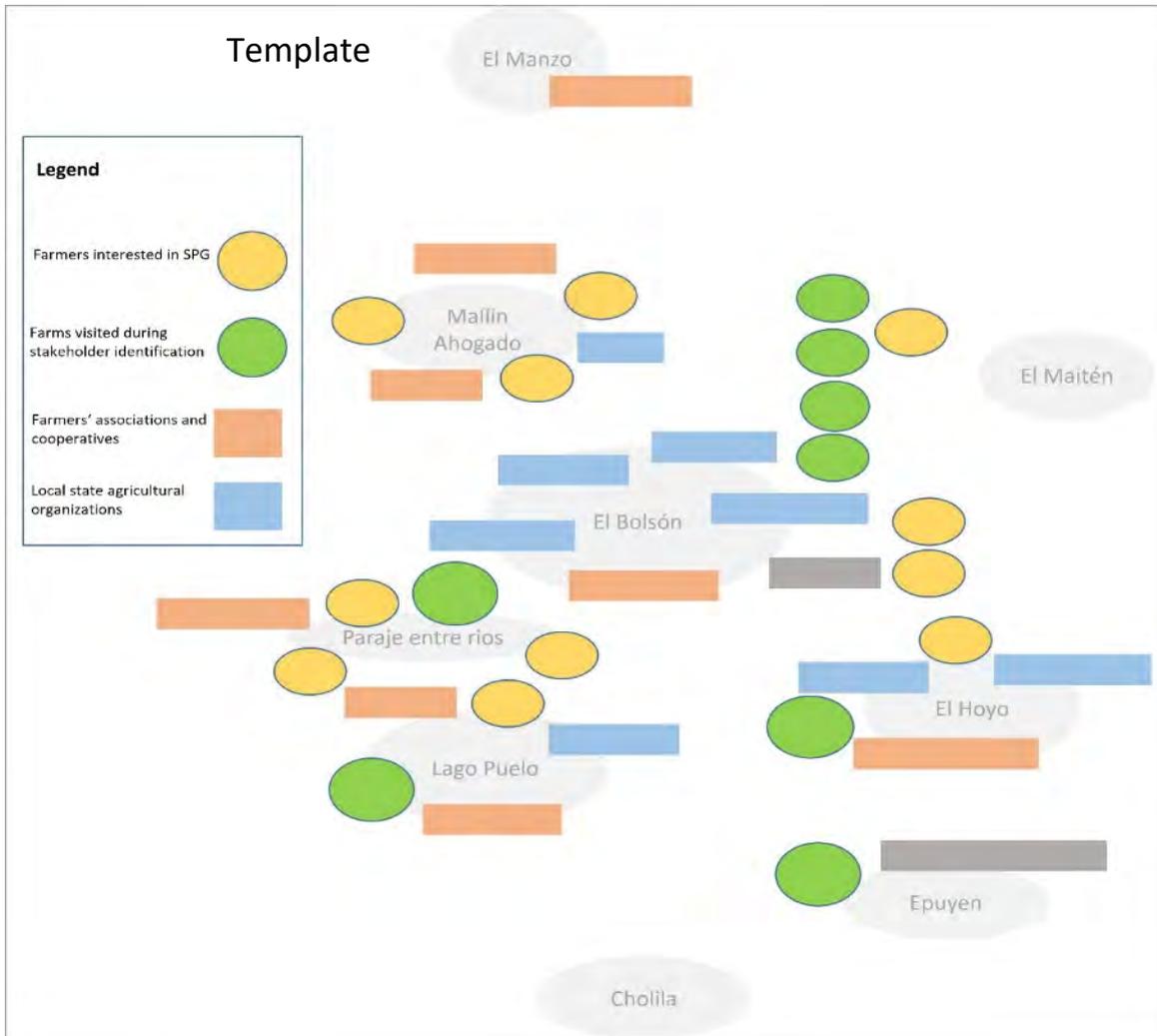
Representante Chacra Rizoma  
(fecha, aclaración, firma)



Markus Frank  
(fecha, firma)

### Appendix 3: Examples of data collection tools and interview guide

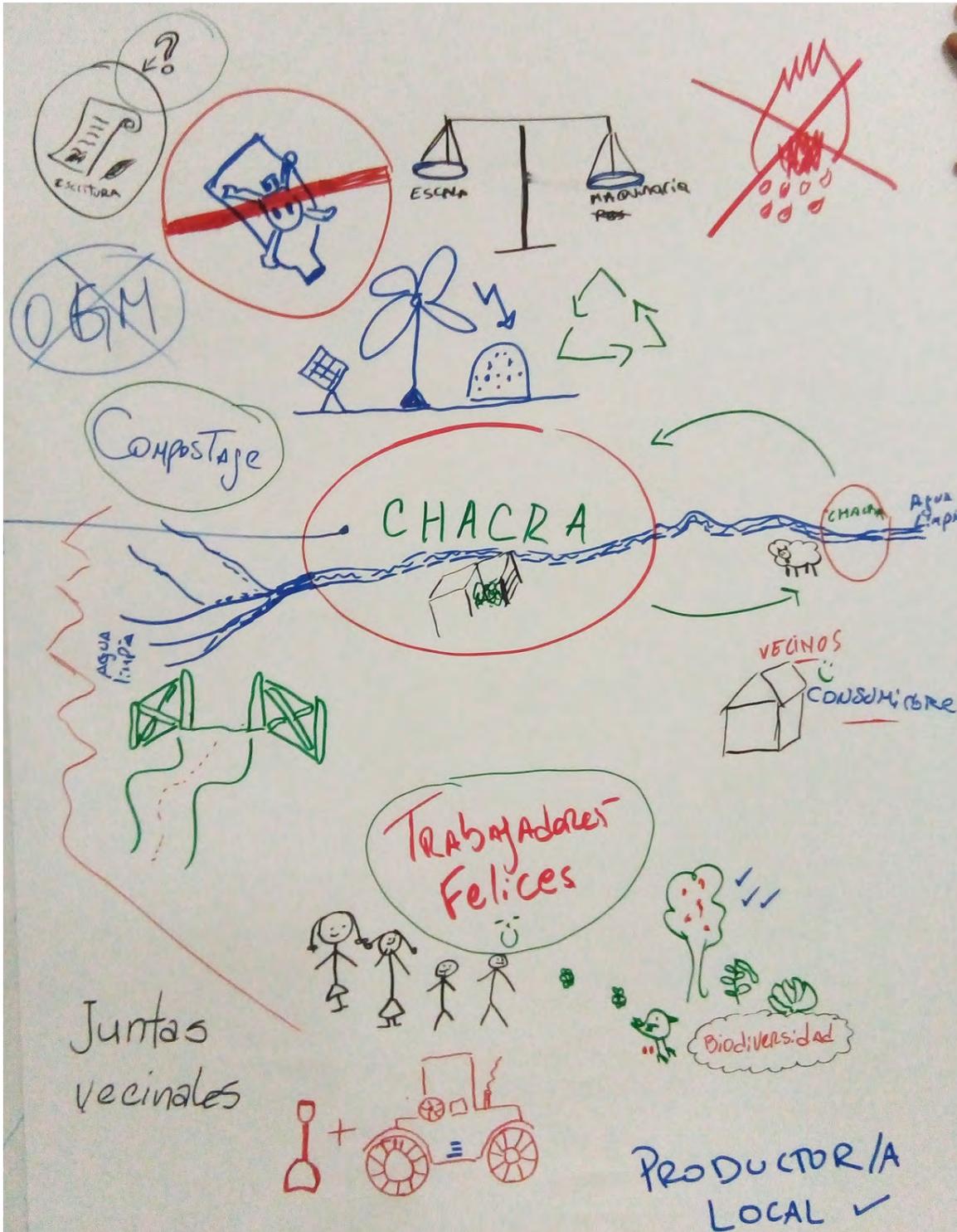
*a: Stakeholder map elaborated during a multi-stakeholder workshop in the framework of stakeholder identification and situation analysis*



**Figure:** The stakeholder map template was elaborated based on the stakeholder mapping activity (see picture next page) conducted during the first institutional workshop during stakeholder identification and situation analysis. Content was then continuously added during the further research, as a documentation tool, and to visualize stakeholders and their organizations and some of their characteristics and interests, in different locations within the case study location (the template is anonymized and considered a possible source of inspiration).



**b: Exemplary material obtained from group work in SP II:**



**Picture:** Result from the “Rich picture” method conducted with a group of consumers to identify and discuss consumers’ expectations from the “ideal” local agroecological farm they would like to receive their food from.

---

**c: Semi-structured interview guide SP III**

*[Translation of the original guide elaborated in Spanish]*

**Presentation:** In the frame of a research project, we are doing a diagnostic of the situation of farmers and local markets in *La Comarca* in the context of the pandemic. We are interested in identifying which conditions changed for farmers between March 2020 and now, and what activities farmers implemented to face the situation. We also strive to understand if the situation caused/facilitated changes in production and marketing to foster local agroecological production and consumption. If you agree the interview will be recorded. All information will be anonymized and only used for research purposes.

**i. Organizational history**

1. At first place I would like to ask you to tell me how the market came about.
  - a. Who collaborated in the process?
  - b. Which were the principle objectives to establish the market?
  - c. What activities have you carried out in the group to reach the objectives?
  - d. What difficulties did you experience to reach the objectives?
  - e. What are the strengths that characterize the initiative to reach the objectives?

**ii. Effects of the pandemic**

2. Now I would like you to tell me about your experience with the market in the context of the pandemic, so from the beginning of the pandemic in March 2020 until now.
  - a. Did your motivations and motivation of other participants changed?
  - b. Did the group changed objectives in the context of the pandemic? Which ones?
  - c. What conditions have changed during the pandemic to carry out the market activities?
  - d. Which activities were changed/adapted?
  - e. Did you face obstacles to reach new objectives? Which ones?
  - f. Did new strengths emerge? Which ones?

**iii. Composition of participants of the market group**

3. At the moment, what are the characteristics of the participants of the market?
  - a. What agricultural practices they conduct, at what scale?
  - b. Do participants consider themselves organic or agroecological?
  - c. Do they pursue other farming activities and/or off-farm work for additional income?

**iv. Expectations for the future**

4. To come to an end, what do you think about the market in the future?
  - a. What aspects to you consider important for the market to sustain in a “post-pandemic” future?

***d: Chronological systematization sheet (SP I and SP II)***

<b>Activity No.</b>	<b>Date</b>	<b>Participants</b>	<b>Objectives and methods</b>	<b>Content and outcome</b>	<b>Links to reference materials</b>
[ID]	[date of activity]	[names participants; stakeholder groups]	[Objectives of activity and methods used]	[Description of activity content and outcomes; agreements for future planning and action]	[direct links to collected materials, using doc-link function; Easy organization and access to all relevant audio and video recordings, field notes, memos, recording of results from visual group work, for data analysis]

## Appendix 4: Qualitative content analysis system

### *a: Category systems for qualitative content analysis SP I*

Farming project		Co-inquiry	
Purposes and objectives	53	Constraints	4
Interests for inquiry	28	Data collection tools	7
		evaluation	
Needs for management	28	Interests	28
improvements			
Background group	7	Motivations	4
members			
Problem statements	33	Objectives	31
farming practice			
Description production	13	Potentials	13
system			
Weaknesses project	10	Process description	24
concept			
Sustainability of the	5	Sources of learning co-	7
project		inquiry	
Project visions	19		
Organizational challenges	10		

### *b: Category systems for qualitative content analysis SP II*

<b>Multi stakeholder platform</b>	<b>47</b>	<b>Role perceptions</b>	<b>169</b>
Descriptions activities	36	Extension	5
Arguments for MS collaboration	11	Researchers	14
		Lecturers	15
<b>Narratives of change</b>	<b>202</b>	Students	17
Power to change	20	Producers	35
Arguments for / why change	73	Consumers	45
Ideas for how to change	109	Policy makers	14
		Definition of roles	24
<b>SI and inst. change processes</b>	<b>74</b>		
Matching	22		
Mismatching	7		
Expected support	21		
Broader social context	24		
<b>Implem. Strategies and activities</b>	<b>135</b>		
Framing and/or knowing	22		
Doing	23		
Organizing	29		
Quality/ type of relationships	28		
Implementation strategies	33		

***c: Exemplary transcript analysis used for content analysis in SP II***

In order to identify rationales, aims and expected effects of the PGS (Table 3-2, page 95), the following exemplary summary of transcript provided stakeholder perceptions of one audio-recorded multi-stakeholder intro meeting during the initial phase of the PGS development process with < 50 participants (mainly consumers; producers; lecturers; students; researchers; extension officers).

**i. Distribution logistics and market access**

- Linking local processing and primary production enterprises (information system on supply/demand of local products)
- Mapping of local ecological production for consumers (what's on offer and where)
- Improve access to local products (e.g., "mobile fair" that takes turns to bring products to consumers' homes)
- Groups can facilitate access of small producers to local markets for marketing
- Possibility to consider different forms of exchange (barter and market)
- PGS may function as a "brand" to boost (sale in local supermarkets?)
- Possibility of certifying products to access markets in other provinces

**ii. Product prices**

- Adding value to local and ecological products
- Fair trade (transparency of production costs and sales prices)
- Differentiation of local organic production without the cost of third-party certification
- Tool for collective price definition (valuing the work of producers, who can satisfy their needs, without using conventional reference prices)

**iii. Awareness of responsible consumption**

- To make the local organic offer more visible
- To include a larger part of the population and thus expand local organic production
- "Who do I want to benefit with my purchase?"
- Strengthen trust in production methods and explain how it is produced

- 
- Consider not only the quality of the product, but also the quality of the local production/processing/marketing process
  - PGS network can strengthen local bartering
  - Strengthen the profile/role of local prosumers
- iv. Knowledge management / collective action for agroecological transition support**
- Work and think together as a group (more in a crisis situation)
  - Encourage local people to produce for self-support and open up the possibility of generating an income by selling surpluses (e.g., community gardens). In this way it can help the family livelihood economy and support the local food system
  - Incorporation of the local University to "bring it to the plain, where we all are"
  - Create a sense that one participates in something bigger, beyond the individual
  - Group accompaniment for producers in transition towards agroecology
  - Strengthening producers with small infrastructures
  - Knowledge exchange on agroecological production practice
  - PGS as a tool to organise a self-managed network of relationships in the local chain
  - Beyond commercialisation, the network can help to tackle collective problems such as water use, land pressure, access to land, etc.
- v. Important considerations before starting co-development/ implementation**
- Explain what the aims and objectives and concrete methods of a PGS in the Comarca are, beyond the operational process
  - Analyse the local supply/demand market. Estimate how much of the population buys local/ecological products (e.g., Feria Franca) vs. how much comes from outside (e.g., supermarket). This is a task of technical accompaniment from the University group for the participating producers
  - Include the elaboration of primary products (e.g., noodles, public kitchens), elaborate protocols for all types of production so that all

types of producers have the possibility of setting up a PGS group (e.g., in different location)

- The state has to be present, to allow family kitchens (sweet, cheese, etc.) to be authorised
- Consider the strong role of the consumer. Their purchasing decision has a lot of power over changes in supply. Consumer grouping is key
- Bagging the term PGS/ renaming it
- How to solve "certification" of food that cannot be produced in the region, without high certification costs for third parties?
- Possibility to use local cooperatives as places for PGS meetings
- Risk of failure of collaborative efforts. Need to have rules and legal framework in place
- Important to incorporate the University to "bring it to the plain, where we all are"
- Involve/reach the large part of the population of the region that is not aware of responsible consumption. Use all available media and channels to spread the PGS initiative
- There will be no support from the capitalist state for an emancipatory and transformative initiative. Important is how to plan an emancipatory initiative
- Distribution/marketing logistics, how to connect the centre and the peripheric (km 0 concept), how to facilitate access to markets for small producers with a small quantity of products?
- Avoiding intermediaries who take a percentage and raise the final price (e.g., joint purchase directly from the producer of larger quantities between groups of consumers)
- Explaining the viability of agroecological production to consumers (e.g., El Hoyo farm where conventional farmer tells consumers that it is not possible on a scale that exceeds the family level to produce without agrochemicals)

### **vi. Concerns/criticism towards PGS co-development**

- It does not consider the delicate issue of the biggest pollution, which is money (the solution lies in a barter system, in "integral cooperatives"

- High costs of organic products. Eating healthy and organic food is complicated for those who do not have the necessary economic resources
- High price (reference to conventional market prices), or definition between consumers, producers, and technicians of a fair price for PGS products
- If the main problem is contamination/poor quality/ of fruit/vegetables coming from outside (plus environmental cost of transport), substitution with local products should have priority before considering how it is produced in the region (argument that levels of agrochemical use are low)

## Appendix 5 Curriculum vitae

Markus Immanuel Frank

### PERSONAL DATA

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Date of birth	21.04.1984, Hamburg, Germany
Nationality	German
Civil status	Married, 3 children

### ACADEMIC EDUCATION

---

07/2012-23	<b>Doctor of Agricultural Sciences (Dr. sc. agr.)</b> University of Hohenheim; accomplished at the German Institute for Tropical and Subtropical Agriculture (DITSL), Germany  Scholarships: <i>Studienstiftung des deutschen Volkes</i> ; Doctoral Scholarship (2020-2023). German Academic Exchange Service (DAAD); one year scholarship for field research (2018-2019).
09/2015	<b>Master of Science in Sustainable International Agriculture (double degree)</b> Georg-August-University of Göttingen, Germany University of Kassel, Germany
02/2012	<b>Bachelor of Science in Organic Agriculture</b> University of Kassel, Germany

### ACADEMIC EXPERIENCE

---

Since 09/2023	<b>Postdoctoral researcher</b> Research Institute for Natural Resources, Agroecology and Rural Development (IRNAD) at the National University of Rio Negro  Scholarship: National Scientific and Technical Research Council (CONICET), Argentina
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- 
- 08/2018 – 03/2023 **Visiting doctoral scholar for field research**  
Research Institute for Natural Resources, Agroecology  
and Rural Development (IRNAD) at the National  
University of Rio Negro
- 10/2015 – 12/2019 **Research associate**  
Department of Agricultural Engineering in the Tropics  
and Subtropics at the Faculty of Organic Agricultural  
Sciences, University of Kassel, Germany
- 11/2009 – 09/2015 **Project coordinator and research assistant**  
German Institute for Tropical and Subtropical  
Agriculture (DITSL) Witzenhausen, Germany
- 09/2014 – 12/2014 **Field research for M.Sc. thesis**  
National Institute for Agricultural Technology (INTA),  
Rio Negro, Argentina

#### **PRACTICAL TRAINING**

---

- 10/2010 – 02/2011 **Internship and field research in agroecology**  
Foundation AGRECOL Andes, Cochabamba, Bolivia
- 04/2007 – 06/2007 **Internship in practical organic farming**  
Lämmerhof, Schleswig-Holstein, Germany
- 06/2005 – 05/2006 **Practical training in agroecological farming**  
Naturaleza Viva, Santa Fe, Argentina
- 06/2004 – 05/2005 **Employment in advertisement and  
exhibition company**  
Witte – Werbetechnik, Hamburg, Germany
- 11/2003 – 05/2004 **Internship in rural development project**  
Welthungerhilfe (Sri Rama Krishna Ashram), West  
Bengal, India

## **HONORARY OFFICE**

---

Since 2011	<b>Board member</b> Association for Agriculture & Ecology (AGRECOL e.V.), Germany
Since 2017	<b>Membership</b> Council for Tropical and Subtropical Agricultural Research (ATSAF e.V.), Germany
Since 2019	<b>Membership</b> Sociedad Argentina de Agroecología (SAAE)

## **WORKING LANGUAGES**

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German (mother tongue), English (C1), Spanish (C1), French (A2)

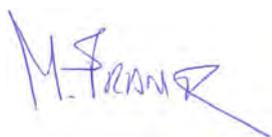
## **COUNTRY EXPERIENCE**

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Long-term (> 4 month) Argentina, Bolivia, Chile, India

Short-term (< 4 month) Zambia, Malawi, Kenya, Spain

El Bolsón, September 2023



Markus Immanuel Frank

## Appendix 6: Affidavit

### Anlage 3

#### Eidesstattliche Versicherung über die eigenständig erbrachte Leistung

gemäß § 18 Absatz 3 Satz 5 der Promotionsordnung der Universität Hohenheim für die Fakultäten Agrar-, Natur- sowie Wirtschafts- und Sozialwissenschaften

1. Bei der eingereichten Dissertation zum Thema

Co-development of transition pathways towards agroecological farming and food systems -

A transdisciplinary case study in Northern Patagonia, Argentina

handelt es sich um meine eigenständig erbrachte Leistung.

2. Ich habe nur die angegebenen Quellen und Hilfsmittel benutzt und mich keiner unzulässigen Hilfe Dritter bedient. Insbesondere habe ich wörtlich oder sinngemäß aus anderen Werken übernommene Inhalte als solche kenntlich gemacht.

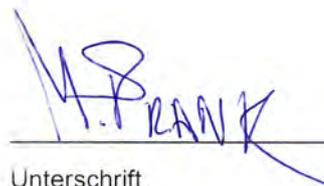
3. Ich habe nicht die Hilfe einer kommerziellen Promotionsvermittlung oder -beratung in Anspruch genommen.

4. Die Bedeutung der eidesstattlichen Versicherung und der strafrechtlichen Folgen einer unrichtigen oder unvollständigen eidesstattlichen Versicherung sind mir bekannt.

Die Richtigkeit der vorstehenden Erklärung bestätige ich. Ich versichere an Eides Statt, dass ich nach bestem Wissen die reine Wahrheit erklärt und nichts verschwiegen habe.

El Bolsón, 20.03.2023

Ort, Datum



Unterschrift



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